HOPE STREET PROJECT
108-134 HOPE STREET
BROOKLYN, NEW YORK

NYSDEC BCP Site Number: C224281

REMEDIAL ACTION WORK PLAN

February 2021

Prepared for:

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CERTIFICATIONS

I Ariel Czemerinski certify that I am currently a NYS registered professional engineer and that this Remedial Action Work 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).

076508	02/25/2021	
NYS Professional Engineer #	Date	Signature

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LIST OF ACRONYMS

Acronym	Definition
AMC	AMC Engineering
AWQS	Ambient Water Quality Standards
BCA	Brownfield Cleanup Agreement
BCP	Brownfield Cleanup Program
BTEX	Benzene, Toluene, Ethylbenzene and Xylene
CQMP	Construction Quality Management Plan
DUSR	Data Usability Statement Report
EBC	Environmental Business Consultants
FER	Final Engineering Report
HDPE	High Density Polyethylene
IRM	Interim Remedial Measure
NYC	New York City
NYCDEP	New York City Department of Environmental Protection
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
PS	Public School
PVC	Polyvinyl Chloride
RAO	Remedial Action Objectives
RAWP	Remedial Action Work Plan
RI	Remedial Investigation
RSCOs	Recommended Site Cleanup Objectives
SCG	Standards, Criteria, and Guidelines
SMMP	Soil/Materials Management Plan
SMP	Site Management Plan
SSDS	Sub-slab Depressurization System
SWPPP	Stormwater Pollution Prevention Plan
SVOCs	Semi-Volatile Organic Compounds
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank
VOCs	Volatile Organic Compounds

EXECUTIVE SUMMARY

Site Description/Physical Setting/Site History

This Remedial Action Work Plan (RAWP) was prepared on behalf of Hope-Keap LLC for the property known as 134 Keap Street, located at 118, 120, & 130 Hope Street and 138 Hope Street/429 Keap Street in Brooklyn, New York (hereafter referred to as the Site). In July 2018, an application was filed with the New York State Department of Environmental Conservation (NYSDEC) by the previous owner of the property (Hope Keap LLC) to admit the Project Site into the New York State Brownfield Cleanup Program (BCP). The Site was accepted into the BCP in January 2019. On January 15, 2020, ownership of the property was transferred to Hope-Keap Owner LLC. An application to amend the Brownfield Cleanup Agreement to add Hope-Keap LLC and to modify the property description to reflect a lot merger was submitted and executed on June 8, 2020. A second application to amend the Brownfield Cleanup Agreement is being submitted with this RAWP to add Lot 4 as part of the brownfield Site.

The street address for the Site is 118, 120, and 130 Hope Street; 138 Hope Street/429 Keap Street; and 134 Hope Street in Brooklyn, NY (**Figure 1**). The Site is located in the Williamsburg neighborhood of Kings County and is comprised of a two tax parcels identified as Block 2386, Lots 4 and 7 **(Figure 2**). Historically Lot 7 was comprised of three Lots (7, 12 and 14) which were merged on June 13, 2018 into Lot 7. Lot 4 and Lot 7 will also be merged as required for redevelopment. The total area of the Site is 25,000 square feet (0.57 acres).

The Site is bounded by Hope Street to the north followed by residential and commercial buildings; Keap Street to the east followed by residential buildings and a daycare; residential buildings followed by Grand Street to the south; and Rodney Street to the west. The Site is a vacant construction Site surrounded by a construction fence with no structures present.

Summary of the Remedial Investigation

A Remedial Investigation was completed at the Site by AKRF from February 8, 2019 through February 21, 2019. The investigation is summarized below. Further details are provided in the Remedial Investigation Report (AKRF, May 2019).The goals of the Remedial Investigation were to define the nature and extent of contamination in soil, groundwater and any other impacted media; to identify the source(s) of the contamination; to assess the impact of the contamination on public health and/or the environment; and to provide information to support the development of a Remedial Work Plan to address the contamination.

Activities completed under the RI:

- Installed fourteen soil borings and collected twenty-two soil samples for laboratory analysis of volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), herbicides, pesticides, PCBs, and metals;
- Installed seven groundwater monitoring wells and collected seven groundwater samples for laboratory analysis of VOCs, SVOCs, pesticides, PCBs, total and dissolved metals and emerging contaminants (PFAS, 1,4-dioxane);
- Installed thirteen soil gas implants and collected samples for laboratory analysis of VOCs.

A Supplemental Remedial Investigation was performed on Lot 4 (428 Rodney Street) by EBC on July 3, 2020, and July 6, 2020. The investigation is summarized below. Further details are provided in the Supplemental Remedial Investigation Report (EBC, August 2020).

Activities completed under the Supplemental RI:

- Installed four soil borings and collected eight soil samples for laboratory analysis of volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), herbicides, pesticides, PCBs, metals and PFAS compounds;
- Installed three groundwater monitoring wells and collected three groundwater samples for laboratory analysis of VOCs, SVOCs, pesticides, PCBs, total and dissolved metals and emerging contaminants (PFAS, 1,4-dioxane);
- Installed four soil gas implants and collected samples for laboratory analysis of VOCs.

The results of sampling performed during the RI and supplemental RI identified an area of petroleum-related VOCs in the north-central area of the Site in the vicinity of a historic underground gasoline storage tank. This impacted area is estimated to be approximately 1,800 sf. Elevated petroleum VOCs were also reported at a depth of 10-12 feet below the surface in the northwest corner of Lot 4.

Historic fill materials have been identified across the Site to depths as great as 12 feet below grade. The fill material contains elevated levels of metals and SVOCs.

Qualitative Human Health Exposure Assessment

The qualitative exposure assessment indicated a limited potential exposure to on-site residents if remediation of the source area was not performed. A potential exposure was also identified for residents and commercial workers in adjacent buildings from dust or vapors during excavation of impacted soil and from chlorinated vapors if the source area was not remediated. A site-specific Community Air Monitoring Plan has been developed to identify and minimize the potential for off-site exposure to residents through continuous air monitoring during excavation activity. There were no other identified potential impacts to off-site populations from site-related contaminants.

Potential environmental impacts through the groundwater to surface water discharge were considered unlikely based on the concentrations of VOCs in groundwater, the groundwater flow direction (east), and the distance to the English Kills waterway (1 mile).

Summary of the Remedy

The remedy recommended for the Site is a Track 1 alternative (Alternative 1) which consists of the removal of all on-Site soil which exceeds Unrestricted Use SCOs. It is expected that a Track 1 alternative will require excavation across Lot 4 to a minimum depth of 12 feet across the Site to remove soil/fill with contaminants above Unrestricted Use SCOs, and excavation to a depth of at least 3 feet across all of Lot 7 to remove soil/fill with contaminants above Unrestricted Use SCOs, with additional deeper excavation within the north-central area to a depth of 9 feet below grade to remove a petroleum hotspot, and 12 feet to remove soil/fill with contaminants above Unrestricted Use SCOs around soil boring RI-SB-11. The remedy will include the following items:

- Removal of underground storage tanks and fill/soil exceeding Track 1 Unrestricted Use SCOs around/below the tanks;
- Excavation of soil/fill exceeding Track 1 Unrestricted Use SCOs as listed in **Table 1,** including excavation across Lot 4 to a minimum depth of 12 feet across the Site to remove soil/fill with contaminants above Unrestricted Use SCOs, excavation to a depth

of at least 3 feet across all of Lot 7 to remove soil/fill with contaminants above Unrestricted Use SCOs, and additional deeper excavation within the north-central area to a depth of at least 9 feet below grade to remove a petroleum hotspot, and 12 feet to remove soil/fill with contaminants above Unrestricted Use SCOs around soil boring RI-SB-11;

- Screening for indications of contamination (by visual means, odor, and monitoring with PID) of all excavated soil during any intrusive Site work;
- Installation of SOE and a dewatering system to allow for excavation/removal of petroleum impacted soil/historic fill at/below the groundwater table. A groundwater sample will be collected in accordance with NYCDEP requirements to determine if treatment is required prior to discharge. Treatment prior to discharge includes removal of fines in a settling tank, a sediment filter unit, and then removal of VOCs using liquid phase granular activated carbon (GAC) vessels. Treated groundwater will be discharged to the NYC sewer system under a NYCDEP sewer discharge permit;
- Installation of one monitoring well within the petroleum impacted source area of Lot 4 and two monitoring wells along the northern property line of Lot 7 to collect post-dewatering groundwater samples for VOCs (EPA Method 8260) analysis to demonstrate dewatering effectively addressed any potential pre-remedy groundwater conditions;
- Collection and analysis of end-point samples to evaluate the performance of the remedy with respect to attainment of Track 1 Unrestricted Use SCOs and Protection of Groundwater SCOs;
- Appropriate off-Site disposal of all material removed from the Site in accordance with all Federal, State and local rules and regulations for handling, transport, and disposal;
- Import of materials to be used for backfill and cover in compliance with: (1) chemical limits and other specifications included in **Table 1**, (2) all Federal, State and local rules and regulations for handling and transport of material;
- As part of the Track 1 remedy, a post-construction soil vapor intrusion evaluation will be completed. The evaluation will include a provision for implementing actions recommended to address exposures related to soil vapor intrusion within the new building;

- If Track 1 cleanup is not achieved, an Environmental Easement will be filed against the Site to limit future use of the property to Restricted Residential, Commercial or Industrial;
- If Track 2 Restricted Residential Use SCOs are not achieved, a composite cover system consisting of the concrete building slab will be constructed;
- If a Track 2 cleanup is not achieved, implementation of a Site Management Plan (SMP) for long term maintenance of the Engineering Controls.

All responsibilities associated with the Remedial Action, including permitting requirements and pretreatment requirements, will be addressed in accordance with all applicable Federal, State and local rules and regulations.

The intent of the remedy is to achieve Track 1 Unrestricted Use therefore, no Environmental Easement (EE) or site management is anticipated. If the soil vapor intrusion (SVI) evaluation is not completed prior to completion of the Final Engineering Report (FER), then a Site Management Plan (SMP) and EE will be required to address the SVI evaluation and implement action as needed; if a mitigation or monitoring action is needed, a Track 1 cleanup can only be achieved if the mitigation system or other required action is no longer needed within 5 years of the date of the Certificate of Completion (COC).

Although the goal of the remedy will be to remove all soil exceeding the Track 1 Unrestricted Use SCOs, if Track 1 Unrestricted Use SCOs cannot be achieved including achievement of groundwater and soil vapor remedial objectives, then a Track 2 or Track 4 remedy may result as described above.

1.0 INTRODUCTION

This Remedial Action Work Plan (RAWP) was prepared on behalf of Hope-Keap LLC for the property known as 134 Keap Street, located at 118, 120, & 130 Hope Street and 138/429 Keap Street in Brooklyn, New York (hereafter referred to as the Site). In July 2018, an application was filed with the New York State Department of Environmental Conservation (NYSDEC) by the previous owner of the property (Hope Keap LLC) to admit the Project Site into the New York State Brownfield Cleanup Program (BCP). The Site was accepted into the BCP in January 2019. On January 15, 2020, ownership of the property was transferred to Hope-Keap Owner LLC. An application to amend the Brownfield Cleanup Agreement to add Hope-Keap LLC and to modify the property description to reflect a lot merger was submitted and executed on June 8, 2020. A second application to amend the Brownfield Cleanup Agreement is being submitted with this RAWP to add Lot 4 as part of the brownfield Site.

An unrestricted use is proposed for the property. When completed, the Site will be redeveloped with a new 7-story residential building. The proposed development is compatible with the existing M1-2/R6A zoning. Refer to the Brownfield Cleanup Program (BCP) application for additional details.

This RAWP summarizes the nature and extent of contamination as determined from data gathered during the Remedial Investigation (RI), performed in February 8, 2019 through February 21, 2019. It provides an evaluation of a Track 1 cleanup and other applicable Remedial Action alternatives, their associated costs, and the recommended and preferred remedy. The remedy described in this document is consistent with the procedures defined in DER-10 and complies with all applicable standards, criteria and guidance. The remedy described in this document also complies with all applicable Federal, State and local laws, regulations and requirements. The NYSDEC and New York State Department of Health (NYSDOH) have determined that this Site does not pose a significant threat to human health and the environment. The RI for this Site did not identify fish and wildlife resources.

A formal Remedial Design document will not be prepared.

1.1 SITE LOCATION AND DESCRIPTION

The street address for the Site is 118, 120, and 130 Hope Street; 138 Hope Street/429 Keap Street; and 134 Hope Street in Brooklyn, NY (**Figure 1**). The Site is located in the Williamsburg neighborhood of Kings County and is comprised of a two tax parcels identified as Block 2386, Lots 4 and 7 (**Figure 2**). Historically Lot 7 was comprised of three Lots (7, 12 and 14) which were merged on June 13, 2018, into Lot 7. Lot 4 and Lot 7 will also be merged as required for redevelopment. The total area of the Site is 25,000 square feet (0.57 acres).

The Site is bounded by Hope Street to the north followed by residential and commercial buildings; Keap Street to the east followed by residential buildings and a daycare; residential buildings followed by Grand Street to the south; and Rodney Street to the west. The Site is a vacant construction Site surrounded by a construction fence with no structures present.

The area surrounding the Site consists of a mix of residential and commercial properties. The property has an elevation of approximately 14 feet above the National Geodetic Vertical Datum (NGVD). Based upon field measurements performed at the Site, the depth to groundwater beneath the site is approximately 11 feet below existing grade. Groundwater is expected to flow west towards the East River based upon regional contour maps.

1.2 CONTEMPLATED REDEVELOPMENT PLAN

The proposed redevelopment plan consists of the construction of a new 7-story mixed use building with a cellar. The cellar will consist of 22,052.77 ft^2 of parking, and the building's meter rooms. The first floor will consist of residential apartments, a 701 ft^2 retail space along Keap Street, a 1,501.27 ft^2 communal and co-working space at the corner of Hope Street and Keap Street, and the residential lobby, mail and package room, and the bicycle storage room. The 2nd through 7th floors will consist of residential apartments.

Excavation for redevelopment is expected to extend to approximately 12 feet below grade across the Site.

1.3 DESCRIPTION OF SURROUNDING PROPERTY

Surrounding land use (**Figure 3**) consists primarily of commercial residential properties with several new multi-story, multi-family apartment buildings to the north, south and east. Some of the new apartment buildings have first floor retail and are interspersed with some older and smaller multi-family buildings.

There are five schools located within 1,000 feet of the Site including the Brooklyn Arbor School approximately 920 feet to the south-southwest, Williamsburg Northside Lower & Middle located 985 feet to the north, P.S. 319 located 895 feet to the south-southwest, P.S. 19 Roberto Clemente located 920 feet to the south-southwest, and Williamsburg Northside Preschool located 985 feet to the north. There are two daycare centers located within 1,000 feet of the Site including Two By Two Childcare Academy located 30 feet to the west and Williamsburg Northside Infant & Toddler Center located 500 feet northeast of the Site.

There were no nursing homes or hospitals identified within 1,000 feet of the Site.

2.0 DESCRIPTION OF REMEDIAL INVESTIGATION FINDINGS

The field work portion of the RI performed on Lot 7 was conducted by AKRF from February 8, 2019, through February 21, 2019. The investigation is summarized in the sections below. Further details are provided in the Remedial Investigation Report (AKRF, May 2019). The field work portion of the Supplemental Remedial Investigation performed on Lot 4 was performed by EBC from July 3, 2020, through July 6, 2020. The investigation is summarized in the sections below. Further details are provided in the Supplemental Remedial Investigation Report (EBC, February 2021).

2.1 SUMMARY OF REMEDIAL INVESTIGATIONS PERFORMED

2.1.1 Soil Sampling

Lot 7

A total of fourteen soil borings (RI-SB-01 through RI-SB-14) were advanced at the Site using a Geoprobe® direct-push probe rig (**Figure 4a**). Soil borings RI-SB-01 through RI-SB0-07 were converted to permanent groundwater monitoring wells; therefore, the aforementioned soil borings were advanced approximately 10 feet below the observed groundwater interface at each location. Soil borings RI-SB-08 through RI-SB-14 were advanced to approximately 5 feet below the groundwater interface.

Soil borings RI-SB-03, RI-SB-05, RI-SB-06, and RI-SB-09 through RI-SB-14 were advanced within the proposed footprint of the proposed building partial cellar (related to formerly proposed building design); and soil borings RI-SB-01, RI-SB-02, RI-SB-04, RI-SB-07, and RI-SB-08 were advanced within the proposed slab-on-grade parking garage area (related to formerly proposed building design).

Soil cores were field-screened using a PID equipped with an 11.7 electron volt (eV) lamp and logged using the modified Burmister soil classification system. At each boring location, AKRF field personnel recorded and documented subsurface conditions.

Lot 4

On July 3, 2020, four soil borings (428B1 - 428B4) were advanced at the Site at the locations shown in **Figure 4b**. Soil samples were collected continuously in 5-foot intervals to a depth of 15 feet below grade using a track-mounted Geoprobe™ model 6712DT sampling system. The Geoprobe™ uses a direct push hydraulic percussion system to drive and retrieve core samplers. Soil samples were retrieved using a 1.25-inch diameter, 5-foot long dual tube with disposable acetate liners. Each soil sample recovered from the soil borings was characterized by an experienced geologist and field screened for the presence of VOCs using a PID. The geologist's field observations and PID readings were recorded for each boring in a soil boring log.

Two samples were retained for laboratory analysis from the 0-2 ft and 10-12 ft interval from each of the four soil borings.

2.1.2 Monitoring Wells

Lot 7

Seven permanent groundwater monitoring wells (RI-MW-01 through RI-MW-07) were installed using a Geoprobe™ DPP at the locations shown on **Figure 7a**. The wells were constructed with 10 feet of 2-inch diameter 0.002-inch slotted polyvinyl chloride (PVC) well screen straddling the groundwater table. A 2-inch diameter solid PVC riser was installed from the top of the screen to surface grade (at RIMW-03 and RI-MW-06 in front of the Site gates) or above surface grade (at RI-MW-01, RI-MW-02, RI-MW-04, RI-MW-05, and RI-MW-07). A No. 2 morie sandpack was installed approximately 2 feet above the well screen. The annular space around the solid well riser was sealed with hydrated bentonite and a non-shrinking grout/cement mixture. Each of the wells was finished with a j-plug and protective locking well cover. Groundwater monitoring wells RI-MW-03 and RI-MW-06 were installed with flush-mount covers due to their locations adjacent to the Site entrances; monitoring wells RI-MW-01, RI-MW-02, RI-MW-04, RI-MW-05, and RI-MW-07 were installed with stick up PVC risers and protected with galvanized steel locking well casings.

Lot 4

Three monitoring wells (428MW1, 428MW2, and 428 MW3) were installed on Lot 4 on July 3, 2020, with a track mounted Geoprobe. Each of the three new monitoring wells was constructed of 1-inch diameter PVC casing and 10 feet of 0.010 inch slotted PVC well screen set 7 to 8 feet below the water table.

A No.00 morie filter-pack sand filled the annulus surrounding the screen within two feet above the top of the screen. A one-foot hydrated bentonite seal was then placed on top of the filter sand and the remainder of the borehole was backfilled to grade. Following installation, each of the wells was surveyed to determine relative casing elevation to the nearest 0.01 ft and horizontal position to the nearest 0.1 ft. Monitoring well locations are identified in **Figure 7b**.

2.1.3 Samples Collected

Soil Samples - Lot 7

Twenty-two soil/fill samples were submitted for laboratory analysis. Soil borings RI-SB-03 and RI-SB-06 were advanced at the locations of FPM's Subsurface (Phase II) Investigation soil borings B-4 and B-7, respectively, where solvents were detected. At these locations, one soil sample was collected for analysis from surface grade to 2 feet below surface grade and a second soil/fill sample was collected for analysis from the 2-foot interval above the saturated zone. Soil borings RI-SB-08 through RI-SB-10 and RI-SB-12 through RI-SB-14 were advanced adjacent to soil borings RI-SB-03 and RI-SB-06 to delineate contamination identified in soil/fill samples collected from soil borings RI-SB-03 and RI-SB-06. At each of these delineation locations, no evidence of contamination was identified; therefore, one soil sample was collected from the 2-foot interval above the saturated zone. Two soil samples were collected for analysis from soil borings RI-SB-05 and RI-SB-11 to characterize soil at the location of the proposed partial cellar: one from grade to 2 feet below grade and the second from the 2-foot interval above the saturated zone. At soil borings RI-SB-01, RI-SB-02, RI-SB-04, and RI-SB-07, two soil samples were collected for analysis from each boring: one from surface grade to 2 feet below grade and the second sample from 2 to 4 feet below surface grade, the approximate extent of proposed excavation for the parking area (related to formerly proposed building design).

Soil/fill samples were submitted to TA of Edison, New Jersey, a New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP)-certified laboratory in accordance with Environmental Protection Agency (EPA) chain of custody (COC) protocol. The soil/fill samples were analyzed by for VOCs by EPA Method 8260 + 10 TICs and 1,4-Dx by

EPA Method 8270 SIM. The 8 soil/fill samples collected from soil borings RI-SB-03, RI-SB-05, RI-SB-06, and RI-SB-11 were also analyzed for SVOCs by EPA Method 8270 + 20 TICs, pesticides by EPA Method 8081, PCBs by EPA Method 8082, TAL metals by EPA Method 6000/7000 series, and hexavalent chromium by EPA Method 7196A.

Soil Samples - Lot 4

A total of 8 soil samples (and one duplicate) were retained for laboratory analysis from the 4 soil borings. The soil samples were collected in pre-cleaned, laboratory supplied glassware, stored in a cooler with ice and submitted for analysis to Phoenix Environmental Laboratories, Inc. (Phoenix) and Alpha Analytical Laboratories (Alpha). The soil samples were analyzed for the following: VOCs (EPA Method 8260), SVOCs and 1,4-dioxane (EPA Method 8270), TAL metals (EPA Method 6010), pesticides/PCBs (EPA Method 8081/8082) and PFAS compounds (EPA Method 537).

Groundwater Samples – Lot 7

Groundwater samples were collected on February 21, 2019 from monitoring wells RI-MW-01 through RI-MW-07 in accordance with the EPA low flow sampling methodology, the February 2018 NYSDEC emerging contaminant sampling guidance and the NYSDEC-approved Site-specific QAPP. Groundwater samples were collected using dedicated and decontaminated sampling equipment. The groundwater samples were collected a minimum of one week after well development.

The groundwater samples were analyzed for VOCs by EPA Method 8260, SVOCs by EPA Method 8270, pesticides by EPA Method 8081, PCBs by EPA Method 8082, TAL total and dissolved metals by EPA Method 6000/7000 series. The groundwater samples collected from monitoring wells RI-MW-03 and RI-MW-06 were additionally analyzed for 1,4-dioxane (1,4-Dx) by EPA Method 8270C Selective Ion Monitoring (SIM) and the 21-compound list of per- and polyfluoroalkyl substances (PFAS) by Modified EPA Method 537.

Groundwater Samples – Lot 4

A groundwater sample was collected from each of the four monitoring wells on July 6, 2020, for laboratory analysis of VOCs EPA method 8260, SVOCs by EPA method 8270, 1,4-dioxane by

EPA Method 8270 SIM, target analyte list (TAL) total metals by EPA method 6010, Pesticides/PCBs by method 8081/8082, and PFAS compounds by EPA method 537. Each of the monitoring wells was sampled using low-flow sampling techniques and were monitored continuously until parameters stabilized. A peristaltic pump was used to develop and purge each well and collect the sample. Samples were collected directly into pre-cleaned laboratory supplied glassware, stored in a cooler with ice and submitted to Phoenix and Alpha.

Soil Gas Samples – Lot 7

Thirteen soil vapor samples were collected from the 13 temporary vapor monitoring probes at the locations shown on **Figure 8a**. Soil vapor sampling was performed in accordance with the guidelines provided in the NYSDOH document entitled, "Guidance for Evaluating Soil Vapor Intrusion in the State of New York, October 2006". Soil vapor samples were collected from the interval above the saturated zone.

The soil vapor samples were collected over a 2-hour time period from each monitoring point using a 6-Liter, batch-certified SUMMA® canister equipped with a vacuum gauge and flow regulator set at a maximum rate of 0.2 Liter per minute.

The soil vapor samples were analyzed for VOCs by EPA Method TO-15 by TA, a NYSDOH ELAP-certified laboratory with Category B deliverables. Samples were shipped to the laboratory with appropriate COC documentation.

Soil vapor sampling locations are shown on **Figure 8a**.

Soil Gas Samples – Lot 4

Four soil vapor implants (SS1 through SS8) were installed on July 3, 2020. The soil vapor probes consisted of Geoprobe™ Model AT86 series, which are constructed of a 6-inch length of double woven stainless steel wire were installed to a depth of 6 feet below grade. The ¼" tubing protruding from the concrete/asphalt was then sealed to the surface with hydrated bentonite and a 6"x6" (approximate) plastic sheet.

Following verification that the surface seal was tight, one to three volumes (i.e., the volume of the sample probe and tube) were purged with a handheld vacuum pump prior to collecting the samples to ensure samples collected were representative. After purging, a 6-liter summa canister, fitted with a 2-hour flow regulator was attached to the surface tube of each of the sampling points and the valve opened to initiate sampling. Sample identification, date, start time, start vacuum, end time and end vacuum were recorded on tags attached to each canister and on a sample log sheet (Appendix D). When the remaining vacuum in the canisters was between 2- and 5-inches Hg, (after approximately 2 hours of run-time) the valve was closed, and the canisters were detached from the sampling tube.

Each of the 6-liter summa canisters were picked up the following day by a Phoenix laboratory courier and delivered to Phoenix for laboratory analysis of VOCs by USEPA Method TO-15. The soil vapor sampling locations on Lot 4 are shown in **Figure 8b**.

2.1.4 Chemical Analytical Work Performed

Lot 7

Each soil and groundwater sample was placed in pre-cleaned laboratory supplied glassware, and placed in a cooler packed with ice for transport to the laboratory. Laboratory services for soil, groundwater and soil vapor sample analysis were provided by Eurofins Test America Laboratories, Inc. (TA) of Edison, New Jersey, a NYSDOH certified environmental laboratory

Retained soil samples were analyzed for VOCs by EPA Method 8260 + 10 TICs and 1,4-Dx by EPA Method 8270 SIM. The 8 soil/fill samples collected from soil borings RI-SB-03, RI-SB-05, RI-SB-06, and RI-SB-11 were also analyzed for SVOCs by EPA Method 8270 + 20 TICs, pesticides by EPA Method 8081, PCBs by EPA Method 8082, TAL metals by EPA Method 6000/7000 series, and hexavalent chromium by EPA Method 7196A.

The groundwater samples were analyzed for VOCs by EPA Method 8260, SVOCs by EPA Method 8270, pesticides by EPA Method 8081, PCBs by EPA Method 8082, TAL total and dissolved metals by EPA Method 6000/7000 series. The groundwater samples collected from monitoring wells RI-MW-03 and RI-MW-06 were additionally analyzed for 1,4-dioxane (1,4-Dx) by EPA Method 8270C Selective Ion Monitoring (SIM) and the 21-compound list of per-and polyfluoroalkyl substances (PFAS) by Modified EPA Method 537. Soil gas samples were analyzed for VOCs by USEPA Method TO-15.

Lot 4

The soil samples were collected in pre-cleaned, laboratory supplied glassware, stored in a cooler with ice and submitted for analysis to Phoenix Environmental Laboratories, Inc. (Phoenix) and Alpha Analytical Laboratories (Alpha). The soil samples were analyzed for the following: VOCs (EPA Method 8260), SVOCs and 1,4-dioxane (EPA Method 8270), TAL metals (EPA Method 6010), pesticides/PCBs (EPA Method 8081/8082), and PFAS compounds (EPA Method 537).

Groundwater samples were collected directly into pre-cleaned laboratory supplied glassware, stored in a cooler with ice and submitted to Phoenix and Alpha. All groundwater samples from the monitoring wells were analyzed for VOCs EPA method 8260, SVOCs by EPA method 8270, 1,4-dioxane by EPA Method 8270 SIM, target analyte list (TAL) total metals and dissolved metals by EPA method 6010, Pesticides/PCBs by method 8081/8082, and PFAS compounds by EPA method 537.

Soil gas samples were analyzed for VOCs by USEPA Method TO-15.

2.1.5 Documentation

A map showing the sampling locations is provided as **Figures 4a/4b**. The results of soil, groundwater and soil gas samples collected during the RI are summarized in **Tables 2** through **14** and **Figures 6a/6b, 7a/7b and 8a/8b**. Below is a summary of the RI findings.

2.2 SIGNIFICANT THREAT

The NYSDEC and NYSDOH have reviewed the RI Report and determined the Site does not pose a significant threat to human health and the environment. Notice of that determination was provided during the public comment period through Fact Sheet No. 2.

2.3 SITE HISTORY

2.3.1 Past Uses and Ownership

According to historic Sanborn fire insurance maps, the Site was divided into several lots developed with one- and two-story residences on the eastern portion and by the Matson and

Hibbard Foundry with a molding shop on the western portion by 1887. By 1905, Brooklyn Coal Company was shown with coal sheds on the southwestern portion, a wagon shed on the central portion of the Site, and a wheel wright shop with a lumber shed and wagon painting on the western portion. By 1942, the Site was developed as two garages with a 550-gallon UST at 120 Hope Street (Lot 7) and a gasoline tank at 138 Hope Street/429 Keap Street (Lot 14). By 1951, 138 Hope Street/429 Keap Street (Lot 14) was shown as a steel warehouse and the gasoline tank was no longer depicted on the map. By 2007, two gasoline tanks were shown at 138 Hope Street/429 Keap Street (Lot 14) and the Site was depicted as three flats.

City Directory listings indicate that 120 Hope Street (Lot 7) was formerly occupied by a garage between 1928 and 1949, a service garage in 1960, an electrical manufacturing company between 1965 and 1973, an upholsterer between 1976 and 1992, a machinery shop between 1997 and 2014, and a metal fabricator between 2000 and 2014; and 128 Hope Street (also Lot 7) was occupied by Terriss Consolidated Industries Inc. between 1965 and 1976. 130 Hope Street (Lot 12) was occupied by DC Center Corp. (a dry cleaner) between 2000 and 2005 and a dry cleaner in 2010. 429 Keap Street (Lot 14) was occupied by a trucking company in 1945, a steel service company in 1949, a taxi company in 1960, and a plumbing and heating company in 1965 to 1976; and 138 Hope Street (Lot 14) was occupied by Parkway Equipment Handlers between 1997 and 2005 and by World Trade Copiers Corp. between 2010 and 2014. The listings indicated that surrounding area was developed historically with residential, commercial, manufacturing, automotive, and woodworking uses.

According to historic Sanborn fire insurance maps, Lot 4 was developed prior to 1887 with two 2-story dwellings, a 1-story office building and a 1-story building with a furnace and yard area utilized as part of a brass foundry operation. The 1906 and 1916 Sanborn map shows the same buildings, but the former foundry buildings are utilized for rag storage. The 1942 Sanborn map identifies the former rag storage buildings as waste paper storage.

Property Owners/Operators	**Years of Ownership**	**Status of Entity**	**Current/Last Known Address**	**Relationship to Requestor**	**Owner/ Operator**
Lot 7					
Hope-Keap Owner LLC	1/15/2020-present	Active	199 Lee Ave #554 Brooklyn, NY 11211	Requestor	Owner
Hope Keap LLC % Heatherwood Communities	9/9/2013-1/15/2020	Active	1737 Veterans Memorial Highway Islandia, NY 11749	None Known	Owner and Operator
RHS Hope LLC % Balticwood - USA	2013-2009	Active	320 Elizabeth Avenue, Newark, NJ 07112	None Known	Owner; Operator Unknown
Hope Street Associates L.L.C.	1997-2009	Active	429 Keap Street Brooklyn, NY 11211	None Known	Owner; Operator Unknown
Henry J. Stern	1976	Unknown	51-18 Grand Avenue Maspeth, NYork 11378	None Known	Owner; Operator Unknown
Henry J. Stern and Vera Stern	1976	Unknown	65-14 Boelson Crescent, Queens, NY 11374	None Known	Owner; Operator Unknown
Sibilation Realty Corp. % Simon H. Gluck	1973	Unknown	1450 Broadway New York, NY 10018	None Known	Owner; Operator Unknown
Unknown	Prior to 1973	Unknown	Unknown	None Known	Unknown
Lot 12					
Hope Keap LLC % Heatherwood Communities	9/9/2013-Present	Active	1737 Veterans Memorial Highway Islandia, NY 11749	Requestor	Owner and Operator
RHS Hope LLC % Balticwood - USA	2013-2009	Active	320 Elizabeth Avenue, Newark, NJ, 07112	None Known	Owner; Operator Unknown
Hope Street Associates L.L.C.	1997-2009	Active	429 Keap Street Brooklyn, NY 11211	None Known	Owner; Operator Unknown
Henry J. Stern	1983-1997	Unknown	51-18 Grand Avenue Maspeth, NY, 11378	None Known	Owner, Operator Unknown
Real Estate for Vehicles Revamping, Inc.	1978-1983	Unknown	10 Walnut Place Lindenhurst, New York 11757	None Known	Owner, Operator Unknown
Philip Kreger	1978	Unknown	369 Kingsland Avenue, Brooklyn, New York	None Known	Owner, Operator Unknown
Edythe Kreger			55 Peach Drive, East Hills, New York 11576		
Unknown	Prior to 1978	Unknown	Unknown	None Known	Owner, Operator Unknown

Lot 14

Lot 14					
Hope-Keap Owner LLC	1/15/2020-present	Active	199 Lee Ave #554 Brooklyn, NY 11211	Requestor	Owner
Hope Keap LLC % Heatherwood Communities	9/9/2013-1/15/2020	Active	1737 Veterans Memorial Highway Islandia, New York 11749	None Known	Owner;
RHS Hope LLC % Balticwood - USA	2013-2009	Active	320 Elizabeth Avenue, Newark, New Jersey 07112	None Known	Owner; Operator Unknown
Hope Street Associates L.L.C.	1997-2009	Active	429 Keap Street Brooklyn, NY 11211	None Known	Owner; Operator Unknown
Henry J. Stern	1983-1997	Unknown	51-18 Grand Avenue Maspeth, New York 11378	None Known	Owner; Operator Unknown
Real Estate for Vehicles Revamping, Inc.	1981-1983	Unknown	10 Walnut Place Lindenhurst, New York 11757	None Known	Owner, Operator Unknown
Saf Tee Plumbing Corporation	1972-1981	Unknown	429 Keap Street Brooklyn, NY 11211	None Known	Owner, Operator Unknown
429 Keap Realty Corp.	1972	Unknown	429 Keap Street Brooklyn, NY 11211	None Known	Owner, Operator Unknown
Unknown	Prior to 1972	Unknown	Unknown	None Known	Unknown
Lot 4					
Hope-Keap Owner LLC	1/15/2020-present	Active	199 Lee Ave #554 Brooklyn, NY 11211	Requestor	Owner
Alejandro Rojas Rojas Family	10/11/1991 to 1/15/2020	Active	133 Guernsey Street, Apt 3R, Brooklyn, NY 11222	None Known	Owner, Operator Unknown
Charles Delisa Charles Delisa Estate	From prior to 5/25/1973 to 10/11/1991	Unknown	107 Malverne Avenue, Malverne, NY11565	None Known	Owner, Operator Unknown

2.3.2 Summary of Previous Reports

Environmental investigations performed at the Site, as summerized in the BCP application prepared by AKRF, include the following:

- *Phase I Environmental Site Assessment*, 118 Hope Street, 120 Hope Street, 130 Hope Street, 138 Hope Street, and 429 Keap Street, Brooklyn, New York, URS Corporation, July 2013.
- *Phase II Environmental Site Assessment*, 118 Hope Street, 120 Hope Street, 130 Hope Street, 138 Hope Street, and 429 Keap Street, Brooklyn, New York, FPM Group, Ltd./FPM Engineering Group, P.C., July 2013.
- *Preliminary Geotechnical Engineering Report*, 188 Hope Street, Brooklyn, New York, AKRF, Inc., March 2018.

Phase I Environmental Site Assessment, 118 Hope Street, 120 Hope Street, 130 Hope Street, 138 Hope Street, and 429 Keap Street, URS Corporation, July 2013

URS Corporation (URS) conducted a Phase I Environmental Site Assessment (ESA) of the Site and prepared a Phase I ESA report in July 2013. The Phase I ESA was performed in general conformance with the American Society of Testing Materials (ASTM) Standard Practice for Environmental Site Assessments (Standard E 1527-05), which was the standard at the time of the assessment. The report included the findings of a reconnaissance, and an evaluation of historical Sanborn insurance maps and select environmental databases. The assessment revealed the following Recognized Environmental Conditions (RECs):

- The Site address 130 Hope Street (Lot 12) was identified in the Drycleaners, Resource Conservation and Recovery Act (RCRA) Small Quantity Generator (SQG), FINDS, and NY Manifest databases.
- Each of the Site lots is listed with a hazardous materials E-Designation (E-138) for UST testing protocols.
- Several gasoline USTs were identified on Sanborn maps at 138 Hope Street/429 Keap Street (Lot 14) and at 120 Hope Street (Lot 7). Vent pipes were visible on the former Site building roofs on Lots 7 and 14; however, no tanks were observed and fuel oil was reportedly not being used at the Site at the time of the inspection.

Based on the RECs, URS recommended that a Subsurface (Phase II) Investigation be conducted at the Site, including the collection of soil, groundwater, and soil vapor samples, to determine if former and/or current uses at the Site or in the Site vicinity had adversely affected subsurface conditions.

Phase II Environmental Site Assessment, 118 Hope Street, 120 Hope Street, 130 Hope Street, 138 Hope Street, and 429 Keap Street, FPM Group, Ltd./FPM Engineering Group, P.C., July 2013

FPM conducted a Subsurface (Phase II) Investigation at the Site and prepared a Subsurface (Phase II) Investigation Report in July 2013. The investigation included the advancement of eight soil borings with the collection and laboratory analysis of eight soil samples; and the installation of four temporary sub-slab soil vapor probes with the collection and laboratory analysis of four soil vapor samples.

Soil borings were advanced to a maximum depth of 5 feet below surface grade using a hand auger. Subsurface materials generally consisted of historic fill material, including sand with silt, clay, concrete, brick, gravel, and porcelain to boring termination depths, with the exception of soil boring SB-6 where native material (sand, silt, and clay) was reportedly observed below the fill. Field evidence of contamination, including elevated photoionization detector (PID) readings, petroleum-like odors, and dark staining, was observed in soil borings B-1 in the former cellar on the northwestern portion of the Site and B4 on the north-central portion of the Site.

The results of the investigation identified elevated concentrations of SVOCs and heavy metals above Restricted-Residential Soil Cleanup Objectives (RRSCOs) in soil across the Site. Petroleum- and solvent-related VOCs were detected in soil vapor, including PCE at concentrations up to 17,200 micrograms per cubic meter ($\mu g/m^3$), TCE at concentrations up to 2,770 $\mu g/m^3$, carbon disulfide at concentrations up to 63,200 $\mu g/m^3$, and petroleum-related compounds at individual concentrations up to 35,100 $\mu g/m^3$.

Preliminary Geotechnical Engineering Report – 118 Hope Street, Brooklyn, New York, AKRF, Inc., March 22, 2018

AKRF performed a preliminary geotechnical investigation at the Site in February and March 2018 and provided geotechnical engineering recommendations in a March 2018 Preliminary Geotechnical Engineering Report. The investigation included the advancement of four test borings with the collection and laboratory analysis of soil samples; and the installation of one observation well to document groundwater elevation at the Site. Subsurface conditions generally consisted of approximately 8 to 15 feet of historical fill material (sand with varying amounts of gravel, silt, clay, brick, concrete, and cinders). An approximately 3.5 to 10-foot thick layer of brown and gray organic silt and clay was observed beneath the historical fill material, which was underlain by glacial till to boring termination depths (up to 104 feet below grade). Groundwater was measured in an observation well ranging between approximately 10 to 11 feet below grade (elevation +4 to +4.5). Bedrock was not encountered. The report provided foundation design recommendations and construction considerations.

2.4 GEOLOGICAL CONDITIONS

According to Remedial Investigation Report (AKRF May 2019), the stratigraphy of the Site, from the surface down, generally consisted of fill material comprising sand, silt, gravel, concrete, brick, and cinders up to approximately 16.5 feet below surface grade, underlain by apparent native sand, gravel, silt, clay, and peat to boring termination depths (up to 17.5 feet below surface grade). The area topography is fairly even. Sidewalk elevation varies between 13.34 ft at the corner of Hope Street and Keap Street to 14.55 ft along Keap Street.

Groundwater at the Site is present under a water table conditions at a depth of approximately 11 feet below grade. Based on groundwater elevation measurements made at the Site, AKRF determined the groundwater flow direction is generally east to southeast (**Figure 5**). A perched water table condition appears to be present in the west end of Lot 7 and eastern portion of Lot 4 due to the elevated silt/clay layer in that area. The perched water table area has a shallower water table depth.

Considering the poor quality of groundwater in the area, including high levels of iron, sodium and magnesium associated with saltwater intrusion and impacts from petroleum and industrial solvents related to the former commercial / industrial use of the area, there is no anticipated future groundwater use.

2.5 CONTAMINATION CONDITIONS

2.5.1 Description of Areas of Concern

The source area identified during the RI consists of petroleum related VOCs and chlorinated VOCs at concentrations above the Protection of Groundwater SCOs in the north central area of Lot 7 and petroleum VOCs at the water table in the northwest corner of Lot 4.

Fill material is present on the property to depths as great as 12 feet below grade. The fill material contains elevated levels of metals and SVOCs.

2.5.2 Soil/Fill Contamination

Petroleum and chlorinated solvent contaminated soil was encountered in the north-central area of Lot 7 with elevated levels benzene, ethylbenzene, toluene, xylenes, tetrachloroethylene, cis-dichloroethylene and trichlorethene. Although the contamination was not reported below 2 feet, a previous Phase II report identified petroleum contamination to 12 feet below grade in this area. The supplemental RI performed on Lot 4 identified petroleum VOCs at the water table in the northwest corner of the lot.

The fill material which is present to depths as great as 12 feet below grade contains elevated levels of SVOCs and metals including benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, chrysene dibenzo(a,h)anthracene, ideno(1,2,3-cd)pyrene, arsenic, barium, copper, lead and mercury.

<u>Summary of Soil/Fill Data</u>

Soil sample results from the RI and supplemental RI can be found in the RI Report (AKRF, May 2019) and Supplemental RI Report (EBC August 2020).

<u>Comparison of Soil/Fill with SCGs</u>

Figures 6a and 6b are spider maps which show soil sampling locations and summarize shallow and deep sample results above Track 1 Unrestricted SCOs for all overburden soil.

2.5.3 On-Site Groundwater Contamination

Groundwater in the north-central area of Lot 7 was also impacted with petroleum and chlorinated VOCs including benzene, ethylbenzene, toluene, tetrachloroethylene, cis-dichloroethylene and vinyl chloride.

<u>Summary of Groundwater Data</u>

The results of groundwater samples collected during the RI and supplemental RI are summarized in the RI Report (AKRF, May 2019) supplemental RI Report (EBC August 2020).

Comparison of Groundwater with SCGs

Spider maps which show groundwater sampling locations and summarize results above GA groundwater standards prior to the remedy are shown in **Figures 7a and 7b**.

2.5.4 On-Site and Off-Site Soil Vapor Contamination

Petroleum VOCs were generally reported at low levels throughout the Site. CVOCs were reported at elevated concentrations in the northern portion of Lot 7.

Summary of Soil Vapor Data

The results of soil vapor samples collected during the RI and supplemental RI, as well as information on soil gas sample collection, handling and analysis, are summarized in the RI Report (AKRF, May 2019) and Supplemental RI Report (EBC August 2020). Soil vapor results are posted on **Figures 8a and 8b**.

2.5.5 Environmental and Public Health Assessments

Qualitative Human Health Exposure Assessment

The objective of the qualitative exposure assessment under the Brownfields Cleanup Program (BCP) is to identify potential receptors to the contaminants of concern (COC) that are present at, or migrating from, the Site. The identification of exposure pathways describes the route that the COC takes to travel from the source to the receptor. An identified pathway indicates that the potential for exposure exists; it does not imply that exposures actually occur. An exposure pathway has five elements; a contaminant source, release and transport mechanisms, point of exposure, route of exposure and a receptor population.

The potential exposure pathways identified below, represent both current and future exposure scenarios.

Contaminant Source

Petroleum and chlorinated solvent contaminated soil was encountered in the north-central area of Lot 7 with elevated levels benzene, ethylbenzene, toluene, xylenes, tetrachloroethylene, cis-dichloroethylene and trichlorethene. Groundwater in this area of the Site was also impacted with petroleum and chlorinated VOCs including benzene, ethylbenzene, toluene, tetrachloroethylene, cis-dichloroethylene and vinyl chloride. Gasoline related VOCs were detected above Protection of Groundwater and/or Unrestricted Use SCOs within a deep (10-12ft) soil sample collected from the northwest corner of Lot 4. The contaminated soil was found in a very thin layer (about 1 inches thick) at a depth of approximately 11 ft below grade. Gasoline related VOCs were detected above GQS within the groundwater sample collected from the same sampling location. The gasoline related VOCs include 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, benzene, ethylbenzene, naphthalene, n-propylbenzene, o-xylene, and toluene.

PAHs and other metals such as arsenic, barium, copper, lead and mercury were also present at concentrations above Unrestricted Use and/or Restricted Residential Use SCOs within fill material throughout the Site to depths as great as 12 feet below grade.

Contaminant Release and Transport Mechanism

The petroleum and CVOC contamination encountered at the Site is associated with both incidental surface spillage associated with former fleet maintenance operations and a former underground gasoline storage tank. There appears to be transfer of both petroleum and chlorinated VOC contaminants in soil to the groundwater and soil vapor.

CVOCs emanating from the off-site BCP site to the north may be a potential source of on-site impacts due to the complicated hydrogeology of the Site and the BCP site to the north.

Historic fill material with elevated concentrations of SVOCs and metals is present across the Site to depths as great as 12 feet below grade. The contaminants detected within the historic fill material are not believed to be associated with a spill/release, but are likely associated with the source of material originally brought in to backfill/raise the property.

Point of Exposure, Route of Exposure and Potentially Exposed Populations

<u>Potential On-Site Exposures</u>: Remediation workers and construction workers engaged in the excavation of impacted and non-impacted soil at the site may be exposed to petroleum / chlorinated VOCs, SVOCs and heavy metals through several routes. Workers excavating impacted soil may be exposed through inhalation, ingestion and dermal contact. A site specific

Health and Safety Plan has been developed to identify and minimize the potential hazards to on-site workers. Site trespassers could also be exposed to impacted soil during excavation, however, security measures including an 8 ft high construction fence and 24 hr security will minimize potential exposure through this route. Potential vapor intrusion is a concern for residents of the planned construction in the north-central area of the Site, however remediation of the source areas is expected to greatly reduce if not eliminate this potential.

Potential Off-Site Exposures: Off-Site residents could also be exposed to dust or vapors during the excavation of impacted soil. A site specific Community Air Monitoring Plan has been developed to identify and minimize the potential for off-site exposure to residents through continuous air monitoring during excavation activity.

The entire area is serviced by the New York City Water System which distributes water from the Croton Reservoir system. Since there are no public or private potable supply wells in the area, exposure from contact with tap water is not a concern.

Off-site exposure is therefore limited to vapor intrusion from light end petroleum VOCs and CVOCs. This potential will be further reduced following the removal of the source area under the planned redevelopment of the Site.

Potential Off-Site Environmental Impacts: Groundwater at the Site is present under a water table conditions at a depth of approximately 11 feet below grade. Based on groundwater elevation measurements made at the Site, AKRF determined the groundwater flow direction is generally east to southeast. A perched water table condition appears to be present in the west end of Lot 7 and eastern portion of Lot 4 due to the elevated silt/clay layer in that area. The perched water table area has a shallower water table depth. Since VOCs in groundwater may be migrating beneath the Site at low concentrations in an easterly direction, the groundwater to surface water discharge pathway was evaluated. The nearest surface water to the Site is the English Kills waterway, located approximately 1 mile to the west. Based upon the concentrations of contaminants currently in groundwater beneath the Site and the distance to English Kills, there are no expected impacts to surface water environments from contaminants migrating from the Site.

2.6 REMEDIAL ACTION OBJECTIVES

Based on the results of the Remedial Investigation, the following Remedial Action Objectives (RAOs) have been identified for this Site.

2.6.1 Groundwater

RAOs for Public Health Protection

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

RAOs for Environmental Protection

- Restore ground water aquifer, to the extent practicable, to pre-disposal/pre-release conditions.
- Prevent the discharge of contaminants to surface water.
- Remove the source of ground or surface water contamination.

2.6.2 Soil

RAOs for Public Health Protection

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

RAOs for Environmental Protection

- Prevent migration of contaminants that would result in groundwater or surface water contamination.
- Prevent impacts to biota due to ingestion/direct contact with contaminated soil that would cause toxicity or bioaccumulation through the terrestrial food chain.

2.6.3 Soil Vapor

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

3.0 DESCRIPTION OF REMEDIAL ACTION PLAN

3.1 EVALUATION OF REMEDIAL ALTERNATIVES

The goal of the remedy selection process under the BCP is to select a remedy that is protective of human health and the environment taking into consideration the current, intended and reasonably anticipated future use of the property. The remedy selection process begins by establishing RAOs for media in which chemical constituents were found in exceedance of NYSDEC standards, criteria and guidance values (SCGs). A remedy is then developed based on the following nine criteria:

- Protection of human health and the environment;
- Compliance with SCGs;
- Short-term effectiveness and impacts;
- Long-term effectiveness and permanence;
- Reduction of toxicity, mobility, or volume of contaminated material;
- Implementability;
- Cost effectiveness;
- Community Acceptance; and
- Land use.

The first two criteria are threshold criteria and must be satisfied in order for an alternative to be considered for selection. The remaining seven criteria are balancing criteria which are used to compare the positive and negative aspects of each of the remedial alternatives, provided the alternative satisfies the threshold criteria.

3.2 STANDARDS, CRITERIA AND GUIDANCE (SCG)

A criterion for remedy selection is evaluation for conformance with SCGs that are applicable, relevant and appropriate. Principal SCGs that are applicable, relevant and appropriate for evaluating the alternatives for remediation of this BCP site include the following:

- 29 CFR Part 1910.120 - Hazardous Waste Operations and Emergency Response
- 10 NYCRR Part 67 – Lead
- 6 NYCRR Part 371 - Identification and Listing of Hazardous Wastes (November 1998)

- 6 NYCRR Part 372 - Hazardous Waste Manifest System and Related Standards for Generators, Transporters and Facilities (November 1998)
- 6 NYCRR Subpart 374-1 - Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities (November 1998)
- 6 NYCRR Part 375 - 6 NYCRR Part 375 Environmental Remediation Programs Subparts 375-1, 375-3 and 375-6 (December 2006)
- 6 NYCRR Part 376 - Land Disposal Restrictions
- 6 NYCRR Part 608 - Use and Protection of Waters
- 6 NYCRR Parts 700-706 - Water Quality Standards (June 1998)
- 6 NYCRR Part 750 through 758 - Implementation of NPDES Program in NYS ("SPDES Regulations")
- 6 NYCRR Part 375-6 Soil Cleanup Objectives
- New York State Groundwater Quality Standards – 6 NYCRR Part 703;
- NYSDEC Ambient Water Quality Standards and Guidance Values – TOGS 1.1.1;
- NYSDEC DER-10 Technical Guidance for Site Investigation and Remediation - May 2010;
- NYSDEC Draft Brownfield Cleanup Program Guide – May 2004;
- NYSDEC Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances (PFAS) – January 2021;
- New York State Department of Health (NYSDOH) Generic Community Air Monitoring Plan
- NYS Waste Transporter Permits – 6 NYCRR Part 364;
- NYS Solid Waste Management Requirements – 6 NYCRR Part 360 and Part 364.
- TAGM 4059 - Making Changes To Selected Remedies (May 1998)
- STARS #1 - Petroleum-Contaminated Soil Guidance Policy
- TAGM 3028 - "Contained In" Criteria for Environmental Media: Soil Action Levels (August 1997)
- DER-10, Technical Guidance for Site Investigation and Remediation, May 2010
- DER-23 / Citizen Participation Handbook for Remedial Programs, January 2010

- OSWER Directive 9200.4-17 - Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites (November 1997)

Additional regulations and guidance are applicable, relevant, and appropriate to the remedial alternatives and will be complied in connection with implementation of the remedial program; however, the list above is intended to represent the principal SCGs which should be considered in evaluating the remedial alternatives for the BCP site.

Conformance with the appropriate standards for remediation of contaminated soil is an important criterion in evaluating the remedial alternatives for the BCP site. Presently, in New York State 6 NYCRR Part 375 establishes the primary SCGs associated with remediation of contaminated soil at sites which are in the BCP. If proposing remediation pursuant to a Track other than Track 1 (Unrestricted Use), 6 NYCRR Part 375 requires evaluation of at least one remedial alternative pursuant to Track I (Unrestricted Use) and one other alternative developed by the applicant for the proposed use of the BCP site. The remedial alternatives presented in Section 3.3 of this work plan have been prepared in conformance with this requirement.

3.3 ALTERNATIVES ANALYSIS

The goal of the remedy selection process under the BCP is to select a remedy that is protective of human health and the environment taking into consideration the current, intended and reasonably anticipated future use of the property. The remedy selection process begins by establishing RAOs for media in which chemical constituents were found in exceedance of NYSDEC standards, criteria and guidance values (SCGs). A remedy is then developed based on the following nine criteria:

- Protection of human health and the environment;
- Compliance with SCGs;
- Short-term effectiveness and impacts;
- Long-term effectiveness and permanence;
- Reduction of toxicity, mobility, or volume of contaminated material;
- Implementability;
- Cost effectiveness;

- Community Acceptance; and
- Land use.

The following is a detailed description of the alternatives analysis and remedy selection to address impacted media at the Site. This analysis was prepared in accordance with 6 NYCRR Part 375-1.8(f) and Part 375-3.8(f) and Section 4.3(c) of NYSDEC DER-10. As required, a minimum of two remedial alternatives (including a Track 1 scenario) are evaluated, as follows:

- Alternative 1 - Track 1, remediation of all soils above bedrock to Unrestricted Use criteria. This alternative does not allow the use of long-term Institutional/Engineering Controls to address impacted media or prevent exposures which may be required beneath the new building. To meet Track 1, this alternative will include removal of all underground storage tanks (if present), excavation across Lot 4 to a minimum depth of 12 feet across the Site to remove soil/fill with contaminants above Unrestricted Use SCOs, and excavation to a depth of at least 3 feet across all of Lot 7 to remove soil/fill with contaminants above Unrestricted Use SCOs, with additional deeper excavation within the north-central area to a depth of 9 feet below grade to remove a petroleum hotspot, and 12 feet to remove soil/fill with contaminants above Unrestricted Use SCOs around soil boring RI-SB-11. Dewatering of the petroleum impacted area will also be required to facilitate excavation and to remove impacted groundwater. One monitoring well within the petroleum impacted source area of Lot 4 and two monitoring wells along the northern property line of Lot 7 would be installed to collect post-dewatering groundwater samples to demonstrate that the dewatering effectively addressed any potential pre-remedy groundwater conditions. The use of long term engineering controls is not anticipated following the removal of petroleum / CVOC impacted soil and groundwater. As part of the Track 1 remedy, a post-construction soil vapor intrusion evaluation will be completed. The evaluation will include a provision for implementing actions recommended to address exposures related to soil vapor intrusion within the new building;

- Alternative 2 - Track 2, remediation of all soils to Restricted Residential criteria to a depth of 15 feet below grade with removal of soils below 15 feet which are a source of contamination to the groundwater. This alternative does not allow the use of long-term Institutional/Engineering Controls to meet SCOs. Long-term Institutional/ Engineering Controls are allowed to address or prevent exposures from other impacted media however, such as soil gas. To meet Track 2, this alternative would require many of the same elements as the Track 1 alternative including removal of all underground storage tanks (if present), removal of soil/fill with contaminants above Restricted Residential SCOs, and excavation/removal petroleum contaminated soil. This alternative will require less excavation than Alternative 1 to meet Restricted Residential SCOs. This alternative is provided as a contingency in the event that Alternative 1 cannot be achieved for non-COC parameters or that operation of a long term (>5 yr) subslab depressurization system (SSDS) is required to meet RAOs. This alternative would require an environmental easement and possibly a Site Management Plan if the SSDS is required. One monitoring well within the petroleum impacted source area of Lot 4 and two monitoring wells along the northern property line of Lot 7 would be installed to collect post-dewatering groundwater samples to demonstrate that the dewatering effectively addressed any potential pre-remedy groundwater conditions. A post-construction soil vapor intrusion evaluation will need to be completed, including a provision for implementing actions recommended to address exposures related to soil vapor intrusion within the new building.

- Alternative 3 - Track 4 would require remediation of all source material soils and covering the remaining soils with the building slab or other impervious cover. This alternative allows the use of long-term Institutional/Engineering Controls (>5yrs) to meet soil cleanup objectives and to address or prevent exposures from other impacted media such as soil gas. This alternative will require excavation of an approximate 1,800 sf area to a depth of approximately 9 ft to remove VOC impacted soil in the north central area of Lot 7, and to approximately 12 ft to remove a petroleum hotspot located in the northwest corner of Lot 4, and capping of the remainder of the Site with the concrete building foundation and concrete or asphalt cover for areas not covered by the foundation. One monitoring well within the petroleum impacted source area of Lot 4 and two monitoring wells along the northern property line of Lot 7 would be installed to collect post-dewatering groundwater samples to demonstrate that the dewatering effectively addressed any potential pre-remedy groundwater conditions. This alternative will also require an environmental easement and a Site Management Plan. An SSDS is not expected to be required following the removal of the petroleum impacted soil. A post-construction soil vapor intrusion evaluation will need to be completed, including a provision for implementing actions recommended to address exposures related to soil vapor intrusion within the new building. This alternative would require an environmental easement and a Site Management Plan for the cover system and also for SSDS, if it is required.

3.4 REMEDIAL ALTERNATIVE 1

The following sections provide an evaluation of Alternative 1 based on the nine evaluation criteria as previously discussed.

3.4.1 Overall Protection of Human Health and the Environment

Alternative 1 will be protective of human health and the environment by removing all historic fill material at the Site and by remediating groundwater by dewatering. The potential for human and environmental exposure to these constituents on-Site will be eliminated by excavation of all soils with parameters in excess of Unrestricted Use criteria, disposing of excavated materials off-Site, dewatering and treatment of groundwater within the impacted soil area, and backfilling as needed with certified clean fill or virgin mined materials.

Installation of a sub-slab depressurization system below the cellar slab of the new building is not feasible due to the depth to groundwater and anticipated depth of the new building's cellar slab. Potential post-remediation exposures to on-Site residents from soil vapor will be eliminated because the building foundation will be constructed approximately at/below the water table. Groundwater use will be restricted at the Site given the generally poor quality of groundwater in the area. As part of the Track 1 remedy, a post-construction soil vapor intrusion evaluation will be completed. The evaluation will include a provision for implementing actions recommended to address exposures related to soil vapor intrusion within the new building.

During remedial and construction activity workers and area residents may be exposed to impacted soil and vapors. Worker exposure to soil and vapors will be minimized through implementation of a Health and Safety Plan. Exposures to area residents from dust and/or vapors will be minimized through the use of engineering controls and through implementation of a Community Air Monitoring Plan (CAMP).

3.4.2 Compliance with Remedial Goals, SCGs and RAOs

Alternative 1 will achieve compliance with the remedial goals, SCGs and RAOs for soil through source removal to Track 1 Unrestricted Use cleanup levels. SCGs for groundwater would also be achieved as impacted groundwater would be extracted and treated prior to discharge into the NYC sewer system and groundwater is then allowed to improve over time. Compliance with SCGs for soil vapor is expected following completion of the remedial action.

3.4.3 Long-Term Effectiveness and Permanence

Alternative 1 achieves long term effectiveness and permanence by permanently removing and/or remediating all soils affected by Site contaminants or historic fill materials. Under this Alternative, risk from soil impacts and groundwater will be eliminated. Alternative 1 will continue to meet RAOs for soil, groundwater and soil vapor in the future, providing a permanent long-term solution for the Site.

3.4.4 Reduction in Toxicity, Mobility or Volume through Treatment

Alternative 1 will permanently eliminate the toxicity, mobility, and volume of contaminants from on-Site soil and groundwater by meeting Unrestricted Use SCOs through excavation and through dewatering and treatment of impacted groundwater. The removal/remediation of on-Site soil will also reduce the toxicity, mobility, and volume of contaminants in soil vapor.

3.4.5 Short-Term Effectiveness

There is the potential for short-term adverse impacts and risks to workers, the community, and the environment during the implementation of Alternative 1. Short-term exposure to on-site workers during excavation and loading activities will be addressed with a HASP and mitigated through the use of personal protective equipment, monitoring and engineering controls. Potential short-term exposure to the surrounding community will be addressed through the use of odor and dust-suppression techniques and through the implementation of a CAMP which will require air monitoring activities during all excavation and soil disturbance activities.

Other potential impacts to the community such as construction-related noise, vibrations and traffic, will be controlled and regulated under the terms of the NYS Department of Buildings issued building permit which can place a Stop Work Order on the property for unsafe conditions, community impacts or violation of the terms and conditions of the permit. Decontamination procedures of equipment, including trucks transporting soil to off-site disposal facilities, will minimize the potential for impacted soil to be dispersed beyond the Site boundary. A truck traffic plan has also been prepared to minimize disturbance to the local roads and community.

3.4.6 Implementability

The techniques, materials and equipment to implement Alternative 1 are readily available and have been proven effective in remediating the contaminants associated with the Site. Excavation and dewatering for the remediation of soils and groundwater is a "low tech" and reliable method which has a long and proven track record on the remediation of hazardous waste and petroleum spill sites.

3.4.7 Cost

Costs associated with Alternative 1 are estimated at approximately $ 1,868,577. This cost estimate includes the following elements and assumptions:

- Removal of underground storage tanks encountered during Site excavation;
- Shoring and SOE work to accommodate excavation across Lot 4 to a minimum depth of 12 feet across the Site to remove soil/fill with contaminants above Unrestricted Use SCOs and approximately 9 feet to remove soil/fill above Unrestricted Use SCOs from a petroleum hotspot in the northwest corner of Lot 4;
- Excavation to a depth of at least 3 feet across all of Lot 7 remove soil/fill with contaminants above Unrestricted Use SCOs;

- Shoring and SOE work to accommodate additional deeper excavation within the north-central area of Lot 7 to a depth of at least 9 feet below grade to remove a petroleum hotspot and additional deeper excavation within the north-central area of Lot 7 to a depth of 12 feet to remove soil/fill with contaminants above Unrestricted Use SCOs around soil boring RI-SB-11;
- Installation and operation of a dewatering and treatment prior to discharge (if necessary) system to allow for excavation/removal of petroleum impacted soil at/below the groundwater table;
- Installation of one monitoring well within the petroleum impacted source area of Lot 4 and two monitoring wells along the northern property line of Lot 7 to collect post-dewatering groundwater samples for VOCs (EPA Method 8260) analysis to demonstrate dewatering effectively addressed any potential pre-remedy groundwater conditions;
- Loading, transport and disposal of approximately 6,800 cy of historic fill material and soil;
- Loading, transport and disposal of approximately 650 cy of petroleum impacted soil;
- Waste characterization and endpoint verification sampling and analysis;
- HASP and CAMP monitoring for the duration of the remedial activities; and
- Post-construction SVI assessment.
- Preparation of a Final Engineering Report.

3.4.8 Compatibility with Land Use

The proposed redevelopment of the Site is compatible with its current zoning. Following remediation, the Site will meet the objectives for Unrestricted Use which is appropriate for its planned community use. A groundwater use restriction will be required to prevent future exposure to affected groundwater.

3.4.9 Community Acceptance

This RAWP will be subject to a 45-day public comment period to determine if the community had comments on the presented remedial alternatives and selected remedy. If no comments are received regarding Alternative 1, it will be considered to be acceptable to the community.

3.5 REMEDIAL ALTERNATIVE 2

The following sections provide an evaluation of Alternative 2 based on the nine evaluation criteria as previously discussed.

3.5.1 Overall Protection of Human Health and the Environment

Alternative 2 will be protective of human health and the environment by excavation of portions of Lot 4 to a minimum depth of 12 feet to remove soil/fill with contaminants above Restricted Residential SCOs, excavation of at least the top 3 ft of soil across Lot 7 to remove soil/fill with contaminants above Restricted Residential SCOs, additional deeper excavation within the north-central area of Lot 7 to a depth of 9 feet below grade to remove a petroleum hotspot with contaminants above Protection of Groundwater SCOs, and additional deeper excavation within the north-central area of Lot 7 to a depth of 12 feet to remove soil/fill with contaminants above Restricted Residential SCOs around soil boring RI-SB-11. The potential for human and environmental exposure to these constituents on-site will be eliminated by excavation of all soil with parameters in excess of Restricted Residential criteria in the top 15 feet, off-site disposal of excavated materials, and backfilling as needed with certified clean fill meeting Restricted Residential SCOs or virgin mined materials.

Installation of a sub-slab depressurization system below the cellar slab of the new building is not feasible due to the depth to groundwater and anticipated depth of the new building’s cellar slab. Potential post-remediation exposures to on-Site residents from soil vapor will be eliminated because the building foundation will be constructed approximately at/below the water table. Groundwater use will be restricted at the Site until groundwater quality recovers. A post-construction soil vapor intrusion evaluation will need to be completed, including a provision for implementing actions recommended to address exposures related to soil vapor intrusion within the new building.

During remedial and construction activity, workers and area residents may be exposed to impacted soil and vapors. Worker exposure to soil and vapors will be minimized through implementation of a HASP. Exposures to area residents from dust and or vapors will be minimized through the use of engineering controls and through implementation of a CAMP.

3.5.2 Compliance with Remedial Goals, SCGs and RAOs

Alternative 2 will achieve compliance with the remedial goals, SCGs and RAOs for soil through excavation to 4 feet to Restricted Residential cleanup levels for the top 15 feet of soil at the site. SCGs for groundwater will also be achieved as impacted groundwater will be extracted and treated prior to discharge into the NYC sewer system and groundwater is then allowed to improve over time. Compliance with SCGs for soil vapor is expected following completion of the remedial action by removal of petroleum impacted soil above Protection of Groundwater SCOs and Unrestricted Use SCOs and removal of groundwater by dewatering.

3.5.3 Long-term Effectiveness and Permanence

Alternative 2 achieves long term effectiveness and permanence by permanently removing and/or remediating all soils affected by Site contaminants above Restricted Residential SCOs to a depth of 15 feet and by remediating groundwater. Under this Alternative risk from soil impacts and groundwater will be eliminated. Alternative 2 will continue to meet RAOs for soil, groundwater and soil vapor in the future, providing a permanent long-term solution for the Site.

3.5.4 Reduction in Toxicity, Mobility or Volume through Treatment

Alternative 2 will permanently eliminate the toxicity, mobility, and volume of contaminants from on-Site soil by meeting Restricted Residential SCOs in the upper 15 feet of the soil column, and removing petroleum impacted soil which represents a source of contamination.

3.5.5 Short-term Effectiveness

The potential for short-term adverse impacts and risks to the workers, the community, and the environment during the implementation of Alternative 2 is minimal. Short-term exposure to on-site workers during excavation and loading activities will be addressed with a HASP and mitigated through the use of personal protective equipment, monitoring and engineering controls. Potential short-term exposure to the surrounding community will be addressed through the use of odor and dust-suppression techniques and through the implementation of a CAMP which will require air monitoring activities during all excavation and soil disturbance activities.

Other potential impacts to the community such as construction-related noise, vibrations and traffic will be controlled and regulated under the terms of the NYS Department of Buildings issued building permit which can place a Stop Work Order on the property for unsafe conditions, community impacts or violation of the terms and conditions of the permit. Decontamination procedures of equipment, including trucks transporting soil to off-site disposal facilities will minimize the potential for impacted soil to be dispersed beyond the Site boundary. A truck traffic plan will also be prepared to minimize disturbance to the local roads and community.

3.5.6 Implementability

The techniques, materials and equipment to implement Alternative 2 are readily available and have been proven effective in remediating the contaminants associated with the Site. Excavation and dewatering for the remediation of soils and groundwater are both "low tech" and reliable methods which have a long and proven track record on the remediation of hazardous waste and petroleum spill sites. Excavation to remove source materials and meet Restricted Residential SCOs will require shoring and dewatering.

3.5.7 Cost

Costs associated with Alternative 2 are similar to Alternative 1 with a reduction in overall excavation depths an adding only those costs associated with preparation of an Environmental Easement package. The costs for Alternative 2 are estimated at approximately $1,735,005. This cost estimate includes the following elements and assumptions:

- Removal of underground storage tanks encountered during Site excavation;
- Shoring and SOE work to accommodate excavation of portions of Lot 4 to a minimum depth of 12 feet to remove soil/fill with contaminants above Restricted Residential SCOs;
- Shoring and SOE work to accommodate excavation of the top 3 feet of soil across Lot 7 to remove soil/fill with contaminants above Restricted Residential SCOs;
- Shoring and SOE work to accommodate deeper excavation within the north-central area of Lot 7 to a depth of 15 feet below grade to remove a petroleum hotspot with contaminants above Protection of Groundwater SCOs, and additional deeper excavation within the north-central area of Lot 7 to a depth of 12 feet to remove soil/fill with contaminants above Restricted Residential SCOs;

- Installation and operation of a dewatering and treatment prior to discharge (if necessary) system to allow for excavation/removal of petroleum impacted soil at/below the groundwater table;
- Installation of one monitoring well within the petroleum impacted source area of Lot 4 and two monitoring wells along the northern property line of Lot 7 to collect post-dewatering groundwater samples for VOCs (EPA Method 8260) analysis to demonstrate dewatering effectively addressed any potential pre-remedy groundwater conditions;
- Loading, transport and disposal of approximately 6,000 cy of historic fill material and soil;
- Loading, transport and disposal of approximately 650 cy of petroleum impacted soil;
- Waste characterization and endpoint verification sampling and analysis;
- HASP and CAMP monitoring for the duration of the remedial activities; and
- Post-construction SVI assessment.
- Preparation of a Site Management Plan;
- Preparation of a Final Engineering Report; and
- Recording of an Environmental Easement to restrict use of the site to Restricted Residential, Commercial or Industrial and to restrict groundwater use.

3.5.8 Compatibility with Land Use

The proposed redevelopment of the Site is compatible with its current zoning. Following remediation, the Site will meet the objectives for Restricted Residential use which is appropriate for its planned community use. A groundwater use restriction will be required to prevent future exposure to affected groundwater.

3.5.9 Community Acceptance

This RAWP will be subject to a 45-day public comment period to determine if the community has any comments on the presented remedial alternatives and selected remedy. If no comments are received, it will be considered to be acceptable to the community.

3.6 REMEDIAL ALTERNATIVE 3

The following sections provide an evaluation of Alternative 3 based on the nine evaluation criteria as previously discussed.

3.6.1 Overall Protection of Human Health and the Environment

Alternative 3 will be protective of human health and the environment by eliminating petroleum concentrations and constituents in soil to depths of at least 9 and 12 ft within the two impacted areas and by capping the Site with the building foundation or other composite cover system. The potential for human and environmental exposure to these constituents on-Site will be eliminated by the excavation and/or capping of all soil with parameters above Restricted Residential criteria. Residual fill with parameters above Restricted Residential criteria which remain following construction excavation, will be effectively capped with the concrete foundation slab of the new building. Groundwater use will be restricted at the Site until groundwater quality recovers. A post-construction soil vapor intrusion evaluation will need to be completed, including a provision for implementing actions recommended to address exposures related to soil vapor intrusion within the new building.

During remedial and construction activity, workers and area residents may be exposed to impacted soil and vapors. Worker exposure to soil and vapors will be minimized through implementation of a HASP. Exposures to area residents from dust and or vapors will be minimized through the use of engineering controls and through implementation of a CAMP.

3.6.2 Compliance with Remedial Goals, SCGs and RAOs

Alternative 3 will achieve compliance with the remedial goals, SCGs and RAOs for soil through source removal and capping of the site. Groundwater quality will continue to improve over time with respect to SCGs. Compliance with SCGs for soil vapor is expected following completion of the remedial action.

3.6.3 Long-term Effectiveness and Permanence

Alternative 3 achieves long term effectiveness and permanence by permanently removing petroleum impacted soils and by capping all soils affected by Site contaminants above Restricted Residential SCOs. Under this Alternative risk from soil impacts is eliminated for on-site residents. Alternative 2 will continue to meet RAOs for soil in the future, providing a permanent long-term solution for the Site.

3.6.4 Reduction in Toxicity, Mobility or Volume through Treatment

Alternative 3 will reduce the toxicity, mobility, and volume of contaminants from on-Site soil throguh rsource removal and will reduce the potential for mobility by covering the remaining soil with the building slab. The covering of on-Site soil will also reduce the toxicity, mobility, and volume of contaminants within on-Site groundwater.

3.6.5 Short-term Effectiveness

The potential for short-term adverse impacts and risks to the workers, the community, and the environment during the implementation of Alternative 3 is minimal. Short-term exposure to on-site workers during excavation and loading activities will be addressed with a HASP and mitigated through the use of personal protective equipment, monitoring and engineering controls. Potential short-term exposure to the surrounding community will be addressed through the use of odor and dust-suppression techniques and through the implementation of a CAMP which will require air monitoring activities during all excavation and soil disturbance activities.

Other potential impacts to the community such as construction-related noise, vibrations and traffic will be controlled and regulated under the terms of the NYS Department of Buildings permit which can place a Stop Work Order on the property for unsafe conditions, community impacts or violation of the terms and conditions of the permit. Decontamination procedures of equipment, including trucks transporting soil to off-site disposal facilities will minimize the potential for impacted soil to be dispersed beyond the Site boundary. A truck traffic plan will also be prepared to minimize disturbance to the local roads and community.

3.6.6 Implementability

The techniques, materials and equipment to implement Alternative 3 are readily available and have been proven effective in remediating the contaminants associated with the Site. Excavation and capping for the remediation / management of soils are both "low tech" s reliable method which have a long and proven track record on the remediation of hazardous waste and petroleum spill sites.

3.6.7 Cost

Costs associated with Alternative 3 are estimated at approximately $738,990. This cost estimate includes the following elements and assumptions:

- Removal of underground storage tanks encountered during Site excavation;
- Shoring and SOE work to accommodate excavation of petroleum impacted soil to depths of 9 and 15 feet within the two impacted areas;
- Installation and operation of a dewatering and treatment prior to discharge (if necessary) system to allow for excavation/removal of petroleum impacted soil at/below the groundwater table;
- Installation of one monitoring well within the petroleum impacted source area of Lot 4 and two monitoring wells along the northern property line of Lot 7 to collect post-dewatering groundwater samples for VOCs (EPA Method 8260) analysis to demonstrate dewatering effectively addressed any potential pre-remedy groundwater conditions;
- Loading, transport and disposal of approximately of 800 cy of petroleum impacted soil;
- Waste characterization and endpoint verification sampling and analysis;
- Covering of the Site with the concrete building slab;
- HASP and CAMP monitoring for the duration of the remedial activities; and
- Recording of an Environmental Easement to restrict use of the site to Restricted Residential, Commercial or Industrial and to restrict groundwater use;
- Post-construction SVI assessment;
- Preparation of a Site Management Plan; and
- Preparation of a Final Engineering Report.

3.6.8 Compatibility with Land Use

The proposed redevelopment of the Site is compatible with its current zoning. Following remediation the Site will meet restricted residential use objectives which is appropriate for its planned mixed residential and commercial use. A groundwater use restriction will be required to prevent future exposure to affected groundwater.

3.6.9 Community Acceptance

This RAWP will be subject to a 45-day public comment period to determine if the community has any comments on the presented remedial alternatives and selected remedy. If no comments are received, it will be considered to be acceptable to the community.

3.7 SELECTION OF THE PREFERRED REMEDY

The remedy recommended for the site is a Track 1 alternative which consists of the removal of all underground storage tanks, and removal and proper off-Site disposal of all petroleum impacted soil and historic fill material with parameters above Unrestricted Use SCOs. Over-excavated areas will be backfilled with either virgin mined materials or certified fill which meet Unrestricted Use SCOs. The Track 1 alternative also includes remediation of groundwater through dewatering during excavation of the petroleum hotspots. A groundwater sample will be collected in accordance with NYCDEP requirements to determine if treatment is required prior to discharge. Typical treatment required for this type of project includes a settling tank, a sediment filter unit, and liquid phase granular activated carbon (GAC) vessels. Post-remedy groundwater sampling will be conducted to ensure the effectiveness of the remedy. As part of the Track 1 remedy, a post-construction soil vapor intrusion evaluation will be completed. The evaluation will include a provision for implementing actions recommended to address exposures related to soil vapor intrusion within the new building.

3.7.1 Preferred Remedy Land Use Factor Evaluation

As required by Article 27, Title 14 of the Environmental Conservation Law 27-1415, the following land use factor evaluation examines whether the preferred alternative is acceptable based on the 14 criteria presented in the following subsections.

Zoning

The Site is zoned as M1-2/R6A (light manufacturing and residential uses) within a Special Mixed-Use District (MX-8), which was designed to: encourage investment in mixed residential and industrial neighborhoods; promote the opportunity for workers to live in the vicinity of their work; create new opportunities for mixed-use neighborhoods; recognize and enhance the vitality and character of existing and potential mixed-use neighborhoods; and promote the most desirable use of land in accordance with a plan to conserve its value of land and buildings, thereby protecting New York City tax revenue. The proposed end use of the Site is consistent with the objectives of the Special Mixed-Use District.

The proposed project which includes a new 7-story mixed use building is compatible with the surrounding land use and will be in compliance with the current zoning.

Applicable Comprehensive Community Master Plans or Land Use Plans

The Williamsburg neighborhood in Brooklyn, New York was first developed for manufacturing and industrial uses in the early 1900's. The 2005 Greenpoint-Williamsburg Rezoning action, which encompasses a larger area including the Site, outlines a plan for the construction of low- to mid-rise housing to replace the decline of manufacturing and industrial operations in an economically beneficial manner.

The proposed development of the Site includes the construction of a new residential building with a mix of affordable and market-rate units. The proposed end use of the Site is consistent with the Greenpoint-Williamsburg Rezoning.

Surrounding Property Uses

The Site is bounded by Hope Street, followed by residential and commercial buildings to the north; Keap Street followed by residential buildings and a daycare to the east; residential buildings followed by Grand Street to the south; and residential and commercial buildings followed by Rodney Street to the west. The Site is located in a developed area predominantly consisting of residential and commercial properties.

Citizen Participation

Citizen participation for implementation of the preferred alternative will be performed in accordance with DER 23 and NYCRR Part 375-1.10 and Part 375-3.10. A Citizen Participation Plan has been prepared and is available for public review at the identified document repositories (125th Street Branch of the New York Public Library, Manhattan Community Board 11).

Environmental Justice Concerns

The Site is not located within a potential environmental justice area though it is located in close proximity to mapped Environmental Justice Areas approximately 2 blocks to the east, west and south. The NYSDEC defines a potential environmental justice area as a "minority or low-income community that may bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local, and tribal programs and policies.

Environmental justice means the fair treatment and meaningful involvement of all people regardless of race, color, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people, including a racial, ethnic, or socioeconomic group, should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local, and tribal programs and policies.

Since the goal of the remedy will achieve the highest level of cleanup and will remove contaminated materials from the community, the remedy poses no environmental justice concerns.

Land use designations

The proposed remedy is consistent with land-use designations.

Population growth patterns

Population growth patterns support the proposed use for the Site. The preferred remedy will not negatively affect on population growth patterns.

Accessibility to existing infrastructure

The Site is accessible to existing infrastructure. The close proximity of the Site to the Major Brooklyn-Queens Expressway (I-278) will assist soil transportation and contractor access to the Site. The Site is also accessible to mass transit and is within walking distance to the G line with a subway stop on Union Avenue Avenue and Devoe Street (1 block north, 1 block east) and to the

L line with a subway stop on Metropolitan Avenue and Lorimer Street (2 blocks north, 2 blocks east). The preferred remedy will not alter accessibility to existing infrastructure.

Proximity to cultural resources

The proposed remedy will not negatively impact cultural resources.

Proximity to natural resources

The proposed remedy will improve the local environment and will not negatively impact affect natural resources.

Off-Site groundwater impacts

The proposed remedy will not affect off-site groundwater quality.

Proximity to floodplains

The NYC Flood Hazard Mapper was reviewed to determine if the Site is located within the 100-year or 500-year flood zones. The review indicates that the entire property is located outside the 100-year and 500-year flood zones. This indicates that there is a minimal risk of flooding at the Site.

Geography and geology of the Site

The selected remedy will excavate soil/fill from the Site to a depth of at least 12 feet below sidewalk grade. The selected alternative and development of the Site have considered the geography and geology of the Site.

Current Institutional Controls

There are no Institutional Controls presently assigned to the Site.

3.8 SUMMARY OF SELECTED REMEDIAL ACTIONS

The remedy recommended for the Site is a Track 1 alternative (Alternative 1) which consists of the removal of all on-Site soil which exceeds Unrestricted Use SCOs and the removal of impacted groundwater. It is expected that a Track 1 alternative will require excavation across Lot 4 to a minimum depth of 12 feet across the Site to remove soil/fill with contaminants above Unrestricted Use SCOs, excavation to a depth of at least 3 feet across all of Lot 7 to remove soil/fill with contaminants above Unrestricted Use SCOs, with additional deeper excavation within the north-central area to a depth of 9 feet below grade to remove a petroleum hotspot, and 12 feet to remove soil/fill with contaminants above Unrestricted Use SCOs around soil boring RI-SB-11. The remedy will include the following items:

1. Removal of underground storage tanks and fill/soil exceeding Track 1 Unrestricted Use SCOs around/below the tanks;
2. Excavation of soil/fill exceeding Track 1 Unrestricted Use SCOs as listed in **Table 1,** including excavation across Lot 4 to a minimum depth of 12 feet across the Site to remove soil/fill with contaminants above Unrestricted Use SCOs, excavation to a depth of at least 3 feet across all of Lot 7 to remove soil/fill with contaminants above Unrestricted Use SCOs, and additional deeper excavation within the north-central area to a depth of at least 9 feet below grade to remove a petroleum hotspot, and 12 feet to remove soil/fill with contaminants above Unrestricted Use SCOs around soil boring RI-SB-11;
3. Screening for indications of contamination (by visual means, odor, and monitoring with PID) of all excavated soil during any intrusive Site work;
4. Installation of SOE and a dewatering system to allow for excavation/removal of petroleum impacted soil / historic fill at/below the groundwater table. A groundwater sample will be collected in accordance with NYCDEP requirements to determine if treatment is required prior to discharge. Treatment prior to discharge includes removal of fines in a settling tank, a sediment filter unit, and then removal of VOCs using liquid phase granular activated carbon (GAC) vessels. Treated groundwater will be discharged to the NYC sewer system under a NYCDEP sewer discharge permit;
5. Installation of one monitoring well within the petroleum impacted source area of Lot 4 and two monitoring wells along the northern property line of Lot 7 to collect post-dewatering groundwater samples for VOCs (EPA Method 8260) analysis to demonstrate dewatering effectively addressed any potential pre-remedy groundwater conditions;
6. Collection and analysis of end-point samples to evaluate the performance of the remedy with respect to attainment of Track 1 Unrestricted Use SCOs;

7. Appropriate off-Site disposal of all material removed from the Site in accordance with all Federal, State and local rules and regulations for handling, transport, and disposal;
8. Import of materials to be used for backfill and cover in compliance with: (1) chemical limits and other specifications included in **Table 1**, (2) all Federal, State and local rules and regulations for handling and transport of material;
9. As part of the Track 1 remedy, a post-construction soil vapor intrusion evaluation will be completed. The evaluation will include a provision for implementing actions recommended to address exposures related to soil vapor intrusion within the new building;
10. If Track 1 cleanup is not achieved, an Environmental Easement will be filed against the Site to limit future use of the property to Restricted Residential, Commercial or Industrial;
11. If Track 2 Restricted Residential Use SCOs are not achieved, a composite cover system consisting of the concrete building slab will be constructed;
12. If a Track 2 cleanup is not achieved, implementation of a Site Management Plan (SMP) for long term maintenance of the Engineering Controls.

All responsibilities associated with the Remedial Action, including permitting requirements and pretreatment requirements, will be addressed in accordance with all applicable Federal, State and local rules and regulations.

The intent of the remedy is to achieve Track 1 Unrestricted Use therefore, no Environmental Easement (EE) or site management is anticipated. If the soil vapor intrusion (SVI) evaluation is not completed prior to completion of the Final Engineering Report (FER), then a Site Management Plan (SMP) and EE will be required to address the SVI evaluation and implement action as needed; if a mitigation or monitoring action is needed, a Track 1 cleanup can only be achieved if the mitigation system or other required action is no longer needed within 5 years of the date of the Certificate of Completion (COC).

Although the goal of the remedy will be to remove all soil exceeding the Track 1 Unrestricted Use SCOs, if Track 1 Unrestricted Use SCOs cannot be achieved including achievement of groundwater and soil vapor remedial objectives, then a Track 2 or Track 4 remedy may result as described above.

Remedial activities will be performed at the Site in accordance with this NYSDEC-approved RAWP. Any anticipated deviations to the RAWP shall be submitted to the NYSDEC for review.

4.0 REMEDIAL ACTION PROGRAM

The objective of this section of the Remedial Action Work Plan, is to present a scope of work which will be approved by NYSDEC and when completely implemented will ready the BCP site for development under the Contemplated Use consistent with the requirements of the Brownfield Cleanup Program.

4.1 GOVERNING DOCUMENTS

Governing documents and procedures included in the Remedial Work Plan include a Site-specific Health and Safety Plan (HASP), a Community Air Monitoring Plan (CAMP), a Citizen Participation Plan, a Soil Management Plan (SoMP), a Quality Assurance Project Plan (QAPP), fluid management procedures, and contractors' site operations and quality control procedures. Highlights of these documents and procedures are provided in the following sections.

4.1.1 Health & Safety Plan (HASP)

Contractors and subcontractors will have the option of adopting this HASP or developing their own Site-specific document. If a contractor or subcontractor chooses to prepare their own HASP, the Remedial Engineer will insure that it meets the minimum requirements as detailed in the Site-specific HASP prepared for the Site.

Activities performed under the HASP will comply with applicable parts of OSHA Regulations, primarily 29 CFR Parts 1910 and 1926. Modifications to the HASP may be made with the approval of the Remedial Engineer (RE), Site Safety Manager (SSM) and/or Project Manager (PM).

All remedial work performed under this plan will be in full compliance with governmental requirements, including Site and worker safety requirements mandated by Federal OSHA.

The Participant and associated parties preparing the remedial documents submitted to the State and those performing the construction work, are completely responsible for the preparation of an appropriate Health and Safety Plan and for the appropriate performance of work according to that plan and applicable laws.

The Health and Safety Plan (HASP) and requirements defined in this Remedial Action Work Plan pertain to all remedial and invasive work performed at the Site until the issuance of a Certificate of Completion.

The Site Safety Coordinator will be Tom Gallo. His resume is provided in **Attachment F**. Confined space entry will comply with all OSHA requirements to address the potential risk posed by combustible and toxic gasses. A copy of the Site-Specific Health and Safety Plan is provided in **Attachment B**.

4.1.2 Quality Assurance Project Plan (QAPP)

The fundamental QA objective with respect to accuracy, precision, and sensitivity of analysis for laboratory analytical data is to achieve the QC acceptance of the analytical protocol. The accuracy, precision and completeness requirements will be addressed by the laboratory for all data generated.

Collected samples will be appropriately packaged, placed in coolers and shipped via overnight courier or delivered directly to the analytical laboratory by field personnel. Samples will be containerized in appropriate laboratory provided glassware and shipped in plastic coolers. Samples will be preserved through the use of ice or a cold-pak(s) to maintain a temperature of 4^{o}C.

Dedicated disposable sampling materials will be used for both soil and groundwater samples (if collected), eliminating the need to prepare field equipment (rinsate) blanks. However, if non-disposable equipment is used, (stainless steel scoop, etc.) field rinsate blanks will be prepared at the rate of 1 for every eight samples collected.

Decontamination of non-dedicated sampling equipment will consist of the following:

- Gently tap or scrape to remove adhered soil
- Rinse with tap water
- Wash with alconox® detergent solution and scrub
- Rinse with tap water
- Rinse with distilled or deionized water

Prepare field blanks by pouring distilled or de-ionized water over decontaminated equipment and collecting the water in laboratory provided containers. Trip blanks will accompany samples each time they are transported to the laboratory. Matrix spike and matrix spike duplicates (MS/MSD) will be collected at the rate of one per 20 samples submitted to the laboratory. Laboratory reports will be upgradeable to ASP category B deliverables for use in the preparation of a data usability report (DUSR). The QAPP for the Site is provided in **Attachment C**.

4.1.3 Construction Quality Assurance Plan (CQAP)

All construction work related to the remedy (i.e. soil excavation) will be monitored by EBC / AMC field personnel under the direct supervision of the Remedial Engineer. Monitoring during soil excavation will be performed to protect the health of site workers and the surrounding community. A Health and Safety Plan (HASP) and Community Air Monitoring Plan (CAMP) have been specifically developed for this project. These plans specify the monitoring procedures, action levels, and contingency measures that are required to protect public health.

All intrusive and soil disturbance activities will be monitored by an environmental professional (EP) under the direct supervision of the Remedial Engineer who will record observations in the site field book and complete a photographic log of the daily activities. The EP will provide daily updates to the Project Manager and Remedial Engineer who will both make periodic visits to the site as needed to assure construction quality. Daily updates will also be submitted to the NYSDEC. See section 4.4.1 Daily Reports.

4.1.4 Soil/Materials Management Plan (SoMP)

A SoMP has been prepared for excavation, handling, storage, transport and disposal of all soils/materials that are disturbed / excavated at the Site. The SoMP includes all of the controls that will be applied to these efforts to assure effective, nuisance-free performance in compliance with all applicable Federal, State and local laws and regulations. The SoMP is presented in Section 5.4.

4.1.5 Erosion and Sediment Control Plan (ESCP)

Erosion and sediment controls will be performed in conformance with requirements presented in the New York State Guidelines for Urban Erosion and Sediment Control. Typical measures that will be utilized at various stages of the project to limit the potential for erosion and migration of soil include the use of hay bales, temporary stabilized construction entrances/exits, placement of silt fencing and/or hay bales around soil stockpiles, and dust control measures.

4.1.6 Community Air Monitoring Plan (CAMP)

The CAMP provides measures for protection for on-site workers and the downwind community (i.e., off-site receptors including residences, businesses, and on-site workers not directly involved in the remedial work) from potential airborne contaminant releases resulting from remedial activities.

The action levels specified require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that the remedial work did not spread contamination off-site through the air. The primary concerns for this site are vapors, nuisance odors and dust particulates.

The primary concerns for this site are vapors, nuisance odors and dust particulates. The CAMP prepared for implementation of the RAWP is provided in **Attachment D**.

4.1.7 Contractors Site Operations Plan (SOP)

The Remedial Engineer has reviewed all plans and submittals for this remedial project (including those listed above and contractor and sub-contractor document submittals) and confirms that they are in compliance with this RAWP. The Remedial Engineer is responsible to ensure that all later document submittals for this remedial project, including contractor and sub-contractor document submittals, are in compliance with this RAWP. All remedial documents will be submitted to NYSDEC and NYSDOH in a timely manner and prior to the start of work.

4.1.8 Citizen Participation Plan (CPP)

The public will be informed of key project documents and events through the distribution of fact sheets through the Department's List Serv. The public was initially informed of the Site and the opportunity to join the List Serv through an ad placed in the local newspaper and mailed fact sheets.

No changes will be made to approved Fact Sheets authorized for release by NYSDEC without written consent of the NYSDEC. No other information, such as brochures and flyers, will be included with the Fact Sheet mailing.

Document repositories have been established at the following locations and contain all applicable project documents:

Brooklyn Public Library, Leonard Branch - The Library is currently closed for Covid 19.

81 Devoe Street
Brooklyn, New York 11211
Managing Librarian: Lauren Comito
(718) 486-6006

Brooklyn Community Board District 1
435 Graham Avenue
Brooklyn, New York 11211
Chairperson: Gerald A. Esposito
bk01@cb.nyc.gov
(718) 389-0009

4.2 GENERAL REMEDIAL ACTION INFORMATION

4.2.1 Project Organization

The Project Manager for the Remedial Activity will be Mr. Kevin Brussee. Overall responsibility for the BCP project will be Mr. Charles B. Sosik, P.G., P.HG. The Remedial Engineer for this project is Mr. Ariel Czemerinski, P.E. Resumes of key personnel involved in the Remedial Action are included in **Attachment F**.

4.2.2 Remedial Engineer

The Remedial Engineer for this project will be Mr. Ariel Czemerinski, P.E. The Remedial Engineer is a registered professional engineer licensed by the State of New York. The Remedial Engineer will have primary direct responsibility for implementation of the remedial program for the Site. The Remedial Engineer will certify in the Final Engineering Report that the remedial activities were observed by qualified environmental professionals under his supervision and that the remediation requirements set forth in the Remedial Action Work Plan and any other relevant provisions of ECL 27-1419 have been achieved in full conformance with that Plan. Other Remedial Engineer certification requirements are listed later in this RAWP.

The Remedial Engineer will review all pre-remedial plans submitted by 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, and will certify compliance in the Final Remediation Report. The Remedial Engineer will provide the certifications listed in Section 10.1 in the Final Engineering Report.

4.2.3 Remedial Action Schedule

The remedial action will begin with mobilization of equipment and material to the Site, which will begin approximately 1 week following RAWP approval and 10 days after the distribution of the remedial construction Fact Sheet. A pre-construction meeting will be held among NYSDEC, the Remedial Engineer, and the selected remedial contractor prior to site mobilization. Mobilization will be followed by soil removal and disposal and confirmation sampling. The work is expected to take 6 months as part of the construction excavation and foundation installation.

4.2.4 Work Hours

The hours for operation of remedial construction will conform to the New York City Department of Buildings construction code requirements or according to specific variances issued by that agency. DEC will be notified by the Applicant of any variances issued by the Department of Buildings. NYSDEC reserves the right to deny alternate remedial construction hours.

4.2.5 Site Security

A construction fence has been erected around the entire property as required by the NYC Department of Buildings. The fence will be maintained as required and secured at the end of each work day.

4.2.6 Traffic Control

The Participant’s construction management personnel will direct the arrival or departure of construction vehicles, and provide flag services as needed to maintain safe travel exiting and entering the Site from Park Avenue. Traffic related to on-going remedial activity will require the staging of 10-wheel dump trucks on Park Avenue on a daily basis during soil excavation activity.

The soil disposal transport route will be as follows:

- EXITING SITE – Turn left onto Hope Street heading west to Rodney Street. Turn right onto Rodney Street heading north to merge with Meeker Street. Continue north on Meeker street merging left to the on-ramp for the Brooklyn-Queens Expressway (I-278).
- ENTERING SITE - from the I-278 heading south. Follow the signs to the Metropolitan Avenue Exit (exit 32b) which merges onto Meeker Avenue. Continue south on Meeker Avenue to Union Avenue. Make a left on to Union Avenue heading southeast to Hope Street. Make a right onto Hope Street heading west approximately 1,5 blocks to the site entrance on the left.

A map showing the truck routes is included as **Figure 9**.

4.2.7 Worker Training and Monitoring

An excavation contractor with appropriate experience, personnel and training (minimum 24 hr OSHA HAZWOPPER) is required to perform the removal of the petroleum impacted soil and non-hazardous historic fill. The excavation contractor’s on-site personnel engaged in this work will all have a minimum of 24 hour Hazardous Waste Operations and Emergency Response Operations training.

All field personnel involved in remedial activities will participate in training, if required under 29 CFR 1910.120, including 24 and 40-hour hazardous waste operator training and annual 8-hour refresher training. The Site Safety Officer will be responsible for maintaining workers training records.

Personnel entering any exclusion zone will be trained in the provisions of the HASP and be required to sign a HASP acknowledgment.

All on-site personnel engaged in remedial or sampling activities must receive adequate Site-specific training in the form of an on-site Health and Safety briefing prior to participating in field work with emphasis on the following:

- Protection of the adjacent community from hazardous vapors and / or dust which may be released during intrusive activities.
- Identification of chemicals known or suspected to be present on-site and the health effects and hazards of those substances.
- The need for vigilance in personnel protection, and the importance of attention to proper use, fit and care of personnel protective equipment.
- Decontamination procedures.
- Site control including work zones, access and security.
- Hazards and protection against heat or cold.
- The proper observance of daily health and safety practices, such as entry and exit of work zones and site. Proper hygiene during lunch, break, etc.
- Emergency procedures to be followed in case of fire, explosion and sudden release of hazardous gases.

4.2.8 Agency Approvals

The Applicant has addressed all SEQRA requirements for this Site. All permits or government approvals required for remedial construction have been, obtained prior to the start of remedial construction.

The planned end use for the Site is in conformance with the current zoning for the property as determined by New York City Department of Planning. A Certificate of Completion will not be issued for the project unless conformance with zoning designation is demonstrated.

A complete list of all local, regional and national governmental permits, certificates or other approvals or authorizations required to perform the remedial and development work is attached in **Table 15**. This list includes a citation of the law, statute or code to be complied with, the originating agency, and a contact name and phone number in that agency. This list will be updated in the Final Remediation Report.

4.2.9 Pre-Construction Meeting with NYSDEC

A pre-construction meeting or teleconference call with the Project Manager, Remedial Engineer, Construction Manager, Owner's Representative and the NYSDEC will take place prior to the start of major construction activities.

4.2.10 Emergency Contact Information

An emergency contact sheet with names and phone numbers is included in **Table 16**. That document will define the specific project contacts for use by NYSDEC and NYSDOH in the case of a day or night emergency.

4.2.11 Remedial Action Costs

The total estimated cost of the Remedial Action is $ 1,868,577.50. An itemized and detailed summary of estimated costs for all remedial activity is attached as **Attachment G**.

4.3 SITE PREPARATION

4.3.1 Mobilization

Mobilization will include the delivery of construction equipment and materials to the Site. All construction personnel will receive site orientation and training in accordance with the Site-specific HASP, CAMP and established policies and procedures to be followed during the implementation of the RAWP. The remediation contractor, construction manager and all associated subcontractors will each receive a copy of the RAWP and the Site-specific HASP and will be briefed on their contents.

4.3.2 Erosion and Sedimentation Controls

Soil erosion and sediment control measures for management of storm water will be installed in accordance with the New York Guidelines for Urban Erosion and Sediment Control. Haybales and/or silt fence will be placed by the remedial contractor at locations surrounding excavation areas and within the perimeter fencing as needed, to control stormwater runoff and surface water from exiting the excavation. These control measures will be installed prior to initiating the soil excavation.

4.3.3 Stabilized Construction Entrance(s)

Stabilized construction entrances will be installed at all points of vehicle ingress and egress to the Site. The stabilized entrances will be constructed of a 4 to 6-inch bed of crushed stone or crushed concrete which will be sloped back toward the interior of the Site. The stabilized entrances will be inspected on a daily basis during soil loading activities and reinforced as needed with additional stone/concrete material to prevent the accumulation of ruts, mud or soil.

4.3.4 Utility Marker and Easements Layout

The Applicant and its contractors are solely responsible for the identification of utilities that might be affected by work under the RAWP and implementation of all required, appropriate, or necessary health and safety measures during performance of work under this RAWP. The Applicant and its contractors are solely responsible for safe execution of all invasive and other work performed under this RAWP. The Applicant and its contractors must obtain any local, State or Federal permits or approvals pertinent to such work that may be required to perform work under this RAWP. Approval of this RAWP by NYSDEC does not constitute satisfaction of these requirements.

The presence of utilities and easements on the Site has been investigated by the Remedial Engineer. It has been determined that no risk or impediment to the planned work under this Remedial Action Work Plan is posed by utilities or easements on the Site.

4.3.5 Sheeting and Shoring

Appropriate management of structural stability of on-Site or off-Site structures during on-Site activities including excavation is the sole responsibility of the Applicant and its contractors. The Applicant and its contractors are solely responsible for safe execution of all invasive and other work performed under this Plan. The Applicant and its contractors must obtain any local, State or Federal permits or approvals that may be required to perform work under this Plan. Further, the Applicant and its contractors are solely responsible for the implementation of all required, appropriate, or necessary health and safety measures during performance of work under the approved Plan.

4.3.6 Equipment and Material Staging

All equipment and work materials will be staged on-Site in areas as designated by the General Contractor, and / or Construction Site Superintendant.

4.3.7 Decontamination Area

A temporary truck decontamination pad will be constructed to decontaminate trucks and other vehicles/equipment leaving the Site. The pad will be constructed by placing a 4 to 6-inch bed of stone aggregate such as crushed rock or RCA. The pad will be bermed at the sides and sloped back to the interior of the Site. The truck pad will be sized to accommodate the largest construction vehicle used and located in line with the stabilized construction entrance. The pad will be inspected on a daily basis during soil loading activities and reinforced as needed with additional stone/concrete material to prevent the accumulation of ruts, mud or soil.

4.3.8 Site Fencing

An 8-foot high construction fence is present around the portions of the Site which are not bordered by adjacent buildings (west and south) with an entrance / exit gate located on Hope Street. This fence will be properly secured at the end of the day and supplemented, as needed, by installing orange safety fencing around open excavations to ensure on-site worker safety.

4.3.9 Demobilization

Demobilization will consist of the restoration of material staging areas and the disposal of materials and/or general refuse in accordance with acceptable rules and regulations. Materials used in remedial activities will be removed and disposed properly. All equipment will be decontaminated prior to leaving the Site.

4.4 REPORTING

All daily and monthly Reports will be included in the Final Engineering Report.

4.4.1 Daily Reports

Daily reports will be submitted to NYSDEC and NYSDOH Project Managers by the end of each day in which remedial activity takes place. Daily reports will include:

- An update of progress made during the reporting day;

- A summary of any and all complaints with relevant details (names, phone numbers);
- A summary of CAMP finding, including excursions;
- An explanation of notable Site conditions.

Daily reports are not intended to be the mode of communication for notification to the NYSDEC of emergencies (accident, spill), requests for changes to the RAWP or other sensitive or time critical information. However, such conditions must also be included in the daily reports. Emergency conditions and changes to the RAWP will be addressed directly to NYSDEC Project Manager via personal communication.

These reports will include a summary of air sampling results, odor and dust problems and corrective actions, and all complaints received from the public.

4.4.2 Monthly Reports

Monthly reports will be submitted to NYSDEC and NYSDOH Project Managers within one week following the end of the month of the reporting period and will include:

- Activities relative to the Site during the previous reporting period and those anticipated for the next reporting period, including a quantitative presentation of work performed (i.e. loads of material exported and imported, etc.);
- Description of approved activity modifications, including changes of work scope and/or schedule;
- Sampling results received following internal data review and validation, as applicable; and,
- An update of the remedial schedule including the percentage of project completion, unresolved delays encountered or anticipated that may affect the future schedule, and efforts made to mitigate such delays.

4.4.3 Other Reporting

Photographs will be taken of all remedial activities and submitted to NYSDEC in digital (JPEG, PDF) format. Photos will illustrate all remedial program elements and will be of acceptable quality. Representative photos of the Site prior to any Remedial Actions will be provided. Representative photos will be provided of each contaminant source, source area and Site structures before, during and after remediation. Photos will be included in the daily reports as needed, and a comprehensive collection of photos will be included in the Final Engineering Report.

Job-site record keeping for all remedial work will be appropriately documented. These records will be maintained on-Site at all times during the project and be available for inspection by NYSDEC and NYSDOH staff.

4.4.4 Complaint Management Plan

Complaints from the public regarding nuisance or other Site conditions including noise, odor, truck traffic etc., will be recorded in the Site field book and reported to the NYSDEC via email on the same day as the complaint is received.

4.4.5 Deviations from the Remedial Action Work Plan

Minor deviations from the RAWP will be identified in the daily update report and will be noted in the Final Engineering Report. When deviations are reported, a brief discussion will be provided which will state the following:

- Reasons for deviating from the approved RAWP;
- Effect of the deviations on overall remedy.

Major changes to the scope of work must be discussed with the NYSDEC and the NYSDOH prior to implementation. If the changes are considered to be significant enough, an addendum to the RAWP Work Plan will be prepared and submitted to NYSDEC / NYSDOH for review.

5.0 REMEDIAL ACTION: MATERIAL REMOVAL FROM SITE

5.1 UST REMOVAL

5.1.1 UST Removal Methods

Four underground storage tanks are suspected to be present in the east-central area of the Site based on the results of the geophysical survey performed during the RI. Although the data were inconclusive, three additional anomalies were reported in the northern area of the Site which may represent underground tanks. At least one of the anomalies (No.2) is located in an area in which a gasoline UST is identified in a Sanborn map, and where petroleum VOC contamination was previously reported. These tanks and any additional USTs encountered during excavation activities at the Site, will be removed in accordance with the procedures described under the NYSDEC Memorandum for the Permanent Abandonment of Petroleum Storage Tanks and Section 5.5 of Draft DER-10 as follows:

- Remove all product to its lowest draw-off point
- Drain and flush piping into the tank
- Vacuum out the tank bottom consisting of water product and sludge
- Dig down to the top of the tank and expose the upper half of the tank
- Remove the fill tube and disconnect the fill, gauge, product and vent lines and pumps. Cap and plug open ends of lines
- Temporarily plug all tank openings, complete the excavation, remove the tank and place it in a secure location
- Render the tank safe and check the tank atmosphere to ensure that petroleum vapors have been satisfactorily purged from the tank
- Clean tank or remove to a storage yard for cleaning
- If the tank is to be moved it must be transported by licensed waste transported. Plug and cap all holes prior to transport leaving a 1/8 inch vent hole located at the top of the tank during transport
- After cleaning the tank must be made acceptable for disposal at a scrap yard cleaning the tank interior with a high pressure rinse and cutting the tank in several pieces.

During the tank and pipe line removal the following field observations should be made and recorded:

- A description and photographic documentation of the tank and pipe line condition (pitting, holes, staining, leak points, evidence of repairs, etc.)
- Examination of the excavation floor and sidewalls for physical evidence of contamination (odor, staining, sheen, etc.)
- Periodic field screening (through bucket return) of the floor and sidewalls of the excavation with a calibrated photoionization detector (PID).
- Endpoint sampling to be performed following excavation of soil to 15 ft below grade (see section 5.3).

5.2 SOIL EXCAVATION

Excavation work includes the following; excavation across Lot 4 to a minimum depth of 12 feet across the Site to remove soil/fill with contaminants above Unrestricted Use SCOs, and excavation to a depth of at least 3 feet across all of Lot 7 to remove soil/fill with contaminants above Unrestricted Use SCOs, with additional deeper excavation within the north-central area of Lot 7 to a depth of 9 feet below grade to remove a petroleum hotspot, and 12 feet to remove soil/fill with contaminants above Unrestricted Use SCOs and Protection of Groundwater SCOs around soil boring RI-SB-11. Dewatering of the petroleum impacted areas will be needed to facilitate excavation below the groundwater interface and to remediate impacted groundwater in this area.

Soil excavation will be performed using conventional equipment such as track-mounted excavators, backhoes and loaders. All excavation work will be performed in accordance with the Site-specific HASP and CAMP. If a previously unknown / unsuspected underground storage tank (UST) is discovered during excavation, the NYSDEC Project Manager will be immediately notified and the UST removed and closed in accordance with DER-10, NYSDEC PBS regulations and NYC Fire Department regulations. It is anticipated that the excavation of non-hazardous petroleum impacted soil, historic fill material and native soil will be performed by an excavation contractor using appropriately trained personnel (24 hr HAZWOPER).

Over excavated areas will be backfilled using clean native soil excavated from other areas of the Site or imported material meeting Unrestricted Use and Protection of Groundwater SCOs. An excavation plan showing the excavation depths to achieve the Track 1 remedy is provided in **Figure 10**.

5.2.1 Soil Cleanup Objectives

The Soil Cleanup Objectives for this Site are listed in **Table 1**. Spider maps showing all soil samples that exceed the SCOs proposed for this Remedial Action are shown in **Figures 6a/6b**.

5.3 REMEDIAL PERFORMANCE EVALUATION (POST EXCAVATION END-POINT SAMPLING)

Post excavation (endpoint) soil samples will be collected from across the Site to verify that remedial goals have been achieved. Endpoint soil samples will be collected from the Site as follows:

(1) Site-wide bottom of excavation endpoint soil samples will be collected following removal of all soil to verify that remedial goals have been achieved (**Figure 11**). The Site-wide endpoint soil samples will be analyzed for VOCs, SVOCs, pesticides, PCBs and metals. Ten percent of the endpoint samples will be analyzed for PFAS compounds and 1,4-dioxane (8270 SIM).

(2) Sidewall endpoint samples will be collected from the north-central petroleum impacted area. The sidewall endpoint soil samples will be analyzed for VOCs, SVOCs, pesticides, PCBs and metals.

5.3.1 End-Point Sampling Frequency

Endpoint sampling frequency will be in accordance with DER-10 section 5.4 which recommends the collection of one bottom sample per 900 sf of bottom area and one sidewall sample per 30 linear feet. Sidewall samples will not be collected where sheeting or shoring is present and will not be collected when the excavation extends to the Site boundaries. Sidewall samples will be collected along the norther site boundary of the petroleum hot-spot area to confirm Protection of Groundwater SCOs have been achieved both on and off-Site.

5.3.2 Methodology

Collected samples will be placed in glass jars supplied by the analytical laboratory and stored in a cooler with ice to maintain a temperature of 4 degrees C. Samples will either be picked up at the Site by a laboratory dispatched courier at the end of the day or transported back to the EBC /AMC office where they will be picked up the following day by the laboratory courier. All samples will be analyzed by a NYSDOH ELAP certified environmental laboratory

All site-wide post-excavation (endpoint) soil samples will be analyzed for VOCs by EPA Method 8260B, SVOCs by EPA method 8270, pesticides/PCBs by EPA method 8081/8082, and TAL metals. Ten percent of the site-wide post excavation samples will be analyzed for 1,4-dioxane by EPA Method 8270 SIM, and 21 PFAS compounds by EPA method 537. Petroleum hotspot bottom and sidewall samples will be analyzed for VOCs by EPA Method 8260B, SVOCs by EPA method 8270, pesticides/PCBs by EPA method 8081/8082, and TAL metals.

5.3.3 Reporting of Results

Sample analysis will be provided by a New York State certified environmental laboratory. Laboratory reports will include ASP category B deliverables for use in the preparation of a data usability summary report (DUSR). All results will be provided in accordance with the NYSDEC Environmental Information Management System (EIMS) electronic data deliverable (EDD) format.

5.3.4 QA/QC

The fundamental QA objective with respect to accuracy, precision, and sensitivity of analysis for laboratory analytical data is to achieve the QC acceptance of the analytical protocol. The accuracy, precision and completeness requirements will be addressed by the laboratory for all data generated.

Collected samples will be appropriately packaged, placed in coolers and shipped via overnight courier or delivered directly to the analytical laboratory by field personnel. Samples will be containerized in appropriate laboratory provided glassware and shipped in plastic coolers. Samples will be preserved through the use of ice or cold-pak(s) to maintain a temperature of 4^{o}C.

Dedicated disposable sampling materials will be used for soil samples, eliminating the need to prepare field equipment (rinsate) blanks. However, if non-disposable equipment is used, (stainless steel scoop, etc.) field rinsate blanks will be prepared at the rate of 1 for every eight samples collected. Field blanks will be prepared by pouring distilled or deionized water over decontaminated equipment and collecting the water in laboratory provided containers.

Trip blanks will accompany samples each time they are transported to the laboratory. Matrix spike and matrix spike duplicates (MS/MSD) will be collected at the rate of one per 20 samples submitted to the laboratory.

5.3.5 DUSR

The DUSR provides a thorough evaluation of analytical data without third party data validation. The primary objective of a DUSR is to determine whether or not the data, as presented, meets the site/project specific criteria for data quality and data use. Verification and/or performance monitoring samples collected under this RAWP will be reviewed and evaluated in accordance with the Guidance for the Development of Data Usability Summary Reports as presented in Appendix 2B of DER-10. The completed DUSR for verification/performance samples collected during implementation of this RAWP will be included in the final Engineering Report.

5.3.6 Reporting of End-Point Data in FER

All endpoint data collected as part of this remedial action will be summarized and presented in the Final Engineering Report. The summary tables will include comparison of results to Unrestricted Use SCOs to verify attainment of Track 1. Laboratory reports and the DUSR will be included as an appendix in the FER.

5.4 ESTIMATED MATERIAL REMOVAL QUANTITIES

It is expected that 6,800 cubic yards (10,880 tons) of non-hazardous historic fill material will be generated by excavating all of Lot 4 to a minimum depth of 12 feet, all of Lot 7 to a depth of least 3 feet to remove soil/fill, and a north-central area to a depth of 12 feet to remove soil/fill with contaminants above Unrestricted Use SCOs around soil boring RI-SB-11. An additional 650 cubic yards (1,040 tons) of petroleum contaminated soil will be generated by excavating the north-central petroleum impacted area to a depth of 9 ft. Clean native soil if present, may be reused, if found to be suitable as backfill behind shoring installed around the perimeter of Site, or in over-excavated areas. The remainder of any clean soil (if present) will be transported off-Site for disposal at a beneficial reuse facility or other approved destination.

5.5 SOIL/MATERIALS MANAGEMENT PLAN

Excavated soil will be secured and temporarily stored on-site until arrangements can be made for off-site disposal. As an alternative, waste characterization soil samples may be collected prior to commencement of excavation activities to allow the soil/fill to be loaded directly on to trucks for transport to the disposal facility. Based on the results of the Remedial Investigation, all soil/fill is expected to be classified as non-hazardous. The final determination on classification will be based on the results of waste characterization analysis and the NYSDEC.

Soil excavation will be performed in accordance with the procedures described under Section 5.5 of DER-10 as follows:

- A description and photographic documentation of the excavation.
- Examination of the excavation floor and sidewalls for physical evidence of contamination (odor, staining, sheen, etc.).
- Periodic field screening (through bucket return) of the floor and sidewalls of the excavation with a calibrated photoionization detector (PID).

Final excavation depth, length, and width will be determined by the Remedial Engineer or his designee and will depend on the horizontal and vertical extent of contaminated soils as identified through physical examination (PID response, odor, staining, etc.).

The following procedure will be used for the excavation of impacted soil (as necessary and appropriate):

- Wear appropriate health and safety equipment as outlined in the HASP;
- Prior to excavation, ensure that the area is clear of utility lines or other obstructions. Lay plastic sheeting on the ground next to the area to be excavated;
- Using a rubber-tired backhoe or track mounted excavator, remove overburden soils and stockpile or dispose of separate from the impacted soil;

- If USTs are discovered, the NYSDEC will be notified and the best course of action to remove the structure should be determined in the field. This may involve the continued removal of overburden to access the top of the structure or continued trenching around the perimeter to minimize its disturbance;
- If physically contaminated soil is present (e.g., staining, odors, sheen, PID response, etc), an attempt will be made to remove it to the extent not limited by the site boundaries. If possible, physically impacted soil will be removed using the backhoe or excavator, segregated from clean soils and overburden, and staged on separate dedicated plastic sheeting or live loaded into trucks from the disposal facility. Removal of the impacted soils will continue until visibly clean material is encountered and monitoring instruments indicate that no contaminants are present;
- Excavated soils which are temporarily stockpiled on-site will be covered with 6-mil polyethylene sheeting while disposal options are determined. Sheeting will be checked on a daily basis and replaced, repaired or adjusted as needed to provide full coverage. The sheeting will be shaped and secured in such a manner as to drain runoff and direct it toward the interior of the property;
- Once the Remedial Engineer is satisfied with the removal effort, verification or confirmatory samples will be collected from the excavation.

5.5.1 Excavation of Historic Fill Soil

Historic fill material is present beneath the Site to depths as great as 12 feet below grade. The historic fill material contains SVOCs and/or metals above Unrestricted Use and/or Restricted Residential SCOs. Historic fill material will be segregated from non-contaminated native soils and disposed of off-Site at a permitted disposal facility.

If fill/soil with lead levels above 1,500 mg/kg is encountered during waste characterization soil sampling, the soil/fill may require further segregation for disposal at alternate facilities. Excavated historic fill materials will be secured and temporarily stored on-Site until arrangements can be made for off-Site disposal. It is anticipated that the historic fill material will be classified as non-hazardous material. If this material is classified as non-hazardous, then the excavation of historic fill material will be performed by the excavation contractor for the construction project using trained personnel (24 hr HAZWOPER). If this material is classified as hazardous, then 40 hr HAZWOPER trained personnel will be needed to perform the excavation of this material.

5.5.2 Excavation of Petroleum Impacted Soil

Petroleum contaminated soil has been documented within an estimated 1,800 sf area to a depth of approximately 9 ft below grade. Excavated petroleum contaminated soil will be secured and temporarily stored on-Site until arrangements can be made for off-Site disposal or pre-classified for live loading. It is anticipated that the petroleum contaminated soil will be classified as non-hazardous material. If this material is classified as non-hazardous, then the excavation of historic fill material will be performed by the excavation contractor for the construction project using trained personnel (24 hr HAZWOPER). If vapors create a need for respiratory protection during excavation then medically cleared 40 hr HAZWOPER trained personnel will be needed to perform the excavation of this material.

Sidewall confirmatory soil samples will be collected along the site boundaries of petroleum impacted soil areas to confirm Unrestricted Use SCOs and Protection of Groundwater SCOs were achieved both on and off Site.

5.5.3 Excavation of Native Soils

Native soils present below the fill material may also be excavated for the new building’s cellar level. Excavation of native soil for the cellar will begin following removal of historic fill. If evidence of contamination is discovered while excavating the native soil, for the cellar level, the contaminated soil will be removed to the extent possible and segregated from clean native soil for proper disposal. Clean native soil will be stockpiled on-Site and characterized for reuse on-Site in over excavated areas or behind shoring constructed around the perimeter of the Site. Any excess soil will be disposed of off-Site as a beneficial re-use material or reused on-Site if found to meet SCOs through testing and if acceptable to the structural engineer.

It is anticipated that the excavation of native soil will be performed by the excavation contractor for the construction project.

5.5.4 Soil Screening Methods

Visual, olfactory and PID soil screening and assessment will be performed by an environmental professional during all remedial and development excavations into known or potentially contaminated material (Residual Contamination Zone). Soil screening will be performed regardless of when the invasive work is done and will include all excavation and invasive work performed during the remedy and during development phase, such as excavations for foundations and utility work, prior to issuance of the COC.

All primary contaminant sources (including but not limited to tanks and hotspots) identified during Site Characterization, Remedial Investigation, and Remedial Action will be surveyed by a surveyor licensed to practice in the State of New York. This information will be provided on maps in the Final Engineering Report.

Screening will be performed by environmental professionals. Resumes will be provided for all personnel responsible for field screening (i.e. those representing the Remedial Engineer) of invasive work for unknown contaminant sources during remediation and development work.

5.5.5 Stockpile Methods

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 NYSDEC.

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. Soils which exhibit strong odors will be completely sealed with heavy tarps or vapor suppressant foam.

5.5.6 Materials Excavation and Load Out

The Remedial Engineer or an EP under his/her supervision will oversee all invasive work and the excavation and load-out of all excavated material. The Participant and its contractors are solely responsible for safe execution of all invasive and other work performed under this Plan.

Loaded vehicles leaving the Site will be appropriately lined, tarped, securely covered, manifested, and placarded in accordance with appropriate Federal, State, local, and NYSDOT requirements (and all other applicable transportation requirements).

Where effective, the equipment will be “dry” decontaminated using a broom and/or brushes. If significant amounts of soil or other contaminants remain after the dry decontamination, the equipment will also be pressure washed before leaving the Site. The EP will be responsible for ensuring that all outbound trucks are dry-brushed or washed on the truck wash/equipment pad before leaving the Site until the remedial construction is complete. Locations where vehicles enter or exit the Site shall be inspected daily for evidence of off-Site sediment tracking. The EP will be responsible for ensuring that all egress points for truck and equipment transport from the Site will be clean of dirt and other materials derived from the Site during Site remediation and development. Cleaning of the adjacent streets will be performed as needed to maintain a clean condition with respect to Site derived materials.

The Participant and associated parties preparing the remedial documents submitted to the State, and parties performing this work, are completely responsible for the safe performance of all invasive work, the structural integrity of excavations, and for structures that may be affected by excavations (such as building foundations and bridge footings).

The Remedial Engineer will ensure that Site development activities will not interfere with, or otherwise impair or compromise, remedial activities proposed in this Remedial Action Work Plan.

Development-related grading cuts and fills will not interfere with, or otherwise impair or compromise, the performance of remediation required by this plan.

Mechanical processing of historical fill material and contaminated soil on-Site is prohibited. All primary contaminant sources (including but not limited to tanks and hotspots) identified during Site Characterization, Remedial Investigation, and Remedial Action will be located and shown on maps to be reported in the Final Engineering Report.

5.5.7 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. Truck transport routes are as follows:

- EXITING SITE – Turn Left onto Hope Street heading west to Rodney Street. Turn right onto Rodney Street heading north to merge with Meeker Street. Continue north on Meeker street merging left to the on-ramp for the Brooklyn-Queens Expressway (I-278).
- ENTERING SITE - from the I-278 heading south. Follow the signs to the Metropolitan Avenue Exit (exit 32b) which merges onto Meeker Avenue. Continue south on Meeker Avenue to Union Avenue. Make a left on to Union Avenue heading southeast to Hope Street. Make a right onto Hope Street heading west approximately 1,5 blocks to the site entrance on the left.

These routes are shown in **Figure 9**.

These are the most appropriate routes to and from the Site and take 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 residential neighborhoods around the project 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. Material transported by trucks exiting the Site will be secured with covers. Wet loads are not anticipated since the entire site will be dewatered prior to excavating soils. However, if wet soils are excavated they will be stockpiled within the excavation to dry or blended with dry soils. No loads of material capable of generating free liquid will be allowed to leave the Site. All trucks will be inspected, dry-brushed and / or washed, as needed, before leaving the Site.

5.5.8 Materials Disposal Off-Site

Multiple disposal facility designations may be employed for the materials removed from the Site. Once final arrangements have been made, the disposal facility acceptance letters will be provided to the NYSDEC Project Manager before the start of excavation activities. It is anticipated that the soil will be disposed of at up to 3 different facilities, based on the following classification:

- Non Hazardous - Contaminated (historic fill / petroleum) Low Lead < 1,500 mg/kg
- Non Hazardous - Contaminated (historic fill / petroleum) High Lead > 1,500 mg/kg
- Uncontaminated Native Soil - meets NJDSC Criteria for beneficial Reuse

The total quantity of material expected to be disposed off-Site is 7,450 cubic yards, including 6,800 cubic yards of historic fill material and 650 cubic yards of petroleum impacted soil.

Hazardous Soil Disposal and Transport

It is not expected that any soil will be classified as hazardous, however if any soil is classified as hazardous it will be shipped under a hazardous waste manifest system. All hazardous waste transported and disposed of must have a USEPA ID Number and waste code and must be distributed in accordance with the regulatory requirements.

The multi-part manifest will be filled out for each load of soil shipped off of the Site. At a minimum, the following information will be recorded on each manifest:

1) Generator's Name, Address, and Phone Number
2) Destination Facility Name, Address and Phone Number
3) EPA ID Number
4) Waste classification code
5) Transporter Name, Address, Phone Number, License Plate Number, Driver Name, and SW Haulers Permit #
6) Signatures – Generator or an authorized agent for the generator shall print, sign, and date each non-hazardous material manifest after each truck is loaded. The transporter shall then sign and date noting time material was picked up at the site. Both the transporter and a representative of the disposal facility will sign the non-hazardous material manifest when the material has been delivered to disposal facility.

Non-Hazardous Soil Disposal and Transport

Non-hazardous historic fill material and petroleum contaminated soil classified as non-hazardous, will be handled, at a minimum, as a Municipal Solid Waste per 6NYCRR Part 360-1.2. Historical fill material and contaminated soils from the Site are prohibited from being disposed at Part 360-16 Registration Facilities (also known as Soil Recycling Facilities).

Soils that are contaminated but non-hazardous and are being removed from the Site are considered by the Division of Materials Management (DMM) in NYSDEC to be Construction and Demolition (C/D) materials with contamination not typical of virgin soils. These soils may be sent to a permitted Part 360 landfill. They may be sent to a permitted C/D processing facility without permit modifications only upon prior notification of NYSDEC Region 2 DSHM. This material is prohibited from being sent or redirected to a Part 360-16 Registration Facility. In this case, as dictated by DMM, special procedures will include, at a minimum, a letter to the C/D facility that provides a detailed explanation that the material is derived from a DER remediation Site, that the soil material is contaminated and that it must not be redirected to on-Site or off-Site Soil Recycling Facilities. The letter will provide the project identity and the name and phone number of the Remedial Engineer. The letter will include as an attachment a summary of all chemical data for the material being transported. Soil classified as non-hazardous fill will be transported under a non-hazardous waste manifest obtained from the selected disposal facility. The multi-part manifest will be filled out for each load of soil shipped off of the Site. At a minimum, the following information will be recorded on each manifest:

1) Generator’s Name, Address, and Phone Number
2) Destination Facility Name, Address and Phone Number
3) Transporter Name, Address, Phone Number, License Plate Number, Driver Name, and SW Haulers Permit #
4 Signatures – Generator or an authorized agent for the generator shall print, sign, and date each non-hazardous material manifest after each truck is loaded. The transporter shall then sign and date noting time material was picked up at the site. Both the transporter and a representative of the disposal facility will sign the non-hazardous material manifest when the material has been delivered to disposal facility.

A copy of the manifest will be retained by AMC on-Site personnel for each shipment. Final signed manifests will be forwarded by the disposal facility to the generator. Copies of the final manifests will be presented in the FER.

Clean Soil Disposal

Clean native soil removed from the Site for development purposes (i.e. basement levels) will be handled as unregulated or beneficial use disposal. This soil will undergo a testing program to confirm that it meets Unrestricted Use SCOs or Residential / Groundwater Protection SCOs prior to unregulated disposal or meets Unrestricted Use SCOs prior to reuse on-Site.

Soil testing for off-site unregulated disposal:

Fill Material Quantity (cubic yards)	Minimum Number of Analyses for Volatile Organic Compounds, if Required	Minimum Number of Analyses for all other parameters
0-300	2	1
301-1000	4	2
1001-10,000	6	3
10,001+	10,001+ Two for every additional 10,000 cubic yards or fraction thereof	One per every additional 10,000 cubic yards or fraction thereof

(1) Sample method and frequency. Samples must be representative of the fill material. The sampling program must be designed and implemented by or under the direction of a qualified environmental professional (QEP), using the table above as a minimum sampling frequency. Written documentation of the sampling program with certification from the QEP that samples were representative of the fill material must be retained for three years after the sampling occurs and must be provided to the department upon request.

(2) Analytical parameters. Fill material samples must be analyzed for:

- (i) the Metals, PCBs/Pesticides, and Semivolatile organic compounds listed in section 375-6.8(b) of this Title;
- (ii) asbestos if demolition of structures has occurred on the site;
- (iii) volume of physical contaminants, if present, based on visual observation; and
- (iv) volatile organic compounds listed in section 375-6.8(b) of this Title, if their presence is possible based on site events such as an historic petroleum spill, odors, photoionization detector meter or other field instrument readings.

(3) Laboratory and analytical requirements. Laboratory analyses must be performed by a laboratory currently certified by the New York State Department of Health's Environmental Laboratory Approval Program (ELAP).

Confirmation testing of clean soils for on-site re-use will be in accordance with DER-10 Section 5.4(e)(10) as follows:

Contaminant	**VOCs**	**SVOCs, Inorganics & PCBs/Pesticides**	
Soil Quantity (cubic yards)	**Discrete Samples**	**Composite**	**Discrete Samples/Composite**
0-50	1	1	Each composite sample for analysis is created from 3-5 discrete samples from representative locations in the fill.
50-100	2	1	
100-200	3	1	
200-300	4	1	
300-400	4	2	
400-500	5	2	
500-800	6	2	
800-1000	7	2	
1000	Add an additional 2 VOC and 1 composite for each additional 1000 Cubic yards or consult with DER		

Uncontaminated native soil confirmed by the above testing program and removed from the site, will be disposed of as C&D material or sent to a beneficial re-use facility. Note that clean soils disposed of at an out-of-state facility will be subject to the testing requirements of that facility in lieu of testing program outlined above. The final destination of soils whether classified as contaminated or uncontaminated must be approved by the Remedial Engineer.

C&D and Scrap Metal Disposal

Concrete demolition material generated on the Site from building slabs, parking areas and other structures will be segregated, sized and shipped to a concrete recycling facility. Concrete crushing or processing on-Site is prohibited. Asphalt removed from the parking areas will be sent to a separate recycling facility.

Additionally, it is common to encounter scrap metals and large boulders (greater than one foot in diameter) during excavation which may not be accepted by either the licensed disposal facility or the C&D facility. These materials will be segregated and subsequently recycled at local facilities. Uncontaminated metal objects will be taken to a local scrap metal facility.

Bricks and other C&D material are also not accepted by most soil disposal facilities if present at greater then 5% by volume. This material, if encountered, will be sent to a C&D landfill or other C&D processing facility. C&D material of this type is most often encountered on sites in which former basement structures have been filled in with material from demolishing a former building.

Scale Tickets

All trucks to be utilized for transport of hazardous or non-hazardous contaminated soil shall be weighed before and after unloading at the disposal facility. Disposal facilities must provide truck scales capable of generating load tickets measured in tons. The tonnage transported and disposed will be determined by the disposal facility and reported on a certified scale ticket which will be attached to each returned manifest. Weights will be reported on the certified scale ticket as Tare and Gross weights.

C&D Transport Tickets / Bills of Lading

Bill of Lading system or equivalent will be used for the disposal of C&D and related materials. Documentation for materials disposed of at recycling facilities (such as metal, concrete, asphalt) and as non-regulated C&D will include transport tickets for each load stating the origin of the material, the destination of the material and the quantity transported. This information will be reported in the Final Engineering Report.

Disposal Facility Documentation

The following documentation will be obtained and reported by the Remedial Engineer for each disposal location used in this project to fully demonstrate and document that the disposal of material derived from the Site conforms with all applicable laws: (1) a letter from the Remedial Engineer or BCP Applicant to the receiving facility describing the material to be disposed and requesting formal written acceptance of the material. This letter will state that material to be disposed is contaminated material generated at an environmental remediation Site in New York State. The letter will provide the project identity and the name and phone number of the Remedial Engineer. The letter will include as an attachment a summary of all chemical data for the material being transported (including Site Characterization data); and (2) a letter from all receiving facilities stating it is in receipt of the correspondence (above) and is approved to accept the material. These documents will be included in the FER.

The Final Engineering Report will include an accounting of the destination of all material removed from the Site during this Remedial Action, including excavated soil, contaminated soil, historic fill, solid waste, and hazardous waste, non-regulated material, and fluids. Documentation associated with disposal of all material must also include records and approvals for receipt of the material. This information will also be presented in a tabular form in the FER.

5.5.9 Materials Reuse On-Site

Re-use of on-Site clean native soil will only be allowed if the material is found to meet Unrestricted Use SCOs (for Track 1) or Restricted Residential Use SCOs (for Track 2) through the verification testing program detailed above. Based on the results of the RI, it is anticipated that there is little to no clean native soil present. If present and found to meet SCOs through a testing program, such soil may be re-used behind the shoring constructed around the perimeter of the Site or re-used on-site to backfill over excavated areas.

The Remedial Engineer will ensure that procedures defined for materials reuse in this RAWP are followed and that unacceptable material will not remain on-Site.

Acceptable demolition material proposed for reuse on-Site, if any, will be sampled for asbestos. Concrete crushing or processing on-Site is prohibited. Contaminated on-Site material, including historic fill material and contaminated soil, removed for grading or other purposes will not be reused within a cover soil layer, within landscaping berms, or as backfill for subsurface utility lines.

5.5.10 Groundwater Remediation

As the depth to groundwater at the Site is above the planned excavation depth of the petroleum impacted areas and deep historic fill areas, dewatering operations will required to remove the impacted soil and to remediate impacted groundwater within these areas. Groundwater at the Site is present under a water table conditions at a depth of approximately 11 feet below grade. Based on groundwater elevation measurements made at the Site, AKRF determined the groundwater flow direction is generally east to southeast. A perched water table condition appears to be present in the west end of Lot 7 and eastern portion of Lot 4 due to the elevated silt/clay layer in that area. The perched water table area has a shallower water table depth.

Dewatering fluids will be handled, transported and disposed of in accordance with applicable local, State, and Federal regulations. Liquids discharged into the New York City sewer system will be addressed through approval by the NYCDEP. This approved permit will be provided to the DEC prior to initiating dewatering operations. Dewatered fluids will not be recharged back to the land surface or subsurface of the Site.

One monitoring well will be installed within the petroleum impacted source area of Lot 4 and two monitoring wells along the northern property line of Lot 7 to collect post-dewatering groundwater samples for VOCs (EPA Method 8260) analysis to demonstrate dewatering effectively addressed any potential pre-remedy groundwater conditions.

5.5.11 Backfill from Off-Site Sources

Off-site fill material may be needed to stabilize the entrance - exit areas of the Site, for temporary driveways for loading trucks and as an underlayment to structural components of the new buildings including slabs and footings. Recycled Concrete Aggregate (RCA) derived from recognizable and uncontaminated concrete and supplied by facilities permitted by, and in full compliance with Part 360-16 and DSNY regulations, is an acceptable form of backfill material. The Remedial Engineer is responsible for ensuring that the facility is compliant with the registration and permitting requirements of 6 NYCRR Part 360 and DSNY regulations at the time the RCA is acquired. RCA imported from compliant facilities does not require additional testing unless required by NYS DEC and DSNY under its terms of operations for the facility. Documentation of part 360-16 and DSNY compliance must be provided to the Remedial Engineer before the RCA is transported to the Site.

Fill material may also consist of general fill, virgin mined sand, gravel or stone products. Gravel or stone material from a virgin mined source may be imported to the Site without testing provided that that the material meets the specifications of the geotechnical engineer, Remedial Engineer, and Redevelopment Construction Documents and that the source of the material is approved by the Remediation Engineer and the NYSDEC Project Manager. This material must contain less than 10% fines and not be blended with soil or other material. As per DER-10, if soil sourced from a virgin mine or pit is imported, at least one round of characterization sampling for the first 100 cubic yards is required in accordance with Table 4 of CP-51/Table 5.4(e)10 of DER-10. The source approval process will require a review of the following information:

- The origin of the material;
- The address of the facility which mines/processes the material;
- If from a virgin source: A letter from the facility stating that the material to be delivered to the site is a virgin mined material and that it has not been co-mingled with other materials during processing or stockpiling.

All materials proposed for import onto the Site will be approved by the Remedial Engineer and will be in compliance with provisions in this RAWP prior to receipt at the Site. Material from industrial sites, spill sites or other potentially contaminated sites will not be imported to the Site. The Final Engineering Report will include the following certification by the Remedial Engineer: "I certify that all import of soils from off-Site, including source evaluation, approval and sampling, has been performed in a manner that is consistent with the methodology defined in the Remedial Action Work Plan".

Under no circumstances will fill materials be imported to the Site without prior approval from the NYSDEC Project Manager. Any soil imported to the Site needs to be tested in accordance with Table 4 of NYSDEC CP-51 Soil Cleanup Guidance Policy. 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.

5.5.12 Stormwater Pollution Prevention

Barriers and hay bale checks will be installed and inspected once a 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 NYSDEC. All necessary repairs shall be made immediately. Accumulated sediments will be removed as required to keep the barrier and hay bale check functional. All undercutting or erosion of the silt fence toe anchor shall be repaired immediately with appropriate backfill materials. Manufacturer's recommendations will be followed for replacing silt fencing damaged due to weathering. Erosion and sediment control measures identified in the RAWP shall be observed to ensure that they are operating correctly. Where discharge locations or points are accessible, they shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters Silt fencing or hay bales will be installed around the entire perimeter of the remedial construction area.

5.5.13 Contingency Plan

If underground tanks or other previously unidentified contaminant sources are found during on-Site remedial excavation or development related construction, sampling will be performed on product, sediment and surrounding soils, with analysis of TCL volatiles and semi-volatiles. Other unidentified or non-petroleum sources will be analyzed for full scan TAL / TCL parameters.

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. These findings will be also included in daily and periodic electronic media reports.

5.5.14 Community Air Monitoring Plan

The Community Air Monitoring Plan (CAMP) provides measures for protection for on-site workers and the downwind community (i.e., off-site receptors including residences, businesses, and on-site workers not directly involved in the remedial work) from potential airborne contaminant releases resulting from remedial activities at construction sites.

The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that the remedial work did not spread contamination off-site through the air. The CAMP consists of monitoring odors, vapors and dust that may be released during remedial activities. Exceedances observed in the CAMP will be reported to NYSDEC and NYSDOH Project Managers and included in the Daily Report. The complete CAMP developed for this Site is included in **Attachment D**.

5.5.15 Odor, Dust and Nuisance Control Plan

The Final Engineering Report will include the following certification by the Remedial Engineer: "I certify that all invasive work during the remediation and all invasive development work were conducted in accordance with dust and odor suppression methodology defined in the Remedial Action Work Plan."

5.5.15.1 Odor Control Plan

This odor control plan is capable of controlling emissions of nuisance odors off-Site and on-Site. If nuisance odors are identified, 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 all other complaints about the project. Implementation of all odor controls, including the halt of work, will be the responsibility of the Applicant's Remediation Engineer, who is responsible for certifying the Final Engineering Report.

All necessary means will be employed to prevent on and off-Site nuisances. At a minimum, procedures will include: (a) use of closed settling tanks and carbon treatment of exhaust air from the pumping / dewatering system (b) limiting the area of open excavations; (c) shrouding open excavations with tarps and other covers; and (d) using foams to cover exposed odorous soils. If odors develop and cannot be otherwise controlled, additional means to eliminate odor nuisances will include: (e) direct load-out of soils to trucks for off-Site disposal; (f) use of chemical odorants in spray or misting systems, (g) use of perimeter misting systems; and, (h) use of staff to monitor odors in surrounding neighborhoods.

Where odor nuisances have developed during remedial work and cannot be corrected, or where the release of nuisance odors cannot otherwise be avoided due to on-Site conditions or close proximity to sensitive receptors, odor control will be achieved by sheltering excavation and handling areas under tented containment structures equipped with appropriate air venting/filtering systems.

5.5.15.2 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 though spraying water directly onto off-road areas including excavations and stockpiles.
- 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 application.

5.5.15.3 Nuisance Control Plan

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 and conforms, to NYCDEP noise control standards.

6.0 RESIDUAL CONTAMINATION TO REMAIN ON-SITE

If a Track 1 cleanup is achieved, all on-Site soil remaining after completion of remediation will meet Track 1 Unrestricted Use SCOs, a bulk reduction of groundwater contamination to asymptotic levels will have occurred, and an Institutional Control (IC) will not be required to protect human health and the environment.

However, if a Track 1 cleanup is not achieved, the Track 2 alternative will be implemented as a contingency and an IC will be required. The Track 2 alternative will allow Restricted Residential use of the property. Long-term management of the IC will be executed under an environmental easement recorded with the NYC Department of Finance, Office of the City Register.

If Track 1 is not achieved, long-term management of ICs and of residual contamination will be executed under a Site-specific Site Management Plan (SMP) that will be developed and submitted to DEC, if needed. The FER will report residual contamination on the Site in tabular and map form.

7.0 ENGINEERING CONTROLS

The intent of this project is to achieve Track 1 Unrestricted Use remedy. If a Track 1 Cleanup cannot be achieved, then a Track 2 Restricted Residential cleanup is proposed. If neither a Track 1 nor Track 2 Cleanup can be achieved, then a Track 4 Cleanup will be achieved.

If a Track 4 remedy is achieved, the Site will be restricted to Restricted-Residential, Commercial and Industrial uses and a site cover may be required to allow for the intended use of the Site. The cover will consist either of the structures such as buildings, pavement, sidewalks comprising the site development or two feet of soil meeting the SCOs as set forth in 6 NYCRR Part 375-6.7(d) and Table 375-6.8(b). The soil cover will be placed over a demarcation layer, with the upper six inches of the soil of sufficient quality to maintain a vegetation layer. Any fill material brought to the Site will meet the requirements for the identified site use as set forth in 6 NYCRR Part 375-6.7(d).

8.0 INSTITUTIONAL CONTROLS

Since the intent of this project is to achieve Track 1 cleanup criteria, institutional controls are not expected to be part of the final remedy for the Site.

If Track 1 cleanup is not achieved, ICs will be incorporated into the remedy to render the overall Site remedy protective of public health and the environmental. Two elements have been designed to ensure continual and proper management of residual contamination in perpetuity: an Environmental Easement and a SMP.

If required, a Site-Specific Environmental Easement will be recorded with the City of New York to provide an enforceable means of ensuring the continual and proper management of residual contamination and protection of public health and the environment in perpetuity or until released in writing by NYSDEC. It requires that the grantor of the Environmental Easement and the grantor's successors and assigns adhere to all Engineering and Institutional Controls (ECs/ICs) placed on the Site by this NYSDEC-approved remedy. ICs provide restrictions on Site usage and mandate operation, maintenance, monitoring and reporting measures for all ECs and ICs.

The SMP describes appropriate methods and procedures to ensure compliance with all ECs and ICs that are required by the Environmental Easement. Once the SMP has been approved by the NYSDEC, compliance with the SMP is required by the grantor of the Environmental Easement and grantor's successors and assigns.

8.1 ENVIRONMENTAL EASEMENT

An Environmental Easement, as defined in Article 71 Title 36 of the Environmental Conservation Law, is required when residual contamination is left on-Site after the Remedial Action is complete. If the Site will have residual contamination after completion of all Remedial Actions than an Environmental Easement is required. If an Environmental Easement is needed following completion of the remedy an Environmental Easement approved by NYSDEC will be filed and recorded with the City of New York. The Environmental Easement (if needed) will be submitted as part of the Final Remediation Report.

The Environmental Easement renders the Site a Controlled Property. The Environmental Easement must be recorded with the City of New York before the Certificate of Completion can be issued by NYSDEC. These Institutional Controls are requirements or restrictions placed on the Site that are listed in, and required by, the Environmental Easement. ICs can, generally, be subdivided between controls that support ECs, and those that place general restrictions on Site usage or other requirements. ICs in both of these groups are closely integrated with the SMP, which provides all of the methods and procedures to be followed to comply with this remedy.

The ICs which will be needed to support ECs are:

- Use of groundwater underlying the Controlled Property is prohibited without treatment rendering it safe for intended purpose;
- Compliance with the Environmental Easement by the Grantee and the Grantee's successor's is required;
- Grantor agrees to submit to NYSDEC a written statement that certifies, under penalty of perjury, that: (1) controls employed at the Controlled Property 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 Controls;
- NYSDEC retains the right to access such Controlled Property at any time in order 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 annual statement must be certified by an expert that the NYSDEC finds acceptable;

8.2 SITE MANAGEMENT PLAN

Site Management is the last phase of remediation and begins with the approval of the Final Engineering Report and issuance of the Certificate of Completion (COC) for the Remedial Action. The SMP is submitted as a separate and independent document from the FER. Site Management continues in perpetuity or until released in writing by NYSDEC. The property owner is responsible to ensure that all Site Management responsibilities defined in the Environmental Easement and the SMP are performed.

The SMP is intended to provide a detailed description of the procedures required to manage residual contamination left in place at the Site following completion of the Remedial Action in accordance with the BCA with the NYSDEC. This includes: (1) development, implementation, and management of all Engineering and Institutional Controls; (2) development and implementation of monitoring systems and a Monitoring Plan; (3) development of a plan to operate and maintain any treatment, collection, containment, or recovery systems (including, where appropriate, preparation of an Operation and Maintenance Manual); (4) submittal of Site Management Reports, performance of inspections and certification of results, and demonstration of proper communication of Site information to NYSDEC; and (5) defining criteria for termination of treatment system operation.

To address these needs, this SMP will include four plans: (1) an Engineering and Institutional Control Plan for implementation and management of EC/ICs; (2) a Monitoring Plan for implementation of Site Monitoring; (3) an Operation and Maintenance Plan for implementation of remedial collection, containment, treatment, and recovery systems; and (4) a Site Management Reporting Plan for submittal of data, information, recommendations, and certifications to NYSDEC. The SMP will be prepared in accordance with the requirements in NYSDEC Draft DER-10 Technical Guidance for Site Investigation and Remediation, dated [month, year], and the guidelines provided by NYSDEC.

Site management activities, reporting, and EC/IC certification will be scheduled on a certification period basis. The certification period will be annually. The Site Management Plan will be based on a calendar year and will be due for submission to NYSDEC by March 1 of the year following the reporting period.

No exclusions for handling of residual contaminated soils will be provided in the SMP. All handling of residual contaminated material will be subject to provisions contained in the SMP.

9.0 FINAL ENGINEERING REPORT

A Final Engineering Report (FER) and Certificate of Completion (COC) will be submitted to NYSDEC following implementation of the Remedial Action defined in this RAWP. The FER provides the documentation that the remedial work required under this RAWP has been completed and has been performed in compliance with this plan. The FER will provide a comprehensive account of the locations and characteristics of all material removed from the Site including the surveyed map(s) of all sources. The Final Engineering Report will include as-built drawings for all constructed elements, certifications, manifests, bills of lading as well as the complete Site Management Plan (formerly the Operation and Maintenance Plan). The FER will provide a description of the changes in the Remedial Action from the elements provided in the RAWP and associated design documents. The FER will provide a tabular summary of all performance evaluation sampling results and all material characterization results and other sampling and chemical analysis performed as part of the Remedial Action. The FER will provide test results demonstrating that all mitigation and remedial systems are functioning properly. The FER will be prepared in conformance with DER-10.

Where determined to be necessary by NYSDEC, a Financial Assurance Plan will be required to ensure the sufficiency of revenue to perform long-term operations, maintenance and monitoring tasks defined in the Site Management Plan and Environmental Easement. This determination will be made by NYSDEC in the context of the Final Engineering Report review.

The Final Engineering Report will include written and photographic documentation of all remedial work performed under this remedy. The FER will include an itemized tabular description of actual costs incurred during all aspects of the Remedial Action.

The FER will provide a thorough summary of all residual contamination left on the Site after the remedy is complete. Residual contamination includes all contamination that exceeds the Track 1 Unrestricted Use SCO in 6NYCRR Part 375-6. A table that shows exceedances from Track 1 Unrestricted SCOs for all soil/fill remaining at the Site after the Remedial Action and a map that shows the location and summarizes exceedances from Track 1 Unrestricted SCOs for all soil/fill remaining at the Site after the Remedial Action will be included in the FER.

The FER will provide a thorough summary of all residual contamination that exceeds the SCOs defined for the Site in the RAWP and must provide an explanation for why the material was not removed as part of the Remedial Action. A table that shows residual contamination in excess of Site SCOs and a map that shows residual contamination in excess of Site SCOs will be included in the FER.

The Final Engineering Report will include an accounting of the destination of all material removed from the Site, including excavated contaminated soil, historic fill, solid waste, hazardous waste, non-regulated material, and fluids. Documentation associated with disposal of all material must also include records and approvals for receipt of the material. It will provide an accounting of the origin and chemical quality of all material imported onto the Site.

Before approval of a FER and issuance of a Certificate of Completion, all project reports must be submitted in digital form on electronic media (PDF).

9.1 CERTIFICATIONS

The following certification will appear in front of the Executive Summary of the Final Engineering Report. The certification will be signed by the Remedial Engineer who is a Professional Engineer registered in New York State. This certification will be appropriately signed and stamped. The certification will include the following statements:

I _________certify that I am currently a NYS registered professional engineer, I had primary direct responsibility for the implementation of the subject construction program, and I certify that the Remedial Work Plan (or Remedial Design or Plans and Specifications) was implemented and that all construction activities were completed in substantial conformance with the DER-approved Remedial Work Plan (or Remedial Design or Plans and Specifications).

Additionally, I certify that:

- *All documents generated in support of this report have been submitted in accordance with the DER's electronic submission protocols and have been accepted by the Department;*
- *All data generated in support of this report have been submitted in accordance with the Department's electronic data deliverable and have been accepted by the Department;*
- *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's Designated Site Representative: [and I have been authorized and designated by all site owners to sign this certification] for this site.*

If the Remedial Action Work Plan (or Remedial Design or Plans and Specifications) identifies time frames to be achieved by the remedial program, the certification must include:

The data submitted to DER demonstrates that the remediation requirements set forth in the Remedial Work Plan (or Remedial Design or Plans and Specifications) and all applicable statutes and regulations have been or will be achieved in accordance with the time frames, if any, established in the work plan (or Remedial Design or Plans and Specifications).

If the remedial program requires ICs or ECs, the certification will include:

All use restrictions, institutional controls, engineering controls and/or any operation and maintenance requirements applicable to the site are contained in an environmental easement created and recorded pursuant to ECL 71-3605 and that any affected local governments, as defined in ECL 71-3603, have been notified that such easement has been recorded.

If the remedial program requires applicable SMP, the certification will include:

A Site Management Plan has been submitted for the continual and proper operation, maintenance, and monitoring of any engineering controls employed at the site including the proper maintenance of any remaining monitoring wells, and that such plan has been approved by DER.

If the remedial program requires financial assurance, the certification will include:

Any financial assurance mechanisms required by DEC pursuant to Environmental Conservation Law have been executed.

10.0 SCHEDULE

The remedial action will begin with mobilization of equipment and material to the Site which will begin approximately 2 weeks following RAWP approval and within 10 days of the distribution of the Construction Fact Sheet. Mobilization will be followed by the installation of shoring structures, removal and disposal of the known USTs, excavation and disposal of petroleum impacted soil, historic fill materials and native soil and by confirmation endpoint soil sampling. Excavation work may proceed in several stages as needed to accommodate pile or sheet driving equipment, underpinning and other components related to the support of excavation (SOE). The work is expected to take approximately 12 months as part of the construction excavation and foundation installation. The schedule of tasks completed under this RAWP is as follows:

Conduct pre-construction meeting with NYSDEC	Within 2 weeks of RAWP approval
Mobilize equipment to the site and construct truck pad and other designated areas	Within 2 weeks following the pre-construction meeting and issuance of Pre-Construction Fact Sheet
Mobilize shoring contractor and equipment to the Site	Within 3 weeks following the pre-construction meeting
Mobilize excavation contractor and equipment to the Site	Within 3 weeks following the installation of shoring or as shoring proceeds
Begin initial excavation cut (historic fill)	Within one week following mobilization of excavation contractor
Begin excavation of USTs (if present)	Upon discovery during initial excavation cut (top 5 feet of soil).
Begin excavation of petroleum impacted soil area	Following the removal of USTs
Set up and begin dewatering of petroleum impacted soil area	As excavation approaches the perched water zone.
Complete the excavation of the petroleum impacted soil area and collect endpoint samples	Within 2 weeks of starting
Complete excavation and disposal of historic fill material and clean native soil.	Within 12 months of mobilization
Perform endpoint verification of entire site	Performed in sequence as final depth of each excavated area is complete.
Submit SMP (as a contingency) if Track 1 Cleanup is not achieved	By August 15th of the year in which the COC is sought or as required by DEC.
Submit FER	By September 15th of the year in which the COC is sought or as required by DEC.

TABLES

TABLE 1
Soil Cleanup Objectives

Contaminant	CAS Number	Protection of Public Health				Protection of Ecological Resources	Protection of Ground-water	Unrestricted Use
		Residential	Restricted-Residential	Commercial	Industrial			
METALS								
Arsenic	7440-38 -2	16f	16f	16f	16f	13f	16f	13[c]
Barium	7440-39 -3	350f	400	400	10,000 d	433	820	350[c]
Beryllium	7440-41 -7	14	72	590	2,700	10	47	7.2
Cadmium	7440-43 -9	2.5f	4.3	9.3	60	4	7.5	2.5[c]
Chromium, hexavalent[h]	18540-29-9	22	110	400	800	1e	19	1[b]
Chromium, trivalent[h]	16065-83-1	36	180	1,500	6,800	41	NS	30[c]
Copper	7440-50 -8	270	270	270	10,000 d	50	1,720	50
Total Cyanide[h]		27	27	27	10,000 d	NS	40	27
Lead	7439-92 -1	400	400	1,000	3,900	63f	450	63[c]
Manganese	7439-96 -5	2,000f	2,000f	10,000 d	10,000 d	1600f	2,000f	1600[c]
Total Mercury		0.81j	0.81j	2.8j	5.7j	0.18f	0.73	0.18[c]
Nickel	7440-02 -0	140	310	310	10,000 d	30	130	30
Selenium	7782-49 -2	36	180	1,500	6,800	3.9f	4f	3.9[c]
Silver	7440-22 -4	36	180	1,500	6,800	2	8.3	2
Zinc	7440-66 -6	2200	10,000 d	10,000 d	10,000 d	109f	2,480	109[c]
PESTICIDES / PCBs								
2,4,5-TP Acid (Silvex)	93-72-1	58	100a	500b	1,000c	NS	3.8	3.8
4,4'-DDE	72-55-9	1.8	8.9	62	120	0.0033 e	17	0.0033[b]
4,4'-DDT	50-29-3	1.7	7.9	47	94	0.0033 e	136	0.0033[b]
4,4'-DDD	72-54-8	2.6	13	92	180	0.0033 e	14	0.0033[b]
Aldrin	309-00-2	0.019	0.097	0.68	1.4	0.14	0.19	0.005[c]
alpha-BHC	319-84-6	0.097	0.48	3.4	6.8	0.04g	0.02	0.02
beta-BHC	319-85-7	0.072	0.36	3	14	0.6	0.09	0.036
Chlordane (alpha)	5103-71 -9	0.91	4.2	24	47	1.3	2.9	0.094
delta-BHC	319-86-8	100a	100a	500b	1,000c	0.04g	0.25	0.04
Dibenzofuran	132-64-9	14	59	350	1,000c	NS	210	7
Dieldrin	60-57-1	0.039	0.2	1.4	2.8	0.006	0.1	0.005[c]
Endosulfan I	959-98-8	4.8i	24i	200i	920i	NS	102	2.4
Endosulfan II	33213-65-9	4.8i	24i	200i	920i	NS	102	2.4
Endosulfan sulfate	1031-07 -8	4.8i	24i	200i	920i	NS	1,000c	2.4
Endrin	72-20-8	2.2	11	89	410	0.014	0.06	0.014
Heptachlor	76-44-8	0.42	2.1	15	29	0.14	0.38	0.042
Lindane	58-89-9	0.28	1.3	9.2	23	6	0.1	0.1
Polychlorinated biphenyls	1336-36 -3	1	1	1	25	1	3.2	0.1
SEMI-VOLATILES								
Acenaphthene	83-32-9	100a	100a	500b	1,000c	20	98	20
Acenapthylene	208-96-8	100a	100a	500b	1,000c	NS	107	100[a]
Anthracene	120-12-7	100a	100a	500b	1,000c	NS	1,000c	100[a]
Benz(a)anthracene	56-55-3	1f	1f	5.6	11	NS	1f	1[c]
Benzo(a)pyrene	50-32-8	1f	1f	1f	1.1	2.6	22	1[c]
Benzo(b) fluoranthene	205-99-2	1f	1f	5.6	11	NS	1.7	1[c]
Benzo(g,h,i) perylene	191-24-2	100a	100a	500b	1,000c	NS	1,000c	100
Benzo(k) fluoranthene	207-08-9	1	3.9	56	110	NS	1.7	0.8[c]
Chrysene	218-01-9	1f	3.9	56	110	NS	1f	1[c]
Dibenz(a,h) anthracene	53-70-3	0.33e	0.33e	0.56	1.1	NS	1,000c	0.33[b]
Fluoranthene	206-44-0	100a	100a	500b	1,000c	NS	1,000c	100[a]
Fluorene	86-73-7	100a	100a	500b	1,000c	30	386	30
Indeno(1,2,3-cd) pyrene	193-39-5	0.5f	0.5f	5.6	11	NS	8.2	0.5[c]
m-Cresol	108-39-4	100a	100a	500b	1,000c	NS	0.33e	0.33[b]
Naphthalene	91-20-3	100a	100a	500b	1,000c	NS	12	12
o-Cresol	95-48-7	100a	100a	500b	1,000c	NS	0.33e	0.33[b]
p-Cresol	106-44-5	34	100a	500b	1,000c	NS	0.33e	0.33[b]
Pentachlorophenol	87-86-5	2.4	6.7	6.7	55	0.8e	0.8e	0.8[b]
Phenanthrene	85-01-8	100a	100a	500b	1,000c	NS	1,000c	100
Phenol	108-95-2	100a	100a	500b	1,000c	30	0.33e	0.33[b]
Pyrene	129-00-0	100a	100a	500b	1,000c	NS	1,000c	100

TABLE 1
Soil Cleanup Objectives

Contaminant	CAS Number	Protection of Public Health: Residential	Restricted-Residential	Commercial	Industrial	Protection of Ecological Resources	Protection of Ground-water	Unrestricted Use
VOLATILES								
1,1,1-Trichloroethane	71-55-6	100a	100a	500b	1,000c	NS	0.68	0.68
1,1-Dichloroethane	75-34-3	19	26	240	480	NS	0.27	0.27
1,1-Dichloroethene	75-35-4	100a	100a	500b	1,000c	NS	0.33	0.33
1,2-Dichlorobenzene	95-50-1	100a	100a	500b	1,000c	NS	1.1	1.1
1,2-Dichloroethane	107-06-2	2.3	3.1	30	60	10	0.02f	0.02[c]
cis-1,2-Dichloroethene	156-59-2	59	100a	500b	1,000c	NS	0.25	0.25
trans-1,2-Dichloroethene	156-60-5	100a	100a	500b	1,000c	NS	0.19	0.19
1,3-Dichlorobenzene	541-73-1	17	49	280	560	NS	2.4	2.4
1,4-Dichlorobenzene	106-46-7	9.8	13	130	250	20	1.8	1.8
1,4-Dioxane	123-91-1	9.8	13	130	250	0.1e	0.1e	0.1 [b]
Acetone	67-64-1	100a	100b	500b	1,000c	2.2	0.05	0.05
Benzene	71-43-2	2.9	4.8	44	89	70	0.06	0.06
Butylbenzene	104-51-8	100a	100a	500b	1,000c	NS	12	12
Carbon tetrachloride	56-23-5	1.4	2.4	22	44	NS	0.76	0.76
Chlorobenzene	108-90-7	100a	100a	500b	1,000c	40	1.1	1.1
Chloroform	67-66-3	10	49	350	700	12	0.37	0.37
Ethylbenzene	100-41-4	30	41	390	780	NS	1	1
Hexachlorobenzene	118-74-1	0.33e	1.2	6	12	NS	3.2	0.33[b]
Methyl ethyl ketone	78-93-3	100a	100a	500b	1,000c	100a	0.12	0.12
Methyl tert-butyl ether	1634-04 -4	62	100a	500b	1,000c	NS	0.93	0.93
Methylene chloride	75-09-2	51	100a	500b	1,000c	12	0.05	0.05
n-Propylbenzene	103-65-1	100a	100a	500b	1,000c	NS	3.9	3.9
sec-Butylbenzene	135-98-8	100a	100a	500b	1,000c	NS	11	11
tert-Butylbenzene	98-06-6	100a	100a	500b	1,000c	NS	5.9	5.9
Tetrachloroethene	127-18-4	5.5	19	150	300	2	1.3	1.3
Toluene	108-88-3	100a	100a	500b	1,000c	36	0.7	0.7
Trichloroethene	79-01-6	10	21	200	400	2	0.47	0.47
1,2,4-Trimethylbenzene	95-63-6	47	52	190	380	NS	3.6	3.6
1,3,5-Trimethylbenzene	108-67-8	47	52	190	380	NS	8.4	8.4
Vinyl chloride	75-01-4	0.21	0.9	13	27	NS	0.02	0.02
Xylene (mixed)	1330-20 -7	100a	100a	500b	1,000c	0.26	1.6	0.26

All soil cleanup objectives (SCOs) are in parts per million (ppm). NS=Not specified. See Technical Support Document (TSD). Footnotes

a The SCOs for residential, restricted-residential and ecological resources use were capped at a maximum value of 100 ppm. See TSD section 9.3.

b The SCOs for commercial use were capped at a maximum value of 500 ppm. See TSD section 9.3.

c The SCOs for industrial use and the protection of groundwater were capped at a maximum value of 1000 ppm. See TSD section 9.3.

d The SCOs for metals were capped at a maximum value of 10,000 ppm. See TSD section 9.3.

e For constituents where the calculated SCO was lower than the contract required quantitation limit (CRQL), the CRQL is used as the SCO value.

Attached Table 2
Hope Street Project
134 Hope Street
Brooklyn, New York
Soil - Volatile Organic Compounds (VOCs)

AKRF Sample ID	NYSDEC UUSCO	NYSDEC RRSCO	RI-SB-01_0-2_20190211	RI-SB-01_2-4_20190211	RI-SB-02_0-2_20190211	RI-SB-02_2-4_20190211
Laboratory Sample ID			460-175116-1	460-175116-2	460-175116-3	460-175116-4
Date Sampled			2/11/2019	2/11/2019	2/11/2019	2/11/2019
Unit			mg/kg	mg/kg	mg/kg	mg/kg
Compound/Dilution Factor			1	1	1	1
1,1,1-Trichloroethane	0.68	100	0.0014 U	0.00091 U	0.00097 U	0.00094 U
1,1,2,2-Tetrachloroethane	NS	NS	0.0014 U	0.00091 U	0.00097 U	0.00094 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	NS	NS	0.0014 U	0.00091 U	0.00097 U	0.00094 U
1,1,2-Trichloroethane	NS	NS	0.0014 U	0.00091 U	0.00097 U	0.00094 U
1,1-Dichloroethane	0.27	26	0.0014 U	0.00091 U	0.00097 U	0.00094 U
1,1-Dichloroethene	0.33	100	0.0014 U	0.00091 U	0.00097 U	0.00094 U
1,2,3-Trichlorobenzene	NS	NS	0.0014 U	0.00091 U	0.00097 U	0.00094 U
1,2,4-Trichlorobenzene	NS	NS	0.0014 U	0.00091 U	0.00097 U	0.00094 U
1,2-Dibromo-3-Chloropropane	NS	NS	0.0014 U	0.00091 U	0.00097 U	0.00094 U
1,2-Dibromoethane (Ethylene Dibromide)	NS	NS	0.0014 U	0.00091 U	0.00097 U	0.00094 U
1,2-Dichlorobenzene	1.1	100	0.0014 U	0.00091 U	0.00097 U	0.00094 U
1,2-Dichloroethane	0.02	3.1	0.0014 U	0.00091 U	0.00097 U	0.00094 U
1,2-Dichloropropane	NS	NS	0.0014 U	0.00091 U	0.00097 U	0.00094 U
1,3-Dichlorobenzene	2.4	49	0.0014 U	0.00091 U	0.00097 U	0.00094 U
1,4-Dichlorobenzene	1.8	13	0.0014 U	0.00091 U	0.00097 U	0.00094 U
2-Hexanone	NS	NS	0.0069 U	0.0045 U	0.0048 U	0.0047 U
Acetone	0.05	100	0.0069 U	0.0045 U	0.0048 U	0.0047 U
Benzene	0.06	4.8	0.0014 U	0.00091 U	0.00097 U	0.00094 U
Bromochloromethane	NS	NS	0.0014 U	0.00091 U	0.00097 U	0.00094 U
Bromodichloromethane	NS	NS	0.0014 U	0.00091 U	0.00097 U	0.00094 U
Bromoform	NS	NS	0.0014 U	0.00091 U	0.00097 U	0.00094 U
Bromomethane	NS	NS	0.0014 U	0.00091 U	0.00097 U	0.00094 U
Carbon Disulfide	NS	NS	0.0014 U	0.00091 U	0.00097 U	0.00094 U
Carbon Tetrachloride	0.76	2.4	0.0014 U	0.00091 U	0.00097 U	0.00094 U
Chlorobenzene	1.1	100	0.0014 U	0.00091 U	0.00097 U	0.00094 U
Chloroethane	NS	NS	0.0014 U	0.00091 U	0.00097 U	0.00094 U
Chloroform	0.37	49	0.0014 U	0.00091 U	0.00097 U	0.00094 U
Chloromethane	NS	NS	0.0014 U	0.00091 U	0.00097 U	0.00094 U
Cis-1,2-Dichloroethylene	0.25	100	0.0014 U	0.00091 U	0.00097 U	0.00094 U
Cis-1,3-Dichloropropene	NS	NS	0.0014 U	0.00091 U	0.00097 U	0.00094 U
Cyclohexane	NS	NS	0.0014 U	0.00091 U	0.00097 U	0.00094 U
Dibromochloromethane	NS	NS	0.0014 U	0.00091 U	0.00097 U	0.00094 U
Dichlorodifluoromethane	NS	NS	0.0014 U	0.00091 U	0.00097 U	0.00094 U
Ethylbenzene	1	41	0.0014 U	0.00091 U	0.00097 U	0.00094 U
Isopropylbenzene (Cumene)	NS	NS	0.0014 U	0.00091 U	0.00097 U	0.00094 U
M,P-Xylenes	NS	NS	0.0014 U	0.00091 U	0.00097 U	0.00094 U
Methyl Acetate	NS	NS	0.0069 UJ	0.0045 UJ	0.0048 UJ	0.0047 UJ
Methyl Ethyl Ketone (2-Butanone)	0.12	100	0.0069 U	0.0045 U	0.0048 U	0.0047 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	NS	NS	0.0069 U	0.0045 U	0.0048 U	0.0047 U
Methylcyclohexane	NS	NS	0.0014 U	0.00091 U	0.00097 U	0.00094 U
Methylene Chloride	0.05	100	0.0014 U	0.00091 U	0.00097 U	0.00094 U
O-Xylene (1,2-Dimethylbenzene)	NS	NS	0.0014 U	0.00091 U	0.00097 U	0.00094 U
Styrene	NS	NS	0.0014 U	0.00091 U	0.00097 U	0.00094 U
Tert-Butyl Methyl Ether	0.93	100	0.0014 UJ	0.00091 UJ	0.00097 UJ	0.00094 UJ
Tetrachloroethylene (PCE)	1.3	19	0.0036	0.0012	0.00019 J	0.00016 J
Toluene	0.7	100	0.0014 U	0.00091 U	0.00097 U	0.00094 U
Total Xylenes	0.26	100	0.0014 U	0.00091 U	0.00097 U	0.00094 U
Trans-1,2-Dichloroethene	0.19	100	0.0014 U	0.00091 U	0.00097 U	0.00094 U
Trans-1,3-Dichloropropene	NS	NS	0.0014 U	0.00091 U	0.00097 U	0.00094 U
Trichloroethylene (TCE)	0.47	21	0.0014 U	0.00091 U	0.00097 U	0.00094 U
Trichlorofluoromethane	NS	NS	0.0014 U	0.00091 U	0.00097 U	0.00094 U
Vinyl Chloride	0.02	0.9	0.0014 U	0.00091 U	0.00097 U	0.00094 U

Attached Table 2
Hope Street Project
134 Hope Street
Brooklyn, New York
Soil - Volatile Organic Compounds (VOCs)

AKRF Sample ID	NYSDEC UUSCO	NYSDEC RRSCO	RI-SB-03_0-2_20190211	RI-SB-X01_0-2_20190211	RI-SB-03_7-9_20190211	RI-SB-04_0-2_20190211
Laboratory Sample ID			460-175116-5	460-175116-16	460-175116-6	460-175116-7
Date Sampled			2/11/2019	2/11/2019	2/11/2019	2/11/2019
Unit			mg/kg	mg/kg	mg/kg	mg/kg
Compound/Dilution Factor			1	1	50	1
1,1,1-Trichloroethane	0.68	100	0.00093 U	0.0011 UJ	0.098 U	0.0016 U
1,1,2,2-Tetrachloroethane	NS	NS	0.00093 U	0.0011 U	0.098 U	0.0016 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	NS	NS	0.00093 U	0.0011 U	0.098 U	0.0016 U
1,1,2-Trichloroethane	NS	NS	0.00093 U	0.0011 U	0.098 R	0.0016 U
1,1-Dichloroethane	0.27	26	0.00093 U	0.0011 U	0.098 U	0.0016 U
1,1-Dichloroethene	0.33	100	0.00093 U	0.0011 U	0.098 U	0.0016 U
1,2,3-Trichlorobenzene	NS	NS	0.00093 U	0.0011 U	0.098 U	0.0016 U
1,2,4-Trichlorobenzene	NS	NS	0.00093 U	0.0011 U	0.098 U	0.0016 U
1,2-Dibromo-3-Chloropropane	NS	NS	0.00093 U	0.0011 U	0.098 U	0.0016 U
1,2-Dibromoethane (Ethylene Dibromide)	NS	NS	0.00093 U	0.0011 U	0.098 U	0.0016 U
1,2-Dichlorobenzene	1.1	100	0.00093 U	0.0011 UJ	0.098 U	0.0016 U
1,2-Dichloroethane	0.02	3.1	0.00093 U	0.0011 U	0.098 U	0.0016 U
1,2-Dichloropropane	NS	NS	0.00093 U	0.0011 U	0.098 U	0.0016 U
1,3-Dichlorobenzene	2.4	49	0.00093 U	0.0011 U	0.098 U	0.0016 U
1,4-Dichlorobenzene	1.8	13	0.00093 U	0.0011 UJ	0.098 U	0.0016 U
2-Hexanone	NS	NS	0.0047 U	0.0054 U	0.49 U	0.0081 U
Acetone	0.05	100	0.0047 U	0.0054 UJ	0.49 U	0.0081 U
Benzene	0.06	4.8	0.00093 U	0.0011 U	0.098 U	0.0016 U
Bromochloromethane	NS	NS	0.00093 U	0.0011 U	0.098 U	0.0016 U
Bromodichloromethane	NS	NS	0.00093 U	0.0011 U	0.098 U	0.0016 U
Bromoform	NS	NS	0.00093 U	0.0011 U	0.098 UJ	0.0016 U
Bromomethane	NS	NS	0.00093 U	0.0011 U	0.098 U	0.0016 U
Carbon Disulfide	NS	NS	0.00093 U	0.0011 U	0.098 U	0.0016 U
Carbon Tetrachloride	0.76	2.4	0.00093 U	0.0011 U	0.098 U	0.0016 U
Chlorobenzene	1.1	100	0.00093 U	0.0011 UJ	0.098 U	0.0016 U
Chloroethane	NS	NS	0.00093 U	0.0011 U	0.098 UJ	0.0016 U
Chloroform	0.37	49	0.00093 U	0.0011 U	0.098 U	0.0016 U
Chloromethane	NS	NS	0.00093 U	0.0011 U	0.098 U	0.0016 U
Cis-1,2-Dichloroethylene	0.25	100	0.00028 JL	0.00064 J	0.098 U	0.0016 U
Cis-1,3-Dichloropropene	NS	NS	0.00093 U	0.0011 U	0.098 U	0.0016 U
Cyclohexane	NS	NS	0.00093 U	0.0011 U	5.8	0.0016 U
Dibromochloromethane	NS	NS	0.00093 U	0.0011 U	0.098 UJ	0.0016 U
Dichlorodifluoromethane	NS	NS	0.00093 U	0.0011 U	0.098 UJ	0.0016 U
Ethylbenzene	1	41	0.00093 U	0.0011 U	0.27	0.0016 U
Isopropylbenzene (Cumene)	NS	NS	0.00093 U	0.0011 U	0.48 J	0.0016 U
M,P-Xylenes	NS	NS	0.00093 U	0.0011 U	0.098 U	0.0016 U
Methyl Acetate	NS	NS	0.0047 UJ	0.0054 UJ	0.49 U	0.0081 UJ
Methyl Ethyl Ketone (2-Butanone)	0.12	100	0.0047 U	0.0054 U	0.49 U	0.0081 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	NS	NS	0.0047 U	0.0054 UJ	0.49 U	0.0081 U
Methylcyclohexane	NS	NS	0.00093 U	0.0011 U	22	0.0016 U
Methylene Chloride	0.05	100	0.00093 U	0.0011 U	0.098 U	0.0016 U
O-Xylene (1,2-Dimethylbenzene)	NS	NS	0.00093 U	0.0011 U	0.045 J	0.00021 J
Styrene	NS	NS	0.00093 U	0.0011 U	0.098 U	0.0016 U
Tert-Butyl Methyl Ether	0.93	100	0.00093 UJ	0.0011 UJ	0.098 U	0.0016 UJ
Tetrachloroethylene (PCE)	1.3	19	0.0051 JL	0.015	0.057 J	0.0016 U
Toluene	0.7	100	0.0041	0.0034	0.098 U	0.0016 U
Total Xylenes	0.26	100	0.00093 U	0.0011 U	0.045 J	0.00021 J
Trans-1,2-Dichloroethene	0.19	100	0.00093 U	0.0011 U	0.098 U	0.0016 U
Trans-1,3-Dichloropropene	NS	NS	0.00093 U	0.0011 U	0.098 U	0.0016 U
Trichloroethylene (TCE)	0.47	21	0.00018 J	0.00061 J	0.051 J	0.0016 U
Trichlorofluoromethane	NS	NS	0.00093 U	0.0011 U	0.098 UJ	0.0016 U
Vinyl Chloride	0.02	0.9	0.00093 U	0.0011 U	0.098 U	0.0016 U

Attached Table 2
Hope Street Project
134 Hope Street
Brooklyn, New York
Soil - Volatile Organic Compounds (VOCs)

AKRF Sample ID	NYSDEC UUSCO	NYSDEC RRSCO	RI-SB-04_2-4_20190211	RI-SB-05_0-2_20190211	RI-SB-05_7-9_20190211	RI-SB-06_0-2_20190212
Laboratory Sample ID			460-175116-8	460-175116-9	460-175116-10	460-175183-1
Date Sampled			2/11/2019	2/11/2019 1:50:00 PM	2/11/2019	2/12/2019
Unit			mg/kg	mg/kg	mg/kg	mg/kg
Compound/Dilution Factor			1	1	1	1
1,1,1-Trichloroethane	0.68	100	0.0013 U	0.0012 U	0.0011 U	0.001 U
1,1,2,2-Tetrachloroethane	NS	NS	0.0013 U	0.0012 U	0.0011 U	0.001 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	NS	NS	0.0013 U	0.0012 U	0.0011 U	0.001 U
1,1,2-Trichloroethane	NS	NS	0.0013 U	0.0012 U	0.0011 U	0.001 U
1,1-Dichloroethane	0.27	26	0.0013 U	0.0012 U	0.0011 U	0.001 U
1,1-Dichloroethene	0.33	100	0.0013 U	0.0012 U	0.0011 U	0.001 U
1,2,3-Trichlorobenzene	NS	NS	0.0013 U	0.0012 U	0.0011 U	0.001 U
1,2,4-Trichlorobenzene	NS	NS	0.0013 U	0.0012 U	0.0011 U	0.001 U
1,2-Dibromo-3-Chloropropane	NS	NS	0.0013 U	0.0012 U	0.0011 U	0.001 U
1,2-Dibromoethane (Ethylene Dibromide)	NS	NS	0.0013 U	0.0012 U	0.0011 U	0.001 U
1,2-Dichlorobenzene	1.1	100	0.0013 U	0.0012 U	0.0011 U	0.001 U
1,2-Dichloroethane	0.02	3.1	0.0013 U	0.0012 U	0.0011 U	0.001 U
1,2-Dichloropropane	NS	NS	0.0013 U	0.0012 U	0.0011 U	0.001 U
1,3-Dichlorobenzene	2.4	49	0.0013 U	0.0012 U	0.0011 U	0.001 U
1,4-Dichlorobenzene	1.8	13	0.0013 U	0.0012 U	0.0011 U	0.001 U
2-Hexanone	NS	NS	0.0065 U	0.0058 U	0.0055 U	0.0051 U
Acetone	0.05	100	0.0065 U	0.0058 U	0.0055 U	0.0051 U
Benzene	0.06	4.8	0.0013 U	0.0012 U	0.0011 U	0.001 U
Bromochloromethane	NS	NS	0.0013 U	0.0012 U	0.0011 U	0.001 U
Bromodichloromethane	NS	NS	0.0013 U	0.0012 U	0.0011 U	0.001 U
Bromoform	NS	NS	0.0013 U	0.0012 U	0.0011 U	0.001 U
Bromomethane	NS	NS	0.0013 U	0.0012 U	0.0011 U	0.001 U
Carbon Disulfide	NS	NS	0.0013 U	0.0012 U	0.0011 U	0.001 U
Carbon Tetrachloride	0.76	2.4	0.0013 U	0.0012 U	0.0011 U	0.001 U
Chlorobenzene	1.1	100	0.0013 U	0.0012 U	0.0011 U	0.001 U
Chloroethane	NS	NS	0.0013 U	0.0012 U	0.0011 U	0.001 U
Chloroform	0.37	49	0.0013 U	0.0012 U	0.0011 U	0.001 U
Chloromethane	NS	NS	0.0013 U	0.0012 U	0.0011 U	0.001 U
Cis-1,2-Dichloroethylene	0.25	100	0.0013 U	0.0012 U	0.0011 U	0.001 U
Cis-1,3-Dichloropropene	NS	NS	0.0013 U	0.0012 U	0.0011 U	0.001 U
Cyclohexane	NS	NS	0.0013 U	0.0012 U	0.0011 U	0.001 U
Dibromochloromethane	NS	NS	0.0013 U	0.0012 U	0.0011 U	0.001 U
Dichlorodifluoromethane	NS	NS	0.0013 U	0.0012 U	0.0011 U	0.001 U
Ethylbenzene	1	41	0.0013 U	0.0012 U	0.0011 U	0.001 U
Isopropylbenzene (Cumene)	NS	NS	0.0013 U	0.0012 U	0.0011 U	0.001 U
M,P-Xylenes	NS	NS	0.0013 U	0.0012 U	0.0011 U	0.001 U
Methyl Acetate	NS	NS	0.0065 UJ	0.0058 UJ	0.0055 UJ	0.0051 U
Methyl Ethyl Ketone (2-Butanone)	0.12	100	0.0065 U	0.0058 U	0.0055 U	0.0051 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	NS	NS	0.0065 U	0.0058 U	0.0055 U	0.0051 U
Methylcyclohexane	NS	NS	0.0013 U	0.0012 U	0.0011 U	0.001 U
Methylene Chloride	0.05	100	0.0013 U	0.0012 U	0.0011 U	0.001 U
O-Xylene (1,2-Dimethylbenzene)	NS	NS	0.0013 U	0.0012 U	0.0011 U	0.001 U
Styrene	NS	NS	0.0013 U	0.0012 U	0.0011 U	0.001 U
Tert-Butyl Methyl Ether	0.93	100	0.0013 UJ	0.0012 UJ	0.0011 UJ	0.001 U
Tetrachloroethylene (PCE)	1.3	19	0.0026	0.00048 J	0.0011	0.017
Toluene	0.7	100	0.0013 U	0.0012 U	0.0011 U	0.001 U
Total Xylenes	0.26	100	0.0013 U	0.0012 U	0.0011 U	0.001 U
Trans-1,2-Dichloroethene	0.19	100	0.0013 U	0.0012 U	0.0011 U	0.001 U
Trans-1,3-Dichloropropene	NS	NS	0.0013 U	0.0012 U	0.0011 U	0.001 U
Trichloroethylene (TCE)	0.47	21	0.0013 U	0.0012 U	0.0011 U	0.001 U
Trichlorofluoromethane	NS	NS	0.0013 U	0.0012 U	0.0011 U	0.001 U
Vinyl Chloride	0.02	0.9	0.0013 U	0.0012 U	0.0011 U	0.001 U

Attached Table 2
Hope Street Project
134 Hope Street
Brooklyn, New York
Soil - Volatile Organic Compounds (VOCs)

AKRF Sample ID	NYSDEC UUSCO	NYSDEC RRSCO	RI-SB-06_6-8_20190212	RI-SB-07_0-2_20190212	RI-SB-07_2-4_20190212	RI-SB-08_6-8_20190211
Laboratory Sample ID			460-175183-2	460-175183-3	460-175183-4	460-175116-11
Date Sampled			2/12/2019	2/12/2019	2/12/2019	2/11/2019
Unit			mg/kg	mg/kg	mg/kg	mg/kg
Compound/Dilution Factor			1	1	1	50
1,1,1-Trichloroethane	0.68	100	0.0012 U	0.0012 U	0.0011 U	0.099 U
1,1,2,2-Tetrachloroethane	NS	NS	0.0012 U	0.0012 U	0.0011 U	0.099 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	NS	NS	0.0012 U	0.0012 U	0.0011 U	0.099 U
1,1,2-Trichloroethane	NS	NS	0.0012 U	0.0012 U	0.0011 U	0.099 U
1,1-Dichloroethane	0.27	26	0.0012 U	0.0012 U	0.0011 U	0.099 U
1,1-Dichloroethene	0.33	100	0.0012 U	0.0012 U	0.0011 U	0.099 U
1,2,3-Trichlorobenzene	NS	NS	0.0012 U	0.0012 U	0.0011 U	0.099 U
1,2,4-Trichlorobenzene	NS	NS	0.0012 U	0.0012 U	0.0011 U	0.099 U
1,2-Dibromo-3-Chloropropane	NS	NS	0.0012 U	0.0012 U	0.0011 U	0.099 U
1,2-Dibromoethane (Ethylene Dibromide)	NS	NS	0.0012 U	0.0012 U	0.0011 U	0.099 U
1,2-Dichlorobenzene	1.1	100	0.0012 U	0.0012 U	0.0011 U	0.099 U
1,2-Dichloroethane	0.02	3.1	0.0012 U	0.0012 U	0.0011 U	0.099 U
1,2-Dichloropropane	NS	NS	0.0012 U	0.0012 U	0.0011 U	0.099 U
1,3-Dichlorobenzene	2.4	49	0.0012 U	0.0012 U	0.0011 U	0.099 U
1,4-Dichlorobenzene	1.8	13	0.0012 U	0.0012 U	0.0011 U	0.099 U
2-Hexanone	NS	NS	0.0058 UJ	0.0059 UJ	0.0054 UJ	0.49 U
Acetone	0.05	100	0.0058 U	0.0059 U	0.0054 U	0.49 U
Benzene	0.06	4.8	0.0012 U	0.0012 U	0.0011 U	0.099 U
Bromochloromethane	NS	NS	0.0012 U	0.0012 U	0.0011 U	0.099 U
Bromodichloromethane	NS	NS	0.0012 U	0.0012 U	0.0011 U	0.099 U
Bromoform	NS	NS	0.0012 U	0.0012 U	0.0011 U	0.099 U
Bromomethane	NS	NS	0.0012 U	0.0012 U	0.0011 U	0.099 U
Carbon Disulfide	NS	NS	0.0012 U	0.0012 U	0.0011 U	0.099 U
Carbon Tetrachloride	0.76	2.4	0.0012 U	0.0012 U	0.0011 U	0.099 U
Chlorobenzene	1.1	100	0.0012 U	0.0012 U	0.0011 U	0.099 U
Chloroethane	NS	NS	0.0012 U	0.0012 U	0.0011 U	0.099 U
Chloroform	0.37	49	0.0012 U	0.0012 U	0.0011 U	0.099 U
Chloromethane	NS	NS	0.0012 U	0.0012 U	0.0011 U	0.099 U
Cis-1,2-Dichloroethylene	0.25	100	0.0012 U	0.0012 U	0.0011 U	0.19
Cis-1,3-Dichloropropene	NS	NS	0.0012 U	0.0012 U	0.0011 U	0.099 U
Cyclohexane	NS	NS	0.0012 U	0.0012 U	0.0011 U	7
Dibromochloromethane	NS	NS	0.0012 U	0.0012 U	0.0011 U	0.099 U
Dichlorodifluoromethane	NS	NS	0.0012 U	0.0012 U	0.0011 U	0.099 UJ
Ethylbenzene	1	41	0.0012 U	0.0012 U	0.0011 U	0.038 J
Isopropylbenzene (Cumene)	NS	NS	0.0012 U	0.0012 U	0.0011 U	0.78
M,P-Xylenes	NS	NS	0.0012 U	0.00031 J	0.0011 U	0.037 J
Methyl Acetate	NS	NS	0.0058 U	0.0059 U	0.0054 U	0.49 U
Methyl Ethyl Ketone (2-Butanone)	0.12	100	0.0058 U	0.0059 U	0.0054 U	0.49 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	NS	NS	0.0058 U	0.0059 U	0.0054 U	0.49 U
Methylcyclohexane	NS	NS	0.0012 U	0.0012 U	0.0011 U	37
Methylene Chloride	0.05	100	0.0031	0.002	0.00018 J	0.099 U
O-Xylene (1,2-Dimethylbenzene)	NS	NS	0.0012 U	0.0012 U	0.0011 U	0.099 U
Styrene	NS	NS	0.0012 U	0.0012 U	0.0011 U	0.099 U
Tert-Butyl Methyl Ether	0.93	100	0.0012 U	0.0012 U	0.0011 U	0.099 U
Tetrachloroethylene (PCE)	1.3	19	0.015	0.0012 U	0.00032 J	0.41
Toluene	0.7	100	0.0012 U	0.0012 U	0.0011 U	0.099 U
Total Xylenes	0.26	100	0.0012 U	0.00031 J	0.0011 U	0.037 J
Trans-1,2-Dichloroethene	0.19	100	0.0012 U	0.0012 U	0.0011 U	0.099 U
Trans-1,3-Dichloropropene	NS	NS	0.0012 U	0.0012 U	0.0011 U	0.099 U
Trichloroethylene (TCE)	0.47	21	0.0012 U	0.0012 U	0.0011 U	0.099 U
Trichlorofluoromethane	NS	NS	0.0012 U	0.0012 U	0.0011 U	0.099 U
Vinyl Chloride	0.02	0.9	0.0012 U	0.0012 U	0.0011 U	0.099 U

Attached Table 2
Hope Street Project
134 Hope Street
Brooklyn, New York
Soil - Volatile Organic Compounds (VOCs)

AKRF Sample ID	NYSDEC UUSCO	NYSDEC RRSCO	RI-SB-09_7-9_20190211	RI-SB-10_9-11_20190211	RI-SB-11_0-2_20190211	RI-SB-11_10-12_20190211
Laboratory Sample ID			460-175116-12	460-175116-13	460-175116-14	460-175116-15
Date Sampled			2/11/2019	2/11/2019	2/11/2019	2/11/2019
Unit			mg/kg	mg/kg	mg/kg	mg/kg
Compound/Dilution Factor			200	50	1	1
1,1,1-Trichloroethane	0.68	100	0.38 U	0.11 U	0.00098 UJ	0.00086 U
1,1,2,2-Tetrachloroethane	NS	NS	0.38 U	0.11 U	0.00098 U	0.00086 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	NS	NS	0.38 U	0.11 U	0.00098 U	0.00086 U
1,1,2-Trichloroethane	NS	NS	0.38 U	0.11 U	0.00098 U	0.00086 U
1,1-Dichloroethane	0.27	26	0.38 U	0.11 U	0.00098 U	0.00086 U
1,1-Dichloroethene	0.33	100	0.38 U	0.11 U	0.00098 U	0.00086 U
1,2,3-Trichlorobenzene	NS	NS	0.38 U	0.11 U	0.00098 U	0.00086 U
1,2,4-Trichlorobenzene	NS	NS	0.38 U	0.11 U	0.00098 U	0.00086 U
1,2-Dibromo-3-Chloropropane	NS	NS	0.38 U	0.11 U	0.00098 U	0.00086 U
1,2-Dibromoethane (Ethylene Dibromide)	NS	NS	0.38 U	0.11 U	0.00098 U	0.00086 U
1,2-Dichlorobenzene	1.1	100	0.38 U	0.11 U	0.00098 UJ	0.00086 U
1,2-Dichloroethane	0.02	3.1	0.38 U	0.11 U	0.00098 U	0.00086 U
1,2-Dichloropropane	NS	NS	0.38 U	0.11 U	0.00098 U	0.00086 U
1,3-Dichlorobenzene	2.4	49	0.38 U	0.11 U	0.00098 U	0.00086 U
1,4-Dichlorobenzene	1.8	13	0.38 U	0.11 U	0.00098 UJ	0.00086 U
2-Hexanone	NS	NS	1.9 U	0.54 U	0.0049 U	0.0043 U
Acetone	0.05	100	1.9 U	0.54 U	0.0044 J	0.0043 U
Benzene	0.06	4.8	**0.7**	0.11 U	0.00098 U	0.00086 U
Bromochloromethane	NS	NS	0.38 U	0.11 U	0.00098 U	0.00086 U
Bromodichloromethane	NS	NS	0.38 U	0.11 U	0.00098 U	0.00086 U
Bromoform	NS	NS	0.38 U	0.11 U	0.00098 U	0.00086 U
Bromomethane	NS	NS	0.38 U	0.11 U	0.00098 U	0.00086 U
Carbon Disulfide	NS	NS	0.38 U	0.11 U	0.00098 U	0.00086 U
Carbon Tetrachloride	0.76	2.4	0.38 U	0.11 U	0.00098 U	0.00086 U
Chlorobenzene	1.1	100	0.38 U	0.11 U	0.00098 UJ	0.00086 U
Chloroethane	NS	NS	0.38 U	0.11 U	0.00098 U	0.00086 U
Chloroform	0.37	49	0.38 U	0.11 U	0.00098 U	0.00086 U
Chloromethane	NS	NS	0.38 U	0.11 U	0.00098 U	0.00086 U
Cis-1,2-Dichloroethylene	0.25	100	0.38 U	0.11 U	0.00098 U	0.00086 U
Cis-1,3-Dichloropropene	NS	NS	0.38 U	0.11 U	0.00098 U	0.00086 U
Cyclohexane	NS	NS	31	2	0.00098 U	0.00086 U
Dibromochloromethane	NS	NS	0.38 U	0.11 U	0.00098 U	0.00086 U
Dichlorodifluoromethane	NS	NS	0.38 U	0.11 UJ	0.00098 U	0.00086 U
Ethylbenzene	1	41	**9.4**	0.11 U	0.00098 U	0.00086 U
Isopropylbenzene (Cumene)	NS	NS	3.2	0.47	0.00098 U	0.00086 U
M,P-Xylenes	NS	NS	42	0.052 J	0.00098 U	0.00086 U
Methyl Acetate	NS	NS	1.9 U	0.54 U	0.0049 UJ	0.0043 UJ
Methyl Ethyl Ketone (2-Butanone)	0.12	100	1.9 U	0.54 U	0.0049 U	0.0043 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	NS	NS	1.9 U	0.54 U	0.0049 UJ	0.0043 U
Methylcyclohexane	NS	NS	120	15	0.00098 U	0.00086 U
Methylene Chloride	0.05	100	0.38 U	0.11 U	0.00098 U	0.00086 U
O-Xylene (1,2-Dimethylbenzene)	NS	NS	18	0.11 U	0.00011 J	0.00086 U
Styrene	NS	NS	0.38 U	0.11 U	0.00098 U	0.00086 U
Tert-Butyl Methyl Ether	0.93	100	0.38 U	0.11 U	0.00098 UJ	0.00086 UJ
Tetrachloroethylene (PCE)	1.3	19	0.38 U	0.11 U	0.00098 U	0.00086 U
Toluene	0.7	100	**0.77**	0.11 U	0.00098 U	0.00086 U
Total Xylenes	0.26	100	**60**	0.052 J	0.00011 J	0.00086 U
Trans-1,2-Dichloroethene	0.19	100	0.38 U	0.11 U	0.00098 U	0.00086 U
Trans-1,3-Dichloropropene	NS	NS	0.38 U	0.11 U	0.00098 U	0.00086 U
Trichloroethylene (TCE)	0.47	21	0.38 U	0.11 U	0.00098 U	0.00086 U
Trichlorofluoromethane	NS	NS	0.38 U	0.11 U	0.00098 U	0.00086 U
Vinyl Chloride	0.02	0.9	0.38 U	0.11 U	0.00098 U	0.00086 U

Attached Table 2
Hope Street Project
134 Hope Street
Brooklyn, New York
Soil - Volatile Organic Compounds (VOCs)

AKRF Sample ID	NYSDEC UUSCO	NYSDEC RRSCO	RI-SB-12_5-7_20190212	RI-SB-13_6-8_20190212	RI-SB-14_5-7_20190212	RI-SB-X02_5-7_20190212
Laboratory Sample ID			460-175183-5	460-175183-6	460-175183-7	460-175183-8
Date Sampled			2/12/2019	2/12/2019	2/12/2019	2/12/2019
Unit			mg/kg	mg/kg	mg/kg	mg/kg
Compound/Dilution Factor			1	1	1	1
1,1,1-Trichloroethane	0.68	100	0.00091 U	0.0011 U	0.0016 U	0.0028 U
1,1,2,2-Tetrachloroethane	NS	NS	0.00091 U	0.0011 U	0.0016 U	0.0028 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	NS	NS	0.00091 U	0.0011 U	0.0016 U	0.0028 U
1,1,2-Trichloroethane	NS	NS	0.00091 U	0.0011 U	0.0016 U	0.0028 U
1,1-Dichloroethane	0.27	26	0.00091 U	0.0011 U	0.0016 U	0.0028 U
1,1-Dichloroethene	0.33	100	0.00091 U	0.0011 U	0.0016 U	0.0028 U
1,2,3-Trichlorobenzene	NS	NS	0.00091 U	0.0011 U	0.0016 UJ	0.0028 U
1,2,4-Trichlorobenzene	NS	NS	0.00091 U	0.0011 U	0.0016 UJ	0.0028 U
1,2-Dibromo-3-Chloropropane	NS	NS	0.00091 U	0.0011 U	0.0016 UJ	0.0028 U
1,2-Dibromoethane (Ethylene Dibromide)	NS	NS	0.00091 U	0.0011 U	0.0016 UJ	0.0028 U
1,2-Dichlorobenzene	1.1	100	0.00091 U	0.0011 U	0.0016 UJ	0.0028 U
1,2-Dichloroethane	0.02	3.1	0.00091 U	0.0011 U	0.0016 U	0.0028 U
1,2-Dichloropropane	NS	NS	0.00091 U	0.0011 U	0.0016 U	0.0028 U
1,3-Dichlorobenzene	2.4	49	0.00091 U	0.0011 U	0.0016 UJ	0.0028 U
1,4-Dichlorobenzene	1.8	13	0.00091 U	0.0011 U	0.0016 UJ	0.0028 U
2-Hexanone	NS	NS	0.0046 UJ	0.0054 UJ	0.0082 UJ	0.014 UJ
Acetone	0.05	100	0.0054 U	0.0054 U	0.0082 U	0.014 U
Benzene	0.06	4.8	0.00091 U	0.0011 U	0.0016 U	0.0028 U
Bromochloromethane	NS	NS	0.00091 U	0.0011 U	0.0016 U	0.0028 U
Bromodichloromethane	NS	NS	0.00091 U	0.0011 U	0.0016 U	0.0028 U
Bromoform	NS	NS	0.00091 U	0.0011 U	0.0016 U	0.0028 U
Bromomethane	NS	NS	0.00091 U	0.0011 U	0.0016 U	0.0028 U
Carbon Disulfide	NS	NS	0.00091 U	0.0011 U	0.0016 U	0.0028 U
Carbon Tetrachloride	0.76	2.4	0.00091 U	0.0011 U	0.0016 U	0.0028 U
Chlorobenzene	1.1	100	0.00091 U	0.0011 U	0.0016 UJ	0.0028 U
Chloroethane	NS	NS	0.00091 U	0.0011 U	0.0016 U	0.0028 U
Chloroform	0.37	49	0.00091 U	0.0011 U	0.0016 U	0.0028 U
Chloromethane	NS	NS	0.00091 U	0.0011 U	0.0016 U	0.0028 U
Cis-1,2-Dichloroethylene	0.25	100	0.00091 U	0.0011 U	0.0016 U	0.0028 U
Cis-1,3-Dichloropropene	NS	NS	0.00091 U	0.0011 U	0.0016 U	0.0028 U
Cyclohexane	NS	NS	0.00091 U	0.0011 U	0.0016 U	0.0028 U
Dibromochloromethane	NS	NS	0.00091 U	0.0011 U	0.0016 U	0.0028 U
Dichlorodifluoromethane	NS	NS	0.00091 U	0.0011 U	0.0016 UJ	0.0028 U
Ethylbenzene	1	41	0.00091 U	0.0011 U	0.0016 U	0.0028 U
Isopropylbenzene (Cumene)	NS	NS	0.00091 U	0.0011 U	0.0016 U	0.0028 U
M,P-Xylenes	NS	NS	0.00091 U	0.0011 U	0.0016 U	0.0028 U
Methyl Acetate	NS	NS	0.0046 U	0.0054 U	0.0082 U	0.014 U
Methyl Ethyl Ketone (2-Butanone)	0.12	100	0.0046 U	0.0054 U	0.0082 U	0.014 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	NS	NS	0.0046 U	0.0054 U	0.0082 U	0.014 U
Methylcyclohexane	NS	NS	0.00091 U	0.0011 U	0.0016 U	0.0028 U
Methylene Chloride	0.05	100	0.00046 J	0.00091 J	0.0027	0.0028 U
O-Xylene (1,2-Dimethylbenzene)	NS	NS	0.00091 U	0.0011 U	0.0016 U	0.0028 U
Styrene	NS	NS	0.00091 U	0.0011 U	0.0016 UJ	0.0028 U
Tert-Butyl Methyl Ether	0.93	100	0.00091 U	0.0011 U	0.0016 U	0.0028 U
Tetrachloroethylene (PCE)	1.3	19	0.0034	0.0038	0.0073 JL	0.018
Toluene	0.7	100	0.00091 U	0.0011 U	0.0016 U	0.0028 U
Total Xylenes	0.26	100	0.00091 U	0.0011 U	0.0016 U	0.0028 U
Trans-1,2-Dichloroethene	0.19	100	0.00091 U	0.0011 U	0.0016 U	0.0028 U
Trans-1,3-Dichloropropene	NS	NS	0.00091 U	0.0011 U	0.0016 UJ	0.0028 U
Trichloroethylene (TCE)	0.47	21	0.00091 U	0.0011 U	0.0016 U	0.0028 U
Trichlorofluoromethane	NS	NS	0.00091 U	0.0011 U	0.0016 U	0.0028 U
Vinyl Chloride	0.02	0.9	0.00091 U	0.0011 U	0.0016 U	0.0028 U

Attached Table 2
Hope Street Project
134 Hope Street
Brooklyn, New York
Soil - Volatile Organic Compounds (VOCs)

AKRF Sample ID	NYSDEC UUSCO	NYSDEC RRSCO	RI-FB-S-01_20190211	RI-FB-S-02_20190213	RI-TB-S-01_20190211	RI-TB-S-02_20190213
Laboratory Sample ID			460-175116-18	460-175183-10	460-175116-17	460-175183-9
Date Sampled			2/11/2019	2/13/2019	2/11/2019	2/8/2019
Unit			ug/L	ug/L	ug/L	ug/L
Compound/Dilution Factor			1	1	1	1
1,1,1-Trichloroethane	0.68	100	1 U	1 U	1 U	1 U
1,1,2,2-Tetrachloroethane	NS	NS	1 U	1 U	1 U	1 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	NS	NS	1 U	1 U	1 U	1 U
1,1,2-Trichloroethane	NS	NS	1 U	1 U	1 U	1 U
1,1-Dichloroethane	0.27	26	1 U	1 U	1 U	1 U
1,1-Dichloroethene	0.33	100	1 U	1 U	1 U	1 U
1,2,3-Trichlorobenzene	NS	NS	1 U	1 U	1 U	1 U
1,2,4-Trichlorobenzene	NS	NS	1 U	1 U	1 U	1 U
1,2-Dibromo-3-Chloropropane	NS	NS	1 U	1 U	1 U	1 U
1,2-Dibromoethane (Ethylene Dibromide)	NS	NS	1 U	1 U	1 U	1 U
1,2-Dichlorobenzene	1.1	100	1 U	1 U	1 U	1 U
1,2-Dichloroethane	0.02	3.1	1 U	1 U	1 U	1 U
1,2-Dichloropropane	NS	NS	1 U	1 U	1 U	1 U
1,3-Dichlorobenzene	2.4	49	1 U	1 U	1 U	1 U
1,4-Dichlorobenzene	1.8	13	1 U	1 U	1 U	1 U
2-Hexanone	NS	NS	5 U	5 U	5 U	5 U
Acetone	0.05	100	5 U	**5.5**	5 U	5 U
Benzene	0.06	4.8	1 U	1 U	1 U	1 U
Bromochloromethane	NS	NS	1 U	1 U	1 U	1 U
Bromodichloromethane	NS	NS	1 U	1 U	1 U	1 U
Bromoform	NS	NS	1 U	1 U	1 U	1 U
Bromomethane	NS	NS	1 U	1 U	1 U	1 U
Carbon Disulfide	NS	NS	1 U	1 U	1 U	1 U
Carbon Tetrachloride	0.76	2.4	1 U	1 U	1 U	1 U
Chlorobenzene	1.1	100	1 U	1 U	1 U	1 U
Chloroethane	NS	NS	1 U	1 U	1 U	1 U
Chloroform	0.37	49	1 U	1 U	1 U	1 U
Chloromethane	NS	NS	1 U	1 U	1 U	1 U
Cis-1,2-Dichloroethylene	0.25	100	1 U	1 U	1 U	1 U
Cis-1,3-Dichloropropene	NS	NS	1 U	1 U	1 U	1 U
Cyclohexane	NS	NS	1 U	1 U	1 U	1 U
Dibromochloromethane	NS	NS	1 U	1 U	1 U	1 U
Dichlorodifluoromethane	NS	NS	1 U	1 UJ	1 U	1 UJ
Ethylbenzene	1	41	1 U	1 U	1 U	1 U
Isopropylbenzene (Cumene)	NS	NS	1 U	1 U	1 U	1 U
M,P-Xylenes	NS	NS	0.41 J	1 U	1 U	1 U
Methyl Acetate	NS	NS	5 U	5 U	5 U	5 U
Methyl Ethyl Ketone (2-Butanone)	0.12	100	5 U	5 U	5 U	5 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	NS	NS	5 U	5 U	5 U	5 U
Methylcyclohexane	NS	NS	1 U	1 U	1 U	1 U
Methylene Chloride	0.05	100	**0.46 J**	1 U	**1 U**	1 U
O-Xylene (1,2-Dimethylbenzene)	NS	NS	1 U	1 U	1 U	1 U
Styrene	NS	NS	1 U	1 U	1 U	1 U
Tert-Butyl Methyl Ether	0.93	100	1 U	1 U	1 U	1 U
Tetrachloroethylene (PCE)	1.3	19	1 U	1 U	1 U	1 U
Toluene	0.7	100	1 U	1 U	1 U	1 U
Total Xylenes	0.26	100	**0.41 J**	1 U	1 U	1 U
Trans-1,2-Dichloroethene	0.19	100	1 U	1 U	1 U	1 U
Trans-1,3-Dichloropropene	NS	NS	1 U	1 U	1 U	1 U
Trichloroethylene (TCE)	0.47	21	1 U	1 U	1 U	1 U
Trichlorofluoromethane	NS	NS	1 U	1 UJ	1 U	1 UJ
Vinyl Chloride	0.02	0.9	1 U	1 U	1 U	1 U

Attached Table 3
Hope Street Project
134 Hope Street
Brooklyn, New York
Soil - Semivolatile Organic Compounds (SVOCs)

AKRF Sample ID	NYSDEC UUSCO	NYSDEC RRSCO	RI-SB-03_0-2_20190211	RI-SB-X01_0-2_20190211	RI-SB-03_7-9_20190211
Laboratory Sample ID			460-175116-5	460-175116-16	460-175116-6
Date Sampled			2/11/2019	2/11/2019	2/11/2019
Unit			mg/kg	mg/kg	mg/kg
Compound/Dilution Factor			10	1	1
1,4-Dioxane (P-Dioxane)	0.1	13	0.022 U	4.9 U	0.033 U
1,2,4,5-Tetrachlorobenzene	NS	NS	3.6 U	0.38 U	0.38 U
2,3,4,6-Tetrachlorophenol	NS	NS	3.6 U	0.38 U	0.38 U
2,4,5-Trichlorophenol	NS	NS	3.6 U	0.38 U	0.38 U
2,4,6-Trichlorophenol	NS	NS	1.4 U	0.15 U	0.15 U
2,4-Dichlorophenol	NS	NS	1.4 U	0.15 U	0.15 U
2,4-Dimethylphenol	NS	NS	3.6 U	0.38 U	0.38 U
2,4-Dinitrophenol	NS	NS	2.9 U	0.3 U	0.31 UJ
2,4-Dinitrotoluene	NS	NS	0.73 U	0.076 U	0.077 U
2,6-Dinitrotoluene	NS	NS	0.73 U	0.076 U	0.077 UJ
2-Chloronaphthalene	NS	NS	3.6 U	0.38 U	0.38 U
2-Chlorophenol	NS	NS	3.6 U	0.38 U	0.38 U
2-Methylnaphthalene	NS	NS	2 J	0.062 JL	0.5
2-Methylphenol (O-Cresol)	0.33	100	3.6 U	0.38 U	0.38 U
2-Nitroaniline	NS	NS	3.6 U	0.38 U	0.38 U
2-Nitrophenol	NS	NS	3.6 U	0.38 U	0.38 UJ
3,3'-Dichlorobenzidine	NS	NS	1.4 U	0.15 U	0.15 U
3-Nitroaniline	NS	NS	3.6 U	0.38 U	0.38 U
4,6-Dinitro-2-Methylphenol	NS	NS	2.9 U	0.3 U	0.31 UJ
4-Bromophenyl Phenyl Ether	NS	NS	3.6 U	0.38 U	0.38 U
4-Chloro-3-Methylphenol	NS	NS	3.6 U	0.38 U	0.38 U
4-Chloroaniline	NS	NS	3.6 U	0.38 U	0.38 U
4-Chlorophenyl Phenyl Ether	NS	NS	3.6 U	0.38 U	0.38 U
4-Methylphenol (P-Cresol)	0.33	100	0.15 J	0.025 JL	0.38 U
4-Nitroaniline	NS	NS	3.6 U	0.38 U	0.38 U
4-Nitrophenol	NS	NS	7.3 U	0.76 U	0.77 U
Acenaphthene	20	100	4	0.14 JL	0.38 U
Acenaphthylene	100	100	0.38 J	0.043 JL	0.38 U
Acetophenone	NS	NS	3.6 U	0.38 U	0.38 U
Anthracene	100	100	4.7	0.33 JL	0.38 U
Atrazine	NS	NS	1.4 U	0.15 U	0.15 U
Benzaldehyde	NS	NS	3.6 U	0.38 U	0.38 U
Benzo(a)Anthracene	1	1	12	0.9 JL	0.038 U
Benzo(a)Pyrene	1	1	12	0.88 JL	0.012 J
Benzo(b)Fluoranthene	1	1	18	1.2 JL	0.018 J
Benzo(g,h,i)Perylene	100	100	7.2	0.64 JL	0.38 U
Benzo(k)Fluoranthene	0.8	3.9	5.4	0.38 JL	0.0079 J
Benzyl Butyl Phthalate	NS	NS	3.6 U	0.38 U	0.38 U
Biphenyl (Diphenyl)	NS	NS	0.51 J	0.38 U	0.047 J
Bis(2-Chloroethoxy) Methane	NS	NS	3.6 U	0.38 U	0.38 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	NS	NS	0.36 U	0.038 U	0.038 U
Bis(2-Chloroisopropyl) Ether	NS	NS	3.6 U	0.38 U	0.38 U
Bis(2-Ethylhexyl) Phthalate	NS	NS	3.6 U	0.042 J	0.38 U
Caprolactam	NS	NS	3.6 U	0.38 U	0.38 U
Carbazole	NS	NS	4.2	0.16 JL	0.38 UJ
Chrysene	1	3.9	13	0.89 JL	0.033 J
Dibenz(a,h)Anthracene	0.33	0.33	1.8	0.17 JL	0.038 U
Dibenzofuran	7	59	3.9	0.11 JL	0.38 U
Diethyl Phthalate	NS	NS	3.6 U	0.38 U	0.38 U
Dimethyl Phthalate	NS	NS	3.6 U	0.38 U	0.38 U
Di-N-Butyl Phthalate	NS	NS	3.6 U	0.38 U	0.38 U
Di-N-Octylphthalate	NS	NS	3.6 U	0.38 U	0.38 U
Fluoranthene	100	100	36	1.9 JL	0.045 J
Fluorene	30	100	3.7	0.13 JL	0.042 J
Hexachlorobenzene	0.33	1.2	0.36 U	0.038 U	0.038 U
Hexachlorobutadiene	NS	NS	0.73 U	0.076 U	0.077 U
Hexachlorocyclopentadiene	NS	NS	3.6 UJ	0.38 U	0.38 UJ
Hexachloroethane	NS	NS	0.36 U	0.038 U	0.038 U
Indeno(1,2,3-c,d)Pyrene	0.5	0.5	9.5	0.65 JL	0.038 U
Isophorone	NS	NS	1.4 U	0.15 U	0.15 U
Naphthalene	12	100	5.8	0.13 JL	0.2 J
Nitrobenzene	NS	NS	0.36 U	0.038 U	0.038 U
N-Nitrosodi-N-Propylamine	NS	NS	0.36 UJ	0.038 U	0.038 U
N-Nitrosodiphenylamine	NS	NS	3.6 U	0.38 U	0.38 U
Pentachlorophenol	0.8	6.7	2.9 U	0.3 U	0.31 U
Phenanthrene	100	100	41	1.6 JL	0.078 J
Phenol	0.33	100	3.6 U	0.38 U	0.38 U
Pyrene	100	100	28	2 JL	0.051 J
Total SVOCs	NS	NS	213 J	12.4 JL	1.03 J

Attached Table 3
Hope Street Project
134 Hope Street
Brooklyn, New York
Soil - Semivolatile Organic Compounds (SVOCs)

AKRF Sample ID	NYSDEC UUSCO	NYSDEC RRSCO	RI-SB-05_0-2_20190211	RI-SB-05_7-9_20190211	RI-SB-06_0-2_20190212
Laboratory Sample ID			460-175116-9	460-175116-10	460-175183-1
Date Sampled			2/11/2019	2/11/2019	2/12/2019
Unit			mg/kg	mg/kg	mg/kg
Compound/Dilution Factor			5	1	1
1,4-Dioxane (P-Dioxane)	0.1	13	0.023 U	0.023 U	0.022 U
1,2,4,5-Tetrachlorobenzene	NS	NS	2 U	0.39 U	0.37 U
2,3,4,6-Tetrachlorophenol	NS	NS	2 U	0.39 U	0.37 U
2,4,5-Trichlorophenol	NS	NS	2 U	0.39 U	0.37 U
2,4,6-Trichlorophenol	NS	NS	0.8 U	0.16 U	0.15 U
2,4-Dichlorophenol	NS	NS	0.8 U	0.16 U	0.15 U
2,4-Dimethylphenol	NS	NS	2 U	0.39 U	0.37 U
2,4-Dinitrophenol	NS	NS	1.6 U	0.32 U	0.3 U
2,4-Dinitrotoluene	NS	NS	0.4 U	0.08 U	0.075 U
2,6-Dinitrotoluene	NS	NS	0.4 U	0.08 U	0.075 U
2-Chloronaphthalene	NS	NS	2 U	0.39 U	0.37 U
2-Chlorophenol	NS	NS	2 U	0.39 U	0.37 U
2-Methylnaphthalene	NS	NS	0.9 J	0.39 U	0.37 U
2-Methylphenol (O-Cresol)	0.33	100	2 U	0.39 U	0.37 U
2-Nitroaniline	NS	NS	2 U	0.39 U	0.37 U
2-Nitrophenol	NS	NS	2 U	0.39 U	0.37 U
3,3'-Dichlorobenzidine	NS	NS	0.8 U	0.16 U	0.15 U
3-Nitroaniline	NS	NS	2 U	0.39 U	0.37 R
4,6-Dinitro-2-Methylphenol	NS	NS	1.6 U	0.32 U	0.3 U
4-Bromophenyl Phenyl Ether	NS	NS	2 U	0.39 U	0.37 U
4-Chloro-3-Methylphenol	NS	NS	2 U	0.39 U	0.37 U
4-Chloroaniline	NS	NS	2 U	0.39 U	0.37 UJ
4-Chlorophenyl Phenyl Ether	NS	NS	2 U	0.39 U	0.37 U
4-Methylphenol (P-Cresol)	0.33	100	2 U	0.39 U	0.02 J
4-Nitroaniline	NS	NS	2 U	0.39 U	0.37 U
4-Nitrophenol	NS	NS	4 U	0.8 U	0.75 U
Acenaphthene	20	100	2.1	0.39 U	0.37 U
Acenaphthylene	100	100	0.32 J	0.39 U	0.37 U
Acetophenone	NS	NS	2 U	0.39 U	0.37 U
Anthracene	100	100	3.5	0.39 U	0.37 U
Atrazine	NS	NS	0.8 U	0.16 U	0.15 UJ
Benzaldehyde	NS	NS	2 U	0.39 U	0.37 U
Benzo(a)Anthracene	1	1	**4.9**	0.039 U	0.037 U
Benzo(a)Pyrene	1	1	**3.5**	0.039 U	0.037 U
Benzo(b)Fluoranthene	1	1	**5**	0.039 U	0.037 U
Benzo(g,h,i)Perylene	100	100	1.6 J	0.39 U	0.37 U
Benzo(k)Fluoranthene	0.8	3.9	**1.7**	0.039 U	0.037 U
Benzyl Butyl Phthalate	NS	NS	2 U	0.39 U	0.37 U
Biphenyl (Diphenyl)	NS	NS	0.2 J	0.39 U	0.37 U
Bis(2-Chloroethoxy) Methane	NS	NS	2 U	0.39 U	0.37 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	NS	NS	0.2 U	0.039 U	0.037 U
Bis(2-Chloroisopropyl) Ether	NS	NS	2 U	0.39 U	0.37 U
Bis(2-Ethylhexyl) Phthalate	NS	NS	2 U	0.39 U	0.37 U
Caprolactam	NS	NS	2 U	0.39 U	0.37 U
Carbazole	NS	NS	1.8 J	0.39 U	0.37 U
Chrysene	1	3.9	**4.7**	0.39 U	0.37 U
Dibenz(a,h)Anthracene	0.33	0.33	**0.46**	0.039 U	0.037 U
Dibenzofuran	7	59	1.6 J	0.39 U	0.37 U
Diethyl Phthalate	NS	NS	2 U	0.39 U	0.37 U
Dimethyl Phthalate	NS	NS	2 U	0.39 U	0.37 U
Di-N-Butyl Phthalate	NS	NS	2 U	0.39 U	0.37 U
Di-N-Octylphthalate	NS	NS	2 U	0.39 U	0.37 U
Fluoranthene	100	100	12	0.39 U	0.37 U
Fluorene	30	100	2.1	0.39 U	0.37 U
Hexachlorobenzene	0.33	1.2	0.2 U	0.039 U	0.037 U
Hexachlorobutadiene	NS	NS	0.4 U	0.08 U	0.075 U
Hexachlorocyclopentadiene	NS	NS	2 UJ	0.39 U	0.37 UJ
Hexachloroethane	NS	NS	0.2 U	0.039 U	0.037 U
Indeno(1,2,3-c,d)Pyrene	0.5	0.5	**2.2**	0.039 U	0.037 U
Isophorone	NS	NS	0.8 U	0.16 U	0.15 U
Naphthalene	12	100	1.4 J	0.39 U	0.029 J
Nitrobenzene	NS	NS	0.2 U	0.039 U	0.037 U
N-Nitrosodi-N-Propylamine	NS	NS	0.2 UJ	0.039 U	0.037 U
N-Nitrosodiphenylamine	NS	NS	2 U	0.39 U	0.37 U
Pentachlorophenol	0.8	6.7	1.6 U	0.32 U	0.3 U
Phenanthrene	100	100	15	0.39 U	0.37 U
Phenol	0.33	100	2 U	0.39 U	0.37 U
Pyrene	100	100	9.1	0.39 U	0.37 U
Total SVOCs	NS	NS	74.1 J	0.39 U	0.049 J

Attached Table 3
Hope Street Project
134 Hope Street
Brooklyn, New York
Soil - Semivolatile Organic Compounds (SVOCs)

AKRF Sample ID	NYSDEC UUSCO	NYSDEC RRSCO	RI-SB-06_6-8_20190212	RI-SB-11_0-2_20190211	RI-SB-11_10-12_20190211	RI-FB-S-01_20190211
Laboratory Sample ID			460-175183-2	460-175116-14	460-175116-15	460-175116-18
Date Sampled			2/12/2019	2/11/2019	2/11/2019	2/11/2019
Unit			mg/kg	mg/kg	mg/kg	ug/L
Compound/Dilution Factor			1	5	1	1
1,4-Dioxane (P-Dioxane)	0.1	13	4.9 U	0.033 U	0.056 U	
1,2,4,5-Tetrachlorobenzene	NS	NS	0.4 U	1.9 U	0.34 U	10 U
2,3,4,6-Tetrachlorophenol	NS	NS	0.4 U	1.9 U	0.34 U	10 UJ
2,4,5-Trichlorophenol	NS	NS	0.4 U	1.9 U	0.34 U	10 U
2,4,6-Trichlorophenol	NS	NS	0.16 U	0.76 U	0.14 U	10 U
2,4-Dichlorophenol	NS	NS	0.16 U	0.76 U	0.14 U	10 U
2,4-Dimethylphenol	NS	NS	0.4 U	1.9 U	0.34 U	10 U
2,4-Dinitrophenol	NS	NS	0.32 U	1.5 U	0.28 U	20 UJ
2,4-Dinitrotoluene	NS	NS	0.08 U	0.38 U	0.069 U	2 U
2,6-Dinitrotoluene	NS	NS	0.08 U	0.38 U	0.069 U	2 U
2-Chloronaphthalene	NS	NS	0.4 U	1.9 U	0.34 U	10 U
2-Chlorophenol	NS	NS	0.4 U	1.9 U	0.34 U	10 U
2-Methylnaphthalene	NS	NS	0.4 U	0.35 J	0.13 J	10 U
2-Methylphenol (O-Cresol)	0.33	100	0.4 U	1.9 U	0.34 U	10 U
2-Nitroaniline	NS	NS	0.4 U	1.9 U	0.34 U	10 U
2-Nitrophenol	NS	NS	0.4 U	1.9 U	0.34 U	10 U
3,3'-Dichlorobenzidine	NS	NS	0.16 U	0.76 U	0.14 U	10 U
3-Nitroaniline	NS	NS	0.4 U	1.9 U	0.34 U	10 U
4,6-Dinitro-2-Methylphenol	NS	NS	0.32 U	1.5 U	0.28 U	20 UJ
4-Bromophenyl Phenyl Ether	NS	NS	0.4 U	1.9 U	0.34 U	10 U
4-Chloro-3-Methylphenol	NS	NS	0.4 U	1.9 U	0.34 U	10 U
4-Chloroaniline	NS	NS	0.4 U	1.9 U	0.34 U	10 U
4-Chlorophenyl Phenyl Ether	NS	NS	0.4 U	1.9 U	0.34 U	10 U
4-Methylphenol (P-Cresol)	0.33	100	0.4 U	1.9 U	0.017 J	10 U
4-Nitroaniline	NS	NS	0.4 U	1.9 U	0.34 U	10 U
4-Nitrophenol	NS	NS	0.8 U	3.8 U	0.69 U	20 U
Acenaphthene	20	100	0.4 U	1.1 J	0.29 J	10 U
Acenaphthylene	100	100	0.4 U	1 J	0.33 J	10 U
Acetophenone	NS	NS	0.4 U	1.9 U	0.34 U	10 U
Anthracene	100	100	0.4 U	3.1	0.94	10 U
Atrazine	NS	NS	0.16 UJ	0.76 U	0.14 U	2 UJ
Benzaldehyde	NS	NS	0.4 U	1.9 U	0.021 J	10 U
Benzo(a)Anthracene	1	1	0.043	9.4	2.8	1 U
Benzo(a)Pyrene	1	1	0.036 J	7.5	2.6	1 U
Benzo(b)Fluoranthene	1	1	0.051	11	3.7	2 U
Benzo(g,h,i)Perylene	100	100	0.025 J	4.7	1.5	10 U
Benzo(k)Fluoranthene	0.8	3.9	0.04 U	3.1	1.2	1 U
Benzyl Butyl Phthalate	NS	NS	0.4 U	1.9 U	0.34 U	10 U
Biphenyl (Diphenyl)	NS	NS	0.4 U	1.9 U	0.035 J	10 U
Bis(2-Chloroethoxy) Methane	NS	NS	0.4 U	1.9 U	0.34 U	10 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	NS	NS	0.04 U	0.19 U	0.034 U	1 U
Bis(2-Chloroisopropyl) Ether	NS	NS	0.4 U	1.9 U	0.34 U	10 UJ
Bis(2-Ethylhexyl) Phthalate	NS	NS	0.4 U	1.9 U	0.11 J	2 U
Caprolactam	NS	NS	0.4 U	1.9 U	0.34 U	10 UJ
Carbazole	NS	NS	0.4 U	1.7 J	0.51	10 U
Chrysene	1	3.9	0.047 J	9.4	2.9	2 U
Dibenz(a,h)Anthracene	0.33	0.33	0.04 U	1.4	0.45	1 U
Dibenzofuran	7	59	0.4 U	0.79 J	0.26 J	10 U
Diethyl Phthalate	NS	NS	0.4 U	1.9 U	0.34 U	10 U
Dimethyl Phthalate	NS	NS	0.4 U	1.9 U	0.34 U	10 U
Di-N-Butyl Phthalate	NS	NS	0.4 U	1.9 U	0.34 U	10 U
Di-N-Octylphthalate	NS	NS	0.4 U	1.9 U	0.34 U	10 U
Fluoranthene	100	100	0.035 J	21	6.5	10 U
Fluorene	30	100	0.4 U	1.2 J	0.31 J	10 U
Hexachlorobenzene	0.33	1.2	0.04 U	0.19 U	0.034 U	1 U
Hexachlorobutadiene	NS	NS	0.08 U	0.38 U	0.069 U	1 U
Hexachlorocyclopentadiene	NS	NS	0.4 U	1.9 UJ	0.34 UJ	10 U
Hexachloroethane	NS	NS	0.04 U	0.19 U	0.034 U	2 U
Indeno(1,2,3-c,d)Pyrene	0.5	0.5	0.021 J	6	1.8	2 U
Isophorone	NS	NS	0.16 U	0.76 U	0.14 U	10 U
Naphthalene	12	100	0.4 U	0.63 J	0.28 J	10 U
Nitrobenzene	NS	NS	0.04 U	0.19 U	0.034 U	1 U
N-Nitrosodi-N-Propylamine	NS	NS	0.04 U	0.19 UJ	0.034 UJ	1 U
N-Nitrosodiphenylamine	NS	NS	0.4 U	1.9 U	0.34 U	10 U
Pentachlorophenol	0.8	6.7	0.32 U	1.5 U	0.28 U	20 UJ
Phenanthrene	100	100	0.018 J	18	5	10 U
Phenol	0.33	100	0.4 U	1.9 U	0.34 U	10 UJ
Pyrene	100	100	0.048 J	18	5.5	10 U
Total SVOCs	NS	NS	0.324 J	119 J	37.1 J	20 U

Attached Table 4
Hope Street Project
134 Hope Street
Brooklyn, New York
Soil - 1,4-Dioxane

AKRF Sample ID	NYSDEC UUSCO	NYSDEC RRSCO	RI-SB-01_0-2_20190211	RI-SB-01_2-4_20190211	RI-SB-02_0-2_20190211	RI-SB-02_2-4_20190211
Laboratory Sample ID			460-175116-1	460-175116-2	460-175116-3	460-175116-4
Date Sampled			2/11/2019	2/11/2019	2/11/2019	2/11/2019
Unit			mg/kg	mg/kg	mg/kg	mg/kg
Compound/Dilution Factor			1	1	1	1
1,4-Dioxane (P-Dioxane)	0.1	13	0.028 U	0.018 U	0.019 U	0.019 U

Attached Table 4
Hope Street Project
134 Hope Street
Brooklyn, New York
Soil - 1,4-Dioxane

AKRF Sample ID	NYSDEC UUSCO	NYSDEC RRSCO	RI-SB-03_0-2_20190211	RI-SB-X01_0-2_20190211	RI-SB-03_7-9_20190211	RI-SB-04_0-2_20190211
Laboratory Sample ID			460-175116-5	460-175116-16	460-175116-6	460-175116-7
Date Sampled			2/11/2019	2/11/2019	2/11/2019	2/11/2019
Unit			mg/kg	mg/kg	mg/kg	mg/kg
Compound/Dilution Factor			1	1	50	1
1,4-Dioxane (P-Dioxane)	0.1	13	0.019 U	0.022 U	4.9 U	0.033 U

Attached Table 4
Hope Street Project
134 Hope Street
Brooklyn, New York
Soil - 1,4-Dioxane

AKRF Sample ID	NYSDEC UUSCO	NYSDEC RRSCO	RI-SB-04_2-4_20190211	RI-SB-05_0-2_20190211	RI-SB-05_7-9_20190211	RI-SB-06_0-2_20190212
Laboratory Sample ID			460-175116-8	460-175116-9	460-175116-10	460-175183-1
Date Sampled			2/11/2019	2/11/2019	2/11/2019	2/12/2019
Unit			mg/kg	mg/kg	mg/kg	mg/kg
Compound/Dilution Factor			1	1	1	1
1,4-Dioxane (P-Dioxane)	0.1	13	0.026 U	0.023 U	0.022 U	0.021 U

Attached Table 4
Hope Street Project
134 Hope Street
Brooklyn, New York
Soil - 1,4-Dioxane

AKRF Sample ID	NYSDEC UUSCO	NYSDEC RRSCO	RI-SB-06_6-8_20190212	RI-SB-07_0-2_20190212	RI-SB-07_2-4_20190212	RI-SB-08_6-8_20190211
Laboratory Sample ID			460-175183-2	460-175183-3	460-175183-4	460-175116-11
Date Sampled			2/12/2019	2/12/2019	2/12/2019	2/11/2019
Unit			mg/kg	mg/kg	mg/kg	mg/kg
Compound/Dilution Factor			1	1	1	50
1,4-Dioxane (P-Dioxane)	**0.1**	**13**	0.023 U	0.023 U	0.022 U	4.9 U

Attached Table 4
Hope Street Project
134 Hope Street
Brooklyn, New York
Soil - 1,4-Dioxane

AKRF Sample ID	NYSDEC UUSCO	NYSDEC RRSCO	RI-SB-09_7-9_20190211	RI-SB-10_9-11_20190211	RI-SB-11_0-2_20190211	RI-SB-11_10-12_20190211
Laboratory Sample ID			460-175116-12	460-175116-13	460-175116-14	460-175116-15
Date Sampled			2/11/2019	2/11/2019	2/11/2019	2/11/2019
Unit			mg/kg	mg/kg	mg/kg	mg/kg
Compound/Dilution Factor			200	50	1	1
1,4-Dioxane (P-Dioxane)	0.1	13	19 U	5.4 U	0.02 U	0.017 U

Attached Table 4
Hope Street Project
134 Hope Street
Brooklyn, New York
Soil - 1,4-Dioxane

AKRF Sample ID	NYSDEC UUSCO	NYSDEC RRSCO	RI-SB-12_5-7_20190212	RI-SB-13_6-8_20190212	RI-SB-14_5-7_20190212	RI-SB-X02_5-7_20190212
Laboratory Sample ID			460-175183-5	460-175183-6	460-175183-7	460-175183-8
Date Sampled			2/12/2019	2/12/2019	2/12/2019	2/12/2019
Unit			mg/kg	mg/kg	mg/kg	mg/kg
Compound/Dilution Factor			1	1	1	1
1,4-Dioxane (P-Dioxane)	0.1	13	0.018 U	0.021 U	0.033 U	0.056 U

Attached Table 4
Hope Street Project
134 Hope Street
Brooklyn, New York
Soil - 1,4-Dioxane

AKRF Sample ID	NYSDEC UUSCO	NYSDEC RRSCO	RI-FB-S-01_20190211	RI-FB-S-02_20190213
Laboratory Sample ID			460-175116-18	460-175183-10
Date Sampled			2/11/2019	2/13/2019
Unit			ug/L	ug/L
Compound/Dilution Factor			1	1
1,4-Dioxane (P-Dioxane)	0.1	13	50 U	50 U

Attached Table 5
Hope Street Project
134 Hope Street
Brooklyn, New York
Soil - Pesticides

AKRF Sample ID	NYSDEC UUSCO	NYSDEC RRSCO	RI-SB-03_0-2_20190211	RI-SB-X01_0-2_20190211	RI-SB-03_7-9_20190211
Laboratory Sample ID			460-175116-5	460-175116-16	460-175116-6
Date Sampled			2/11/2019	2/11/2019	2/11/2019
Unit			mg/kg	mg/kg	mg/kg
Compound					
Aldrin	0.005	0.097	0.0073 U	0.0077 U	0.0078 U
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.02	0.48	0.0022 U	0.0023 U	0.0023 U
Alpha Endosulfan	NS	NS	0.0073 U	0.0077 U	0.0078 U
Beta Bhc (Beta Hexachlorocyclohexane)	0.036	0.36	0.0022 U	0.0023 U	0.0023 U
Beta Endosulfan	NS	NS	0.0073 U	0.0077 U	0.0078 U
Chlordane, Total	NS	NS	0.073 U	0.077 U	0.078 U
Delta BHC (Delta Hexachlorocyclohexane)	0.04	100	0.0022 U	0.0023 U	0.0023 U
Dieldrin	0.005	0.2	0.0022 U	0.0023 U	0.0023 U
Endosulfan Sulfate	NS	NS	0.0073 UJ	0.0077 UJ	0.0078 U
Endrin	0.014	11	0.0073 U	0.0077 U	0.0078 U
Endrin Aldehyde	NS	NS	0.0073 U	0.0077 U	0.0078 U
Endrin Ketone	NS	NS	0.0073 U	0.0077 U	0.0078 U
Gamma Bhc (Lindane)	0.1	1.3	0.0022 U	0.0023 U	0.0023 U
Heptachlor	0.042	2.1	0.0073 U	0.0077 U	0.0078 U
Heptachlor Epoxide	NS	NS	0.0073 U	0.0077 U	0.0078 U
Methoxychlor	NS	NS	0.0073 U	0.0077 U	0.0078 U
P,P'-DDD	0.0033	13	0.0073 U	0.0077 U	0.0078 U
P,P'-DDE	0.0033	8.9	0.0073 U	0.0077 U	0.0078 U
P,P'-DDT	0.0033	7.9	0.0073 U	0.0077 U	0.0078 U
Toxaphene	NS	NS	0.073 U	0.077 U	0.078 U

Attached Table 5
Hope Street Project
134 Hope Street
Brooklyn, New York
Soil - Pesticides

AKRF Sample ID	NYSDEC UUSCO	NYSDEC RRSCO	RI-SB-05_0-2_20190211	RI-SB-05_7-9_20190211	RI-SB-06_0-2_20190212
Laboratory Sample ID			460-175116-9	460-175116-10	460-175183-1
Date Sampled			2/11/2019	2/11/2019	2/12/2019
Unit			mg/kg	mg/kg	mg/kg
Compound					
Aldrin	0.005	0.097	0.0081 U	0.0079 U	0.0075 U
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.02	0.48	0.0024 U	0.0024 U	0.0022 U
Alpha Endosulfan	NS	NS	0.0081 U	0.0079 U	0.0075 U
Beta Bhc (Beta Hexachlorocyclohexane)	0.036	0.36	0.0024 U	0.0024 U	0.0022 U
Beta Endosulfan	NS	NS	0.0081 U	0.0079 U	0.0075 U
Chlordane, Total	NS	NS	0.081 U	0.079 U	0.075 U
Delta BHC (Delta Hexachlorocyclohexane)	0.04	100	0.0024 U	0.0024 U	0.0022 U
Dieldrin	0.005	0.2	0.0024 U	0.0024 U	0.0022 U
Endosulfan Sulfate	NS	NS	0.0081 U	0.0079 U	0.0075 UJ
Endrin	0.014	11	0.0081 U	0.0079 U	0.0075 U
Endrin Aldehyde	NS	NS	0.0081 U	0.0079 U	0.0075 U
Endrin Ketone	NS	NS	0.0081 U	0.0079 U	0.0075 U
Gamma Bhc (Lindane)	0.1	1.3	0.0024 U	0.0024 U	0.0022 U
Heptachlor	0.042	2.1	0.0081 U	0.0079 U	0.0075 U
Heptachlor Epoxide	NS	NS	0.0081 U	0.0079 U	0.0075 U
Methoxychlor	NS	NS	0.0081 U	0.0079 U	0.0075 U
P,P'-DDD	0.0033	13	0.0081 U	0.0079 U	0.0075 U
P,P'-DDE	0.0033	8.9	0.0081 U	0.0079 U	0.0075 U
P,P'-DDT	0.0033	7.9	0.0081 U	0.0079 U	0.0075 U
Toxaphene	NS	NS	0.081 U	0.079 U	0.075 U

Attached Table 5
Hope Street Project
134 Hope Street
Brooklyn, New York
Soil - Pesticides

AKRF Sample ID	NYSDEC UUSCO	NYSDEC RRSCO	RI-SB-06_6-8_20190212	RI-SB-11_0-2_20190211	RI-SB-11_10-12_20190211	RI-FB-S-01_20190211
Laboratory Sample ID			460-175183-2	460-175116-14	460-175116-15	460-175116-18
Date Sampled			2/12/2019	2/11/2019	2/11/2019	2/11/2019
Unit			mg/kg	mg/kg	mg/kg	ug/L
Compound						
Aldrin	0.005	0.097	0.008 U	0.0077 U	0.0069 U	0.02 U
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.02	0.48	0.0024 U	0.0023 U	0.0021 U	0.02 U
Alpha Endosulfan	NS	NS	0.008 U	0.0077 U	0.0069 U	0.02 U
Beta Bhc (Beta Hexachlorocyclohexane)	0.036	0.36	0.0024 U	0.0023 U	0.0021 U	0.02 U
Beta Endosulfan	NS	NS	0.008 U	0.0077 U	0.0069 U	0.02 U
Chlordane, Total	NS	NS	0.08 U	0.077 U	0.069 U	0.5 U
Delta BHC (Delta Hexachlorocyclohexane)	0.04	100	0.0024 U	0.0023 U	0.0021 U	0.02 U
Dieldrin	0.005	0.2	0.0024 U	0.0023 U	0.0021 U	0.02 U
Endosulfan Sulfate	NS	NS	0.008 UJ	0.0077 U	0.0069 U	0.02 U
Endrin	0.014	11	0.008 U	0.0077 U	0.0069 U	0.02 U
Endrin Aldehyde	NS	NS	0.008 U	0.0077 U	0.0069 U	0.02 U
Endrin Ketone	NS	NS	0.008 U	0.0077 U	0.0069 U	0.02 U
Gamma Bhc (Lindane)	0.1	1.3	0.0024 U	0.0023 U	0.0021 U	0.02 U
Heptachlor	0.042	2.1	0.008 U	0.0077 U	0.0069 U	0.02 U
Heptachlor Epoxide	NS	NS	0.008 U	0.0077 U	0.0069 U	0.02 U
Methoxychlor	NS	NS	0.008 U	0.0077 U	0.0069 U	0.02 U
P,P'-DDD	0.0033	13	0.008 U	0.0077 U	0.0069 U	0.02 U
P,P'-DDE	0.0033	8.9	0.008 U	0.0077 U	0.0069 U	0.02 U
P,P'-DDT	0.0033	7.9	0.008 U	0.0077 U	0.0069 U	0.02 U
Toxaphene	NS	NS	0.08 U	0.077 U	0.069 U	0.5 U

Attached Table 5
Hope Street Project
134 Hope Street
Brooklyn, New York
Soil - Polychlorinated Biphenyls (PCBs)

AKRF Sample ID	NYSDEC UUSCO	NYSDEC RRSCO	RI-SB-03_0-2_20190211	RI-SB-X01_0-2_20190211	RI-SB-03_7-9_20190211
Laboratory Sample ID			460-175116-5	460-175116-16	460-175116-6
Date Sampled			2/11/2019	2/11/2019	2/11/2019
Unit			mg/kg	mg/kg	mg/kg
Compound					
PCB-1016 (Aroclor 1016)	NS	NS	0.073 U	0.077 U	0.078 U
PCB-1221 (Aroclor 1221)	NS	NS	0.073 U	0.077 U	0.078 U
PCB-1232 (Aroclor 1232)	NS	NS	0.073 U	0.077 U	0.078 U
PCB-1242 (Aroclor 1242)	NS	NS	0.073 U	0.077 U	0.078 U
PCB-1248 (Aroclor 1248)	NS	NS	0.073 U	0.077 U	0.078 U
PCB-1254 (Aroclor 1254)	NS	NS	0.073 U	0.077 U	0.078 U
PCB-1260 (Aroclor 1260)	NS	NS	0.073 U	0.077 U	0.078 U
PCB-1262 (Aroclor 1262)	NS	NS	0.073 U	0.077 U	0.078 U
PCB-1268 (Aroclor 1268)	NS	NS	0.073 U	0.077 U	0.078 U
Total PCBs	0.1	1	0.073 U	0.077 U	0.078 U

Attached Table 5
Hope Street Project
134 Hope Street
Brooklyn, New York
Soil - Polychlorinated Biphenyls (PCBs)

AKRF Sample ID	NYSDEC UUSCO	NYSDEC RRSCO	RI-SB-05_0-2_20190211	RI-SB-05_7-9_20190211	RI-SB-06_0-2_20190212
Laboratory Sample ID			460-175116-9	460-175116-10	460-175183-1
Date Sampled			2/11/2019	2/11/2019	2/12/2019
Unit			mg/kg	mg/kg	mg/kg
Compound					
PCB-1016 (Aroclor 1016)	NS	NS	0.081 U	0.079 U	0.075 U
PCB-1221 (Aroclor 1221)	NS	NS	0.081 U	0.079 U	0.075 U
PCB-1232 (Aroclor 1232)	NS	NS	0.081 U	0.079 U	0.075 U
PCB-1242 (Aroclor 1242)	NS	NS	0.081 U	0.079 U	0.075 U
PCB-1248 (Aroclor 1248)	NS	NS	0.081 U	0.079 U	0.075 U
PCB-1254 (Aroclor 1254)	NS	NS	0.081 U	0.079 U	0.075 U
PCB-1260 (Aroclor 1260)	NS	NS	0.081 U	0.079 U	0.075 U
PCB-1262 (Aroclor 1262)	NS	NS	0.081 U	0.079 U	0.075 U
PCB-1268 (Aroclor 1268)	NS	NS	0.081 U	0.079 U	0.075 U
Total PCBs	0.1	1	0.081 U	0.079 U	0.075 U

Attached Table 5
Hope Street Project
134 Hope Street
Brooklyn, New York
Soil - Polychlorinated Biphenyls (PCBs)

AKRF Sample ID	NYSDEC UUSCO	NYSDEC RRSCO	RI-SB-06_6-8_20190212	RI-SB-11_0-2_20190211	RI-SB-11_10-12_20190211	RI-FB-S-01_20190211
Laboratory Sample ID			460-175183-2	460-175116-14	460-175116-15	460-175116-18
Date Sampled			2/12/2019	2/11/2019	2/11/2019	2/11/2019
Unit			mg/kg	mg/kg	mg/kg	ug/L
Compound						
PCB-1016 (Aroclor 1016)	NS	NS	0.08 U	0.077 U	0.069 U	0.4 U
PCB-1221 (Aroclor 1221)	NS	NS	0.08 U	0.077 U	0.069 U	0.4 U
PCB-1232 (Aroclor 1232)	NS	NS	0.08 U	0.077 U	0.069 U	0.4 U
PCB-1242 (Aroclor 1242)	NS	NS	0.08 U	0.077 U	0.069 U	0.4 U
PCB-1248 (Aroclor 1248)	NS	NS	0.08 U	0.077 U	0.069 U	0.4 U
PCB-1254 (Aroclor 1254)	NS	NS	0.08 U	0.077 U	0.069 U	0.4 U
PCB-1260 (Aroclor 1260)	NS	NS	0.08 U	0.077 U	0.069 U	0.4 U
PCB-1262 (Aroclor 1262)	NS	NS	0.08 U	0.077 U	0.069 U	0.4 U
PCB-1268 (Aroclor 1268)	NS	NS	0.08 U	0.077 U	0.069 U	0.4 U
Total PCBs	0.1	1	0.08 U	0.077 U	0.069 U	0.4 U

Attached Table 6
Hope Street Project
134 Hope Street
Brooklyn, New York
Soil - Metals

AKRF Sample ID	NYSDEC UUSCO	NYSDEC RRSCO	RI-SB-03_0-2_20190211	RI-SB-03_0-2_20190211	RI-SB-03_0-2_20190211	RI-SB-X01_0-2_20190211
Laboratory Sample ID			460-175116-5	460-175116-5	460-175116-5	460-175116-16
Date Sampled			2/11/2019	2/11/2019	2/11/2019	2/11/2019
Unit			mg/kg	mg/kg	mg/kg	mg/kg
Compound/Dilution Factor			1	20	50	1
Aluminum	NS	NS	NR	6500	NR	NR
Antimony	NS	NS	NR	1 U	NR	NR
Arsenic	13	16	NR	5.4 JL	NR	NR
Barium	350	400	NR	55.4 JL	NR	NR
Beryllium	7.2	72	NR	0.25 JL	NR	NR
Cadmium	2.5	4.3	NR	1 U	NR	NR
Calcium	NS	NS	NR	6030 JL	NR	NR
Chromium, Hexavalent	1	110	2.1 U	NR	NR	NR U
Chromium, Total	NS	NS	NR	12.8 JL	NR	NR
Cobalt	NS	NS	NR	5.8 JL	NR	NR
Copper	50	270	NR	22.7 JL	NR	NR
Iron	NS	NS	NR	NR	20400	NR
Lead	63	400	NR	**195 JL**	NR	NR
Magnesium	NS	NS	NR	1660 JL	NR	NR
Manganese	1600	2000	NR	315	NR	NR
Mercury	0.18	0.81	**0.36**	NR	NR	**0.38**
Nickel	30	310	NR	12.1 JL	NR	NR
Potassium	NS	NS	NR	971	NR	NR
Selenium	3.9	180	NR	0.53 J	NR	NR
Silver	2	180	NR	1 U	NR	NR
Sodium	NS	NS	NR	301	NR	NR
Thallium	NS	NS	NR	0.41 U	NR	NR
Vanadium	NS	NS	NR	19.5 JL	NR	NR
Zinc	109	10000	NR	71 JL	NR	NR

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AKRF Sample ID	NYSDEC UUSCO	NYSDEC RRSCO	RI-SB-X01_0-2_20190211	RI-SB-X01_0-2_20190211	RI-SB-03_7-9_20190211	RI-SB-03_7-9_20190211
Laboratory Sample ID			460-175116-16	460-175116-16	460-175116-6	460-175116-6
Date Sampled			2/11/2019	2/11/2019	2/11/2019	2/11/2019
Unit			mg/kg	mg/kg	mg/kg	mg/kg
Compound/Dilution Factor			20	100	1	20
Aluminum	**NS**	**NS**	8560	NR	NR	6920
Antimony	**NS**	**NS**	0.32 J	NR	NR	1.1 UJ
Arsenic	**13**	**16**	12.4	NR	NR	2.3
Barium	**350**	**400**	148	NR	NR	37.3
Beryllium	**7.2**	**72**	0.61	NR	NR	0.43 J
Cadmium	**2.5**	**4.3**	0.96 U	NR	NR	1.1 U
Calcium	**NS**	**NS**	16500	NR	NR	3600
Chromium, Hexavalent	**1**	**110**	NR	NR	2.3 U	
Chromium, Total	**NS**	**NS**	24.7	NR	NR	14.8
Cobalt	**NS**	**NS**	8.5	NR	NR	6.2
Copper	**50**	**270**	**58.7**	NR	NR	11.7
Iron	**NS**	**NS**	NR	27500	NR	NR
Lead	**63**	**400**	**429**	NR	NR	18.1
Magnesium	**NS**	**NS**	2620	NR	NR	2040 JL
Manganese	**1600**	**2000**	472	NR	NR	501
Mercury	**0.18**	**0.81**	NR	NR	0.024	NR
Nickel	**30**	**310**	**134**	NR	NR	10.5
Potassium	**NS**	**NS**	1110	NR	NR	664
Selenium	**3.9**	**180**	0.62 J	NR	NR	5.6 U
Silver	**2**	**180**	0.96 U	NR	NR	1.1 U
Sodium	**NS**	**NS**	301	NR	NR	148
Thallium	**NS**	**NS**	0.13 J	NR	NR	0.44 U
Vanadium	**NS**	**NS**	30.9	NR	NR	23.9
Zinc	**109**	**10000**	**121**	NR	NR	26.2

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AKRF Sample ID	NYSDEC UUSCO	NYSDEC RRSCO	RI-SB-03_7-9_20190211	RI-SB-05_0-2_20190211	RI-SB-05_0-2_20190211	RI-SB-05_0-2_20190211
Laboratory Sample ID			460-175116-6	460-175116-9	460-175116-9	460-175116-9
Date Sampled			2/11/2019	2/11/2019	2/11/2019	2/11/2019
Unit			mg/kg	mg/kg	mg/kg	mg/kg
Compound/Dilution Factor			50	1	20	50
Aluminum	NS	NS	NR	NR	8720	NR
Antimony	NS	NS	NR	NR	0.39 J	NR
Arsenic	13	16	NR	NR	6.1	NR
Barium	350	400	NR	NR	124	NR
Beryllium	7.2	72	NR	NR	0.56	NR
Cadmium	2.5	4.3	NR	NR	1.2 U	NR
Calcium	NS	NS	NR	NR	4960	NR
Chromium, Hexavalent	1	110	NR	2.4 U	NR	NR
Chromium, Total	NS	NS	NR	NR	36.9	NR
Cobalt	NS	NS	NR	NR	7	NR
Copper	50	270	NR	NR	36.5	NR
Iron	NS	NS	18800	NR	NR	28200
Lead	63	400	NR	NR	**268**	NR
Magnesium	NS	NS	NR	NR	2170	NR
Manganese	1600	2000	NR	NR	404	NR
Mercury	0.18	0.81	NR	**0.55**	NR	NR
Nickel	30	310	NR	NR	13.7	NR
Potassium	NS	NS	NR	NR	1040	NR
Selenium	3.9	180	NR	NR	0.79 J	NR
Silver	2	180	NR	NR	1.2 U	NR
Sodium	NS	NS	NR	NR	226	NR
Thallium	NS	NS	NR	NR	0.48 U	NR
Vanadium	NS	NS	NR	NR	29.1	NR
Zinc	109	10000	NR	NR	68.9	NR

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AKRF Sample ID	NYSDEC UUSCO	NYSDEC RRSCO	RI-SB-05_7-9_20190211	RI-SB-05_7-9_20190211	RI-SB-05_7-9_20190211	RI-SB-06_0-2_20190212
Laboratory Sample ID			460-175116-10	460-175116-10	460-175116-10	460-175183-1
Date Sampled			2/11/2019	2/11/2019	2/11/2019	2/12/2019
Unit			mg/kg	mg/kg	mg/kg	mg/kg
Compound/Dilution Factor			1	20	50	1
Aluminum	NS	NS	NR	10300	NR	NR
Antimony	NS	NS	NR	1.1 U	NR	NR
Arsenic	13	16	NR	2.8	NR	NR
Barium	350	400	NR	46.9	NR	NR
Beryllium	7.2	72	NR	0.62	NR	NR
Cadmium	2.5	4.3	NR	1.1 U	NR	NR
Calcium	NS	NS	NR	1410	NR	NR
Chromium, Hexavalent	1	110	2.3 U	NR	NR	2.2 U
Chromium, Total	NS	NS	NR	15.9	NR	NR
Cobalt	NS	NS	NR	5.7	NR	NR
Copper	50	270	NR	11.4	NR	NR
Iron	NS	NS	NR	NR	16800	NR
Lead	63	400	NR	29.2	NR	NR
Magnesium	NS	NS	NR	1990	NR	NR
Manganese	1600	2000	NR	328	NR	NR
Mercury	0.18	0.81	0.071	NR	NR	NR
Nickel	30	310	NR	11.8	NR	NR
Potassium	NS	NS	NR	882	NR	NR
Selenium	3.9	180	NR	5.6 U	NR	NR
Silver	2	180	NR	1.1 U	NR	NR
Sodium	NS	NS	NR	141	NR	NR
Thallium	NS	NS	NR	0.44 U	NR	NR
Vanadium	NS	NS	NR	21.3	NR	NR
Zinc	109	10000	NR	25.8	NR	NR

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AKRF Sample ID	**NYSDEC UUSCO**	**NYSDEC RRSCO**	**RI-SB-06_0-2_20190212**	**RI-SB-06_0-2_20190212**	**RI-SB-06_6-8_20190212**	**RI-SB-06_6-8_20190212**
Laboratory Sample ID			**460-175183-1**	**460-175183-1**	**460-175183-2**	**460-175183-2**
Date Sampled			**2/12/2019**	**2/12/2019**	**2/12/2019**	**2/12/2019**
Unit			**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**
Compound/Dilution Factor			**2**	**20**	**1**	**20**
Aluminum	**NS**	**NS**	NR	7480	NR	11400
Antimony	**NS**	**NS**	NR	1.9	NR	0.68 J
Arsenic	**13**	**16**	NR	**30.9**	NR	4.9
Barium	**350**	**400**	NR	**628**	NR	55.5
Beryllium	**7.2**	**72**	NR	0.81	NR	0.74
Cadmium	**2.5**	**4.3**	NR	0.6 J	NR	1.1 U
Calcium	**NS**	**NS**	NR	9130	NR	3590
Chromium, Hexavalent	**1**	**110**	NR	NR	2.4 U	NR
Chromium, Total	**NS**	**NS**	NR	14.8	NR	15.6
Cobalt	**NS**	**NS**	NR	8.7	NR	5.3
Copper	**50**	**270**	NR	**285**	NR	26.5
Iron	**NS**	**NS**	NR	23900	NR	NR
Lead	**63**	**400**	NR	**1750**	NR	**68.7**
Magnesium	**NS**	**NS**	NR	1550	NR	1930
Manganese	**1600**	**2000**	NR	304	NR	199
Mercury	**0.18**	**0.81**	**1.3**	NR	**0.28**	NR
Nickel	**30**	**310**	NR	21.3	NR	14.9
Potassium	**NS**	**NS**	NR	1100	NR	765
Selenium	**3.9**	**180**	NR	**6.8**	NR	0.43 J
Silver	**2**	**180**	NR	1.7	NR	1.1 U
Sodium	**NS**	**NS**	NR	672	NR	381
Thallium	**NS**	**NS**	NR	0.32 J	NR	0.45 U
Vanadium	**NS**	**NS**	NR	37.4	NR	23.7
Zinc	**109**	**10000**	NR	**434**	NR	**199**

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AKRF Sample ID	NYSDEC UUSCO	NYSDEC RRSCO	RI-SB-06_6-8_20190212	RI-SB-11_0-2_20190211	RI-SB-11_0-2_20190211	RI-SB-11_0-2_20190211
Laboratory Sample ID			460-175183-2	460-175116-14	460-175116-14	460-175116-14
Date Sampled			2/12/2019	2/11/2019	2/11/2019	2/11/2019
Unit			mg/kg	mg/kg	mg/kg	mg/kg
Compound/Dilution Factor			50	1	20	50
Aluminum	NS	NS	NR	NR	7630	NR
Antimony	NS	NS	NR	NR	1.7	NR
Arsenic	13	16	NR	NR	8.3	NR
Barium	350	400	NR	NR	106	NR
Beryllium	7.2	72	NR	NR	0.46	NR
Cadmium	2.5	4.3	NR	NR	1 U	NR
Calcium	NS	NS	NR	NR	52900	NR
Chromium, Hexavalent	1	110	NR	2.3 U	NR	NR
Chromium, Total	NS	NS	NR	NR	20.1	NR
Cobalt	NS	NS	NR	NR	4.4	NR
Copper	50	270	NR	NR	41.8	NR
Iron	NS	NS	16700	NR	NR	13600
Lead	63	400	NR	NR	**578**	NR
Magnesium	NS	NS	NR	NR	3770	NR
Manganese	1600	2000	NR	NR	300	NR
Mercury	0.18	0.81	NR	**0.27**	NR	NR
Nickel	30	310	NR	NR	10.6	NR
Potassium	NS	NS	NR	NR	1090	NR
Selenium	3.9	180	NR	NR	0.46 J	NR
Silver	2	180	NR	NR	1 U	NR
Sodium	NS	NS	NR	NR	571	NR
Thallium	NS	NS	NR	NR	0.41 U	NR
Vanadium	NS	NS	NR	NR	20	NR
Zinc	109	10000	NR	NR	100	NR

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AKRF Sample ID	NYSDEC UUSCO	NYSDEC RRSCO	RI-SB-11_10-12_20190211	RI-SB-11_10-12_20190211	RI-SB-11_10-12_20190211	RI-FB-S-01_20190211	RI-FB-S-01_20190211
Laboratory Sample ID			460-175116-15	460-175116-15	460-175116-15	460-175116-18	460-175116-18
Date Sampled			2/11/2019	2/11/2019	2/11/2019	2/11/2019	2/11/2019
Unit			mg/kg	mg/kg	mg/kg	ug/L	ug/L
Compound/Dilution Factor			1	20	50	1	2
Aluminum	**NS**	**NS**	NR	10500	NR	NR	40 U
Antimony	**NS**	**NS**	NR	5.7	NR	NR	2 U
Arsenic	**13**	**16**	NR	8.7	NR	NR	2 U
Barium	**350**	**400**	NR	102	NR	NR	4 U
Beryllium	**7.2**	**72**	NR	0.59	NR	NR	0.8 U
Cadmium	**2.5**	**4.3**	NR	1 U	NR	NR	2 U
Calcium	**NS**	**NS**	NR	34300	NR	NR	200 U
Chromium, Hexavalent	**1**	**110**	2 U	NR	NR	10 U	NR
Chromium, Total	**NS**	**NS**	NR	22.8	NR	NR	4 U
Cobalt	**NS**	**NS**	NR	5.2	NR	NR	4 U
Copper	**50**	**270**	NR	34.8	NR	NR	4 U
Iron	**NS**	**NS**	NR	NR	14600	NR	120 U
Lead	**63**	**400**	NR	**153**	NR	NR	1.2 U
Magnesium	**NS**	**NS**	NR	3400	NR	NR	200 U
Manganese	**1600**	**2000**	NR	246	NR	NR	8 U
Mercury	**0.18**	**0.81**	**0.27**	NR	NR	0.2 U	NR
Nickel	**30**	**310**	NR	24.5	NR	NR	4 U
Potassium	**NS**	**NS**	NR	1070	NR	NR	200 U
Selenium	**3.9**	**180**	NR	0.47 J	NR	NR	10 U
Silver	**2**	**180**	NR	1 U	NR	NR	2 U
Sodium	**NS**	**NS**	NR	351	NR	NR	200 U
Thallium	**NS**	**NS**	NR	0.4 U	NR	NR	0.8 U
Vanadium	**NS**	**NS**	NR	21.2	NR	NR	4 U
Zinc	**109**	**10000**	NR	78.6	NR	NR	16 U

Attached Table 7
Hope Street Project
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Groundwater - Volatile Organic Compounds (VOCs)

AKRF Sample ID		RI-MW-01_20190221	RI-MW-02_20190221	RI-MW-03_20190221
Laboratory Sample ID	NYSDEC	460-175945-1	460-175945-2	460-175945-3
Date Sampled	AWQSGV	2/21/2019	2/21/2019	2/21/2019
Compound/Unit		ug/L	ug/L	ug/L
1,1,1-Trichloroethane	5	1 U	1 U	1 U
1,1,2,2-Tetrachloroethane	5	1 U	1 U	1 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	5	1 U	1 U	1 U
1,1,2-Trichloroethane	1	1 U	1 U	1 U
1,1-Dichloroethane	5	1 U	1 U	1 U
1,1-Dichloroethene	5	1 U	1 U	1 U
1,2,3-Trichlorobenzene	5	1 U	1 U	1 U
1,2,4-Trichlorobenzene	5	1 U	1 U	1 U
1,2-Dibromo-3-Chloropropane	0.04	1 UJ	1 UJ	1 UJ
1,2-Dibromoethane (Ethylene Dibromide)	0.0006	1 U	1 U	1 U
1,2-Dichlorobenzene	3	1 U	1 U	0.89 J
1,2-Dichloroethane	0.6	1 U	1 U	1 U
1,2-Dichloropropane	1	1 U	1 U	1 U
1,3-Dichlorobenzene	3	1 U	1 U	1 U
1,4-Dichlorobenzene	3	1 U	1 U	1 U
2-Hexanone	50	5 U	5 U	5 U
Acetone	50	5 U	5 U	32
Benzene	1	1 U	1 U	**53**
Bromochloromethane	5	1 U	1 U	1 U
Bromodichloromethane	50	1 U	1 U	1 U
Bromoform	50	1 U	1 U	1 U
Bromomethane	5	1 U	1 U	1 U
Carbon Disulfide	60	1 U	1 U	1 U
Carbon Tetrachloride	5	1 UJ	1 UJ	1 UJ
Chlorobenzene	5	1 U	1 U	1 U
Chloroethane	5	1 U	1 U	1 U
Chloroform	7	1 U	1 U	1 U
Chloromethane	5	1 U	1 U	1 U
Cis-1,2-Dichloroethylene	5	1 U	1 U	**92**
Cis-1,3-Dichloropropene	NS	1 U	1 U	1 U
Cyclohexane	NS	1 U	1 U	160
Dibromochloromethane	50	1 U	1 U	1 U
Dichlorodifluoromethane	5	1 U	1 U	1 U
Ethylbenzene	5	1 U	1 U	**31**
Isopropylbenzene (Cumene)	5	1 U	1 U	**30**
M,P-Xylenes	5	1 U	1 U	5
Methyl Acetate	NS	5 U	5 U	5 U
Methyl Ethyl Ketone (2-Butanone)	50	5 U	5 U	5 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	NS	5 U	5 U	5 U
Methylcyclohexane	NS	1 U	1 U	290
Methylene Chloride	5	1 U	1 U	1 U
O-Xylene (1,2-Dimethylbenzene)	5	1 U	1 U	4.5
Styrene	5	1 U	1 U	1 U
Tert-Butyl Methyl Ether	10	1 U	1 U	1 U
Tetrachloroethylene (PCE)	5	3.4	1 U	0.99 J
Toluene	5	1 U	1 U	**6.2**
Trans-1,2-Dichloroethene	5	1 U	1 U	1 U
Trans-1,3-Dichloropropene	NS	1 U	1 U	1 U
Trichloroethylene (TCE)	5	1 U	1 U	1 U
Trichlorofluoromethane	5	1 U	1 U	1 U
Vinyl Chloride	2	1 U	1 U	**19**

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Groundwater - Volatile Organic Compounds (VOCs)

AKRF Sample ID	NYSDEC AWQSGV	RI-MW-04_20190221	RI-MW-05_20190221	RI-MW-06_20190221
Laboratory Sample ID		460-175945-4	460-175945-5	460-175945-6
Date Sampled		2/21/2019	2/21/2019	2/21/2019
Compound/Unit		ug/L	ug/L	ug/L
1,1,1-Trichloroethane	5	1 U	1 U	1 U
1,1,2,2-Tetrachloroethane	5	1 U	1 U	1 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	5	1 U	1 U	1 U
1,1,2-Trichloroethane	1	1 U	1 U	1 U
1,1-Dichloroethane	5	1 U	1 U	1 U
1,1-Dichloroethene	5	1 U	1 U	1 U
1,2,3-Trichlorobenzene	5	1 U	1 U	1 U
1,2,4-Trichlorobenzene	5	1 U	1 U	1 U
1,2-Dibromo-3-Chloropropane	0.04	1 U	1 U	1 UJ
1,2-Dibromoethane (Ethylene Dibromide)	0.0006	1 U	1 U	1 U
1,2-Dichlorobenzene	3	1 U	1 U	1 U
1,2-Dichloroethane	0.6	1 U	1 U	1 U
1,2-Dichloropropane	1	1 U	1 U	1 U
1,3-Dichlorobenzene	3	1 U	1 U	1 U
1,4-Dichlorobenzene	3	1 U	1 U	1 U
2-Hexanone	50	5 U	5 U	5 U
Acetone	50	5 U	5 U	5 U
Benzene	1	1 U	1 U	1 U
Bromochloromethane	5	1 U	1 U	1 U
Bromodichloromethane	50	1 U	1 U	1 U
Bromoform	50	1 U	1 U	1 U
Bromomethane	5	1 U	1 U	1 U
Carbon Disulfide	60	1 U	1 U	1 U
Carbon Tetrachloride	5	1 UJ	1 UJ	1 UJ
Chlorobenzene	5	1 U	1 U	1 U
Chloroethane	5	1 U	1 U	1 U
Chloroform	7	1 U	1 U	1 U
Chloromethane	5	1 U	1 U	1 U
Cis-1,2-Dichloroethylene	5	1 U	1 U	1 U
Cis-1,3-Dichloropropene	NS	1 U	1 U	1 U
Cyclohexane	NS	1 U	1 U	1 U
Dibromochloromethane	50	1 U	1 U	1 U
Dichlorodifluoromethane	5	1 U	1 U	1 U
Ethylbenzene	5	1 U	1 U	1 U
Isopropylbenzene (Cumene)	5	1 U	1 U	1 U
M,P-Xylenes	5	1 U	1 U	1 U
Methyl Acetate	NS	5 UJ	5 U	5 U
Methyl Ethyl Ketone (2-Butanone)	50	5 U	5 U	5 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	NS	5 U	5 U	5 U
Methylcyclohexane	NS	1 U	1 U	1 U
Methylene Chloride	5	1 U	1 U	1 U
O-Xylene (1,2-Dimethylbenzene)	5	1 U	1 U	1 U
Styrene	5	1 U	1 U	1 U
Tert-Butyl Methyl Ether	10	1 U	1 U	1 U
Tetrachloroethylene (PCE)	5	2.8	1 U	**10**
Toluene	5	1 U	1 U	1 U
Trans-1,2-Dichloroethene	5	1 U	1 U	1 U
Trans-1,3-Dichloropropene	NS	1 U	1 U	1 U
Trichloroethylene (TCE)	5	1 U	1 U	1 U
Trichlorofluoromethane	5	1 U	1 U	1 U
Vinyl Chloride	2	1 U	1 U	1 U

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Groundwater - Volatile Organic Compounds (VOCs)

AKRF Sample ID	NYSDEC	RI-MW-X01_20190221	RI-MW-07_20190221	RI-TB-W_20190221	RI-FB-W_20190221
Laboratory Sample ID	AWQSGV	460-175945-9	460-175945-7	460-175945-10	460-175945-8
Date Sampled		2/21/2019	2/21/2019	2/21/2019	2/21/2019
Compound/Unit		ug/L	ug/L	ug/L	ug/L
1,1,1-Trichloroethane	5	1 UJ	1 UJ	1 UJ	1 U
1,1,2,2-Tetrachloroethane	5	1 UJ	1 UJ	1 UJ	1 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	5	1 UJ	1 UJ	1 UJ	1 U
1,1,2-Trichloroethane	1	1 UJ	1 UJ	1 UJ	1 U
1,1-Dichloroethane	5	1 UJ	1 UJ	1 UJ	1 U
1,1-Dichloroethene	5	1 UJ	1 UJ	1 UJ	1 U
1,2,3-Trichlorobenzene	5	1 UJ	1 UJ	1 UJ	1 U
1,2,4-Trichlorobenzene	5	1 UJ	1 UJ	1 UJ	1 U
1,2-Dibromo-3-Chloropropane	0.04	1 UJ	1 UJ	1 UJ	1 UJ
1,2-Dibromoethane (Ethylene Dibromide)	0.0006	1 UJ	1 UJ	1 UJ	1 U
1,2-Dichlorobenzene	3	1 UJ	1 UJ	1 UJ	1 U
1,2-Dichloroethane	0.6	1 UJ	1 UJ	1 UJ	1 U
1,2-Dichloropropane	1	1 UJ	1 UJ	1 UJ	1 U
1,3-Dichlorobenzene	3	1 UJ	1 UJ	1 UJ	1 U
1,4-Dichlorobenzene	3	1 UJ	1 UJ	1 UJ	1 U
2-Hexanone	50	5 U	5 U	5 U	5 U
Acetone	50	5 U	5 U	5 U	5 U
Benzene	1	1 U	1 U	1 U	1 U
Bromochloromethane	5	1 U	1 U	1 U	1 U
Bromodichloromethane	50	1 U	1 U	1 U	1 U
Bromoform	50	1 U	1 U	1 U	1 U
Bromomethane	5	1 U	1 U	1 U	1 U
Carbon Disulfide	60	1 U	1 U	1 U	1 U
Carbon Tetrachloride	5	1 UJ	1 UJ	1 UJ	1 UJ
Chlorobenzene	5	1 U	1 U	1 U	1 U
Chloroethane	5	1 U	1 U	1 U	1 U
Chloroform	7	1 U	1 U	1 U	1 U
Chloromethane	5	1 U	1 U	1 U	1 U
Cis-1,2-Dichloroethylene	5	1 UJ	1 UJ	1 UJ	1 U
Cis-1,3-Dichloropropene	NS	1 UJ	1 UJ	1 UJ	1 U
Cyclohexane	NS	1 U	1 U	1 U	1 U
Dibromochloromethane	50	1 U	1 U	1 U	1 U
Dichlorodifluoromethane	5	1 U	1 U	1 U	1 U
Ethylbenzene	5	1 U	1 U	1 U	1 U
Isopropylbenzene (Cumene)	5	1 U	1 U	1 U	1 U
M,P-Xylenes	5	1 UJ	1 UJ	1 UJ	0.39 J
Methyl Acetate	NS	5 U	5 U	5 U	5 U
Methyl Ethyl Ketone (2-Butanone)	50	5 U	5 U	5 U	5 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	NS	5 U	5 U	5 U	5 U
Methylcyclohexane	NS	1 U	1 U	1 U	1 U
Methylene Chloride	5	1 U	1 U	1 U	0.44 J
O-Xylene (1,2-Dimethylbenzene)	5	1 UJ	1 UJ	1 UJ	1 U
Styrene	5	1 U	1 U	1 U	1 U
Tert-Butyl Methyl Ether	10	1 U	1 U	1 UJ	1 U
Tetrachloroethylene (PCE)	5	**14**	0.73 J	1 U	1 U
Toluene	5	1 U	1 U	1 U	1 U
Trans-1,2-Dichloroethene	5	1 UJ	1 UJ	1 UJ	1 U
Trans-1,3-Dichloropropene	NS	1 UJ	1 UJ	1 UJ	1 U
Trichloroethylene (TCE)	5	1 U	1 U	1 U	1 U
Trichlorofluoromethane	5	1 U	1 U	1 U	1 U
Vinyl Chloride	2	1 U	1 U	1 U	1 U

Attached Table 8
Hope Street Project
134 Hope Street
Brooklyn, New York
Groundwater - Semivolatile Organic Compounds (SVOCs)

AKRF Sample ID	NYSDEC	RI-MW-01_20190221	RI-MW-02_20190221	RI-MW-03_20190221
Laboratory Sample ID	AWQSGV	460-175945-1	460-175945-2	460-175945-3
Date Sampled		2/21/2019	2/21/2019	2/21/2019
Compound/Unit		ug/L	ug/L	ug/L
1,2,4,5-Tetrachlorobenzene	5	10 U	10 U	10 U
1,4-Dioxane (P-Dioxane)	NS	50 U	50 U	0.11 J
2,3,4,6-Tetrachlorophenol	NS	10 UJ	10 UJ	10 U
2,4,5-Trichlorophenol	NS	10 U	10 U	10 U
2,4,6-Trichlorophenol	NS	10 U	10 U	10 U
2,4-Dichlorophenol	5	10 U	10 U	10 U
2,4-Dimethylphenol	50	10 U	10 U	10 U
2,4-Dinitrophenol	10	20 UJ	20 UJ	20 U
2,4-Dinitrotoluene	5	2 U	2 U	2 U
2,6-Dinitrotoluene	5	2.6	2 U	2 U
2-Chloronaphthalene	10	10 U	10 U	10 U
2-Chlorophenol	NS	10 U	10 U	10 U
2-Methylnaphthalene	NS	10 U	10 U	6.1 J
2-Methylphenol (O-Cresol)	NS	10 U	10 U	10 U
2-Nitroaniline	5	10 U	10 U	10 U
2-Nitrophenol	NS	10 U	10 U	10 U
3,3'-Dichlorobenzidine	5	10 U	10 U	10 U
3-Nitroaniline	5	10 U	10 U	10 U
4,6-Dinitro-2-Methylphenol	NS	20 UJ	20 UJ	20 U
4-Bromophenyl Phenyl Ether	NS	10 U	10 U	10 U
4-Chloro-3-Methylphenol	NS	10 U	10 U	10 U
4-Chloroaniline	5	10 U	10 U	10 U
4-Chlorophenyl Phenyl Ether	NS	10 U	10 U	10 U
4-Methylphenol (P-Cresol)	NS	10 U	10 U	10 U
4-Nitroaniline	5	10 U	10 U	10 U
4-Nitrophenol	NS	20 U	20 U	20 UJ
Acenaphthene	20	10 U	10 U	10 U
Acenaphthylene	NS	10 U	10 U	10 U
Acetophenone	NS	10 U	10 U	25 JK
Anthracene	50	10 U	10 U	0.66 J
Atrazine	7.5	2 U	2 U	2 UJ
Benzaldehyde	NS	10 U	10 U	10 U
Benzo(a)Anthracene	0.002	1 U	1 U	1 U
Benzo(a)Pyrene	ND	1 U	1 U	1 U
Benzo(b)Fluoranthene	0.002	2 U	2 U	2 U
Benzo(g,h,i)Perylene	NS	10 UJ	10 UJ	10 U
Benzo(k)Fluoranthene	0.002	1 U	1 U	1 U
Benzyl Butyl Phthalate	50	10 U	10 U	10 U
Biphenyl (Diphenyl)	5	10 U	10 U	10 U
Bis(2-Chloroethoxy) Methane	5	10 U	10 U	10 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	1	1 U	1 U	1 U
Bis(2-Chloroisopropyl) Ether	5	10 U	10 U	10 U
Bis(2-Ethylhexyl) Phthalate	5	2 U	2 U	2 U
Caprolactam	NS	10 UJ	10 UJ	10 UJ
Carbazole	NS	10 U	10 U	10 U
Chrysene	0.002	2 U	2 U	2 U
Dibenz(a,h)Anthracene	NS	1 UJ	1 UJ	1 U
Dibenzofuran	NS	10 U	10 U	1.2 J
Diethyl Phthalate	50	10 U	10 U	10 U
Dimethyl Phthalate	50	10 U	10 U	10 U
Di-N-Butyl Phthalate	50	10 U	10 U	10 U
Di-N-Octylphthalate	50	10 U	10 U	10 U
Fluoranthene	50	10 U	10 U	2.8 J
Fluorene	50	10 U	10 U	1.9 J
Hexachlorobenzene	0.04	1 U	1 U	1 U
Hexachlorobutadiene	0.5	1 U	1 U	1 U
Hexachlorocyclopentadiene	5	10 U	10 U	10 U
Hexachloroethane	5	2 U	2 U	2 U
Indeno(1,2,3-c,d)Pyrene	0.002	2 UJ	2 UJ	2 U
Isophorone	50	10 U	10 U	10 U
Naphthalene	10	10 U	10 U	10 U
Nitrobenzene	0.4	1 U	1 U	1 U
N-Nitrosodi-N-Propylamine	NS	1 U	1 U	1 U
N-Nitrosodiphenylamine	50	10 U	10 U	10 U
Pentachlorophenol	NS	20 UJ	20 UJ	20 U
Phenanthrene	50	10 U	10 U	3.6 J
Phenol	1	10 U	10 U	10 U
Pyrene	50	10 U	10 U	2.3 J

Attached Table 8
Hope Street Project
134 Hope Street
Brooklyn, New York
Groundwater - Semivolatile Organic Compounds (SVOCs)

AKRF Sample ID	NYSDEC	RI-MW-04_20190221	RI-MW-05_20190221	RI-MW-06_20190221
Laboratory Sample ID	AWQSGV	460-175945-4	460-175945-5	460-175945-6
Date Sampled		2/21/2019	2/21/2019	2/21/2019
Compound/Unit		ug/L	ug/L	ug/L
1,2,4,5-Tetrachlorobenzene	5	10 U	10 U	10 U
1,4-Dioxane (P-Dioxane)	NS	50 U	50 U	0.2 U
2,3,4,6-Tetrachlorophenol	NS	10 UJ	10 UJ	10 UJ
2,4,5-Trichlorophenol	NS	10 U	10 U	10 U
2,4,6-Trichlorophenol	NS	10 U	10 U	10 U
2,4-Dichlorophenol	5	10 U	10 U	10 UJ
2,4-Dimethylphenol	50	10 U	10 U	10 UJ
2,4-Dinitrophenol	10	20 UJ	20 UJ	20 UJ
2,4-Dinitrotoluene	5	2 U	2 U	2 UJ
2,6-Dinitrotoluene	5	2 U	2 U	2 UJ
2-Chloronaphthalene	10	10 U	10 U	10 U
2-Chlorophenol	NS	10 U	10 U	10 U
2-Methylnaphthalene	NS	10 U	10 U	10 U
2-Methylphenol (O-Cresol)	NS	10 U	10 U	10 U
2-Nitroaniline	5	10 U	10 U	10 U
2-Nitrophenol	NS	10 U	10 U	10 U
3,3'-Dichlorobenzidine	5	10 U	10 U	10 UJ
3-Nitroaniline	5	10 U	10 U	10 U
4,6-Dinitro-2-Methylphenol	NS	20 UJ	20 UJ	20 UJ
4-Bromophenyl Phenyl Ether	NS	10 U	10 U	10 U
4-Chloro-3-Methylphenol	NS	10 U	10 U	10 U
4-Chloroaniline	5	10 U	10 U	10 U
4-Chlorophenyl Phenyl Ether	NS	10 U	10 U	10 U
4-Methylphenol (P-Cresol)	NS	10 U	10 U	10 U
4-Nitroaniline	5	10 U	10 U	10 U
4-Nitrophenol	NS	20 U	20 U	20 U
Acenaphthene	20	10 U	10 U	10 U
Acenaphthylene	NS	10 U	10 U	10 U
Acetophenone	NS	10 U	10 U	10 U
Anthracene	50	10 U	10 U	10 U
Atrazine	7.5	2 U	2 U	2 U
Benzaldehyde	NS	10 U	10 U	10 U
Benzo(a)Anthracene	0.002	1 U	1 U	1 U
Benzo(a)Pyrene	ND	1 U	1 U	1 U
Benzo(b)Fluoranthene	0.002	2 U	2 U	2 U
Benzo(g,h,i)Perylene	NS	10 UJ	10 UJ	10 UJ
Benzo(k)Fluoranthene	0.002	1 U	1 U	1 U
Benzyl Butyl Phthalate	50	10 U	10 U	10 U
Biphenyl (Diphenyl)	5	10 U	10 U	10 U
Bis(2-Chloroethoxy) Methane	5	10 U	10 U	10 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	1	1 U	1 U	1 U
Bis(2-Chloroisopropyl) Ether	5	10 U	10 U	10 U
Bis(2-Ethylhexyl) Phthalate	5	2 U	2 U	2 U
Caprolactam	NS	10 UJ	10 UJ	10 UJ
Carbazole	NS	10 U	10 U	10 U
Chrysene	0.002	2 U	2 U	2 U
Dibenz(a,h)Anthracene	NS	1 U	1 UJ	1 UJ
Dibenzofuran	NS	10 U	10 U	10 U
Diethyl Phthalate	50	10 U	10 U	10 U
Dimethyl Phthalate	50	10 U	10 U	10 U
Di-N-Butyl Phthalate	50	10 U	10 U	10 U
Di-N-Octylphthalate	50	10 U	10 U	10 U
Fluoranthene	50	10 U	10 U	10 U
Fluorene	50	10 U	10 U	10 U
Hexachlorobenzene	0.04	1 U	1 U	1 U
Hexachlorobutadiene	0.5	1 U	1 U	1 U
Hexachlorocyclopentadiene	5	10 U	10 U	10 U
Hexachloroethane	5	2 U	2 U	2 U
Indeno(1,2,3-c,d)Pyrene	0.002	2 UJ	2 UJ	2 UJ
Isophorone	50	10 U	10 U	10 U
Naphthalene	10	10 U	10 U	10 U
Nitrobenzene	0.4	1 U	1 U	1 U
N-Nitrosodi-N-Propylamine	NS	1 U	1 U	1 U
N-Nitrosodiphenylamine	50	10 U	10 U	10 U
Pentachlorophenol	NS	20 UJ	20 UJ	20 UJ
Phenanthrene	50	10 U	10 U	10 U
Phenol	1	10 U	10 U	10 U
Pyrene	50	10 U	10 U	10 U

Attached Table 8
Hope Street Project
134 Hope Street
Brooklyn, New York
Groundwater - Semivolatile Organic Compounds (SVOCs)

AKRF Sample ID		RI-MW-X01_20190221	RI-MW-07_20190221	RI-FB-W_20190221
Laboratory Sample ID	NYSDEC	460-175945-9	460-175945-7	460-175945-8
Date Sampled	AWQSGV	2/21/2019	2/21/2019	2/21/2019
Compound/Unit		ug/L	ug/L	ug/L
1,2,4,5-Tetrachlorobenzene	5	10 UJ	10 UJ	10 U
1,4-Dioxane (P-Dioxane)	NS	0.2 UJ	50 UJ	0.2 U
2,3,4,6-Tetrachlorophenol	NS	10 UJ	10 UJ	10 UJ
2,4,5-Trichlorophenol	NS	10 UJ	10 UJ	10 U
2,4,6-Trichlorophenol	NS	10 UJ	10 UJ	10 U
2,4-Dichlorophenol	5	10 UJ	10 UJ	10 U
2,4-Dimethylphenol	50	10 UJ	10 UJ	10 U
2,4-Dinitrophenol	10	20 UJ	20 UJ	20 UJ
2,4-Dinitrotoluene	5	2 UJ	2 UJ	2 U
2,6-Dinitrotoluene	5	2 UJ	2 UJ	2 U
2-Chloronaphthalene	10	10 U	10 U	10 U
2-Chlorophenol	NS	10 U	10 U	10 U
2-Methylnaphthalene	NS	10 U	10 U	10 U
2-Methylphenol (O-Cresol)	NS	10 U	10 U	10 U
2-Nitroaniline	5	10 U	10 U	10 U
2-Nitrophenol	NS	10 U	10 U	10 U
3,3'-Dichlorobenzidine	5	10 UJ	10 UJ	10 U
3-Nitroaniline	5	10 U	10 U	10 U
4,6-Dinitro-2-Methylphenol	NS	20 UJ	20 UJ	20 UJ
4-Bromophenyl Phenyl Ether	NS	10 U	10 U	10 U
4-Chloro-3-Methylphenol	NS	10 U	10 U	10 U
4-Chloroaniline	5	10 U	10 U	10 U
4-Chlorophenyl Phenyl Ether	NS	10 U	10 U	10 U
4-Methylphenol (P-Cresol)	NS	10 U	10 U	10 U
4-Nitroaniline	5	10 U	10 U	10 U
4-Nitrophenol	NS	20 U	20 U	20 U
Acenaphthene	20	10 U	10 U	10 U
Acenaphthylene	NS	10 U	10 U	10 U
Acetophenone	NS	10 U	10 U	10 U
Anthracene	50	10 U	10 U	10 U
Atrazine	7.5	2 U	2 U	2 U
Benzaldehyde	NS	10 U	10 U	10 U
Benzo(a)Anthracene	0.002	1 U	1 U	1 U
Benzo(a)Pyrene	ND	1 U	1 U	1 U
Benzo(b)Fluoranthene	0.002	2 U	2 U	2 U
Benzo(g,h,i)Perylene	NS	10 UJ	10 UJ	10 UJ
Benzo(k)Fluoranthene	0.002	1 U	1 U	1 U
Benzyl Butyl Phthalate	50	10 U	10 U	10 U
Biphenyl (Diphenyl)	5	10 U	10 U	10 U
Bis(2-Chloroethoxy) Methane	5	10 U	10 U	10 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	1	1 U	1 U	1 U
Bis(2-Chloroisopropyl) Ether	5	10 U	10 U	10 U
Bis(2-Ethylhexyl) Phthalate	5	2 U	2 U	2 U
Caprolactam	NS	10 UJ	10 UJ	10 UJ
Carbazole	NS	10 U	10 U	10 U
Chrysene	0.002	2 U	2 U	2 U
Dibenz(a,h)Anthracene	NS	1 UJ	1 UJ	1 UJ
Dibenzofuran	NS	10 U	10 U	10 U
Diethyl Phthalate	50	10 U	10 U	10 U
Dimethyl Phthalate	50	10 U	10 U	10 U
Di-N-Butyl Phthalate	50	10 U	10 U	10 U
Di-N-Octylphthalate	50	10 U	10 U	10 U
Fluoranthene	50	10 U	10 U	10 U
Fluorene	50	10 U	10 U	10 U
Hexachlorobenzene	0.04	1 U	1 U	1 U
Hexachlorobutadiene	0.5	1 U	1 U	1 U
Hexachlorocyclopentadiene	5	10 U	10 U	10 U
Hexachloroethane	5	2 U	2 U	2 U
Indeno(1,2,3-c,d)Pyrene	0.002	2 UJ	2 UJ	2 UJ
Isophorone	50	10 U	10 U	10 U
Naphthalene	10	10 U	10 U	10 U
Nitrobenzene	0.4	1 U	1 U	1 U
N-Nitrosodi-N-Propylamine	NS	1 U	1 U	1 U
N-Nitrosodiphenylamine	50	10 U	10 U	10 U
Pentachlorophenol	NS	20 UJ	20 UJ	20 UJ
Phenanthrene	50	10 U	10 U	10 U
Phenol	1	10 U	10 U	10 U
Pyrene	50	10 U	10 U	10 U

Attached Table 9
Hope Street Project
134 Hope Street
Brooklyn, New York
Groundwater - Pesticides

AKRF Sample ID		RI-MW-01_20190221	RI-MW-02_20190221	RI-MW-03_20190221
Laboratory Sample ID	NYSDEC	460-175945-1	460-175945-2	460-175945-3
Date Sampled	AWQSGV	2/21/2019	2/21/2019	2/21/2019
Compound/Unit		ug/L	ug/L	ug/L
Aldrin	ND	0.02 U	0.02 U	0.02 U
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.01	0.02 U	0.02 U	0.02 U
Alpha Endosulfan	NS	0.02 U	0.02 U	0.02 U
Beta Bhc (Beta Hexachlorocyclohexane)	0.04	0.02 U	0.02 U	0.02 U
Beta Endosulfan	NS	0.02 U	0.02 U	0.02 U
Chlordane, Total	0.05	0.5 U	0.5 U	0.5 U
Delta BHC (Delta Hexachlorocyclohexane)	0.04	0.02 U	0.02 U	0.02 U
Dieldrin	0.004	0.02 U	0.02 U	0.02 U
Endosulfan Sulfate	NS	0.02 U	0.02 U	0.02 U
Endrin	ND	0.02 U	0.02 U	0.02 U
Endrin Aldehyde	5	0.02 U	0.02 U	0.02 U
Endrin Ketone	5	0.02 U	0.02 U	0.02 U
Gamma Bhc (Lindane)	0.05	0.02 U	0.02 U	0.02 U
Heptachlor	0.04	0.02 U	0.02 U	0.02 U
Heptachlor Epoxide	0.03	0.02 U	0.02 U	0.02 U
Methoxychlor	35	0.02 U	0.02 U	0.02 U
P,P'-DDD	0.3	0.02 U	0.02 U	0.02 U
P,P'-DDE	0.2	0.02 U	0.02 U	0.02 U
P,P'-DDT	0.2	0.02 U	0.02 U	0.02 U
Toxaphene	0.06	0.5 U	0.5 U	0.5 U

Attached Table 9
Hope Street Project
134 Hope Street
Brooklyn, New York
Groundwater - Pesticides

AKRF Sample ID		RI-MW-04_20190221	RI-MW-05_20190221	RI-MW-06_20190221
Laboratory Sample ID	NYSDEC	460-175945-4	460-175945-5	460-175945-6
Date Sampled	AWQSGV	2/21/2019	2/21/2019	2/21/2019
Compound/Unit		ug/L	ug/L	ug/L
Aldrin	ND	0.02 U	0.02 U	0.02 U
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.01	0.02 U	0.02 U	0.02 U
Alpha Endosulfan	NS	0.02 U	0.02 U	0.02 U
Beta Bhc (Beta Hexachlorocyclohexane)	0.04	0.02 U	0.02 U	0.02 U
Beta Endosulfan	NS	0.02 U	0.02 U	0.02 U
Chlordane, Total	0.05	0.5 U	0.5 U	0.5 U
Delta BHC (Delta Hexachlorocyclohexane)	0.04	0.02 U	0.02 U	0.02 U
Dieldrin	0.004	0.02 U	0.02 U	0.02 U
Endosulfan Sulfate	NS	0.02 U	0.02 U	0.02 U
Endrin	ND	0.02 U	0.02 U	0.02 U
Endrin Aldehyde	5	0.02 U	0.02 U	0.02 U
Endrin Ketone	5	0.02 U	0.02 U	0.02 U
Gamma Bhc (Lindane)	0.05	0.02 U	0.02 U	0.02 U
Heptachlor	0.04	0.02 U	0.02 U	0.02 U
Heptachlor Epoxide	0.03	0.02 U	0.02 U	0.02 U
Methoxychlor	35	0.02 U	0.02 U	0.02 U
P,P'-DDD	0.3	0.02 U	0.02 U	0.02 U
P,P'-DDE	0.2	0.02 U	0.02 U	0.02 U
P,P'-DDT	0.2	0.02 U	0.02 U	0.02 U
Toxaphene	0.06	0.5 U	0.5 U	0.5 U

Attached Table 9
Hope Street Project
134 Hope Street
Brooklyn, New York
Groundwater - Pesticides

AKRF Sample ID		RI-MW-X01_20190221	RI-MW-07_20190221	RI-FB-W_20190221
Laboratory Sample ID	NYSDEC	460-175945-9	460-175945-7	460-175945-8
Date Sampled	AWQSGV	2/21/2019	2/21/2019	2/21/2019
Compound/Unit		ug/L	ug/L	ug/L
Aldrin	ND	0.02 U	0.02 U	0.02 U
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.01	0.02 U	0.02 U	0.02 U
Alpha Endosulfan	NS	0.02 U	0.02 U	0.02 U
Beta Bhc (Beta Hexachlorocyclohexane)	0.04	0.02 U	0.02 U	0.02 U
Beta Endosulfan	NS	0.02 U	0.02 U	0.02 U
Chlordane, Total	0.05	0.5 U	0.5 U	0.5 U
Delta BHC (Delta Hexachlorocyclohexane)	0.04	0.02 U	0.02 U	0.02 U
Dieldrin	0.004	0.02 U	0.02 U	0.02 U
Endosulfan Sulfate	NS	0.02 U	0.02 U	0.02 U
Endrin	ND	0.02 U	0.02 U	0.02 U
Endrin Aldehyde	5	0.02 U	0.02 U	0.02 U
Endrin Ketone	5	0.02 U	0.02 U	0.02 U
Gamma Bhc (Lindane)	0.05	0.02 U	0.02 U	0.02 U
Heptachlor	0.04	0.02 U	0.02 U	0.02 U
Heptachlor Epoxide	0.03	0.02 U	0.02 U	0.02 U
Methoxychlor	35	0.02 U	0.02 U	0.02 U
P,P'-DDD	0.3	0.02 UJ	0.02 UJ	0.02 U
P,P'-DDE	0.2	0.02 UJ	0.02 UJ	0.02 U
P,P'-DDT	0.2	0.02 UJ	0.02 UJ	0.02 U
Toxaphene	0.06	0.5 U	0.5 U	0.5 U

Attached Table 10
Hope Street Project
134 Hope Street
Brooklyn, New York
Groundwater - Polychlorinated Biphenyls (PCBs)

AKRF Sample ID		**RI-MW-01_20190221**	**RI-MW-02_20190221**	**RI-MW-03_20190221**	**RI-MW-04_20190221**	**RI-MW-05_20190221**
Laboratory Sample ID	**NYSDEC**	**460-175945-1**	**460-175945-2**	**460-175945-3**	**460-175945-4**	**460-175945-5**
Date Sampled	**AWQSGV**	**2/21/2019**	**2/21/2019**	**2/21/2019**	**2/21/2019**	**2/21/2019**
Compound/Unit		**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**
PCB-1016 (Aroclor 1016)	**NS**	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
PCB-1221 (Aroclor 1221)	**NS**	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
PCB-1232 (Aroclor 1232)	**NS**	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
PCB-1242 (Aroclor 1242)	**NS**	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
PCB-1248 (Aroclor 1248)	**NS**	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
PCB-1254 (Aroclor 1254)	**NS**	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
PCB-1260 (Aroclor 1260)	**NS**	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
PCB-1262 (Aroclor 1262)	**NS**	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
PCB-1268 (Aroclor 1268)	**NS**	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
Total PCBs	**0.09**	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U

Attached Table 10
Hope Street Project
134 Hope Street
Brooklyn, New York
Groundwater - Polychlorinated Biphenyls (PCBs)

AKRF Sample ID		RI-MW-06_20190221	RI-MW-X01_20190221	RI-MW-07_20190221	RI-FB-W_20190221
Laboratory Sample ID	NYSDEC	460-175945-6	460-175945-9	460-175945-7	460-175945-8
Date Sampled	AWQSGV	2/21/2019	2/21/2019	2/21/2019	2/21/2019
Compound/Unit		ug/L	ug/L	ug/L	ug/L
PCB-1016 (Aroclor 1016)	NS	0.4 U	0.4 U	0.4 U	0.4 U
PCB-1221 (Aroclor 1221)	NS	0.4 U	0.4 U	0.4 U	0.4 U
PCB-1232 (Aroclor 1232)	NS	0.4 U	0.4 U	0.4 U	0.4 U
PCB-1242 (Aroclor 1242)	NS	0.4 U	0.4 U	0.4 U	0.4 U
PCB-1248 (Aroclor 1248)	NS	0.4 U	0.4 U	0.4 U	0.4 U
PCB-1254 (Aroclor 1254)	NS	0.4 U	0.4 U	0.4 U	0.4 U
PCB-1260 (Aroclor 1260)	NS	0.4 U	0.4 U	0.4 U	0.4 U
PCB-1262 (Aroclor 1262)	NS	0.4 U	0.4 U	0.4 U	0.4 U
PCB-1268 (Aroclor 1268)	NS	0.4 U	0.4 U	0.4 U	0.4 U
Total PCBs	0.09	0.4 U	0.4 U	0.4 U	0.4 U

Attached Table 11
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Groundwater - Total Metals

AKRF Sample ID	NYSDEC AWQSGV	RI-MW-01_20190221	RI-MW-01_20190221	RI-MW-02_20190221	RI-MW-02_20190221
Laboratory Sample ID		460-175945-1	460-175945-1	460-175945-2	460-175945-2
Date Sampled		2/21/2019	2/21/2019	2/21/2019	2/21/2019
Unit		ug/L	ug/L	ug/L	ug/L
Compound/Dilution Factor		1	2	1	2
Aluminum	NS	NR	157	NR	3500
Antimony	3	NR	2.6	NR	2 U
Arsenic	25	NR	15	NR	3.5
Barium	1,000	NR	22.7	NR	300
Beryllium	3	NR	0.8 U	NR	0.8 U
Cadmium	5	NR	2 U	NR	2 U
Calcium	NS	NR	92500	NR	169000
Chromium, Total	50	NR	**94.1**	NR	7.2
Cobalt	NS	NR	4 U	NR	3.2 J
Copper	200	NR	12	NR	6.1
Iron	300	NR	246	NR	**32800**
Lead	25	NR	7.7	NR	4.8
Magnesium	35,000	NR	9270	NR	**52900**
Manganese	300	NR	7.2 J	NR	**426**
Mercury	0.7	0.2 U	NR	0.2 U	NR
Nickel	100	NR	6	NR	7.8
Potassium	NS	NR	33800	NR	40700
Selenium	10	NR	10 U	NR	10 U
Silver	50	NR	2 U	NR	2 U
Sodium	20,000	NR	**92200**	NR	**87800**
Thallium	0.5	NR	0.8 U	NR	0.8 U
Vanadium	NS	NR	7.8	NR	8.9
Zinc	2,000	NR	16 U	NR	16 U

Attached Table 11
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Groundwater - Total Metals

AKRF Sample ID	NYSDEC AWQSGV	RI-MW-03_20190221	RI-MW-03_20190221	RI-MW-04_20190221	RI-MW-04_20190221
Laboratory Sample ID		460-175945-3	460-175945-3	460-175945-4	460-175945-4
Date Sampled		2/21/2019	2/21/2019	2/21/2019	2/21/2019
Unit		ug/L	ug/L	ug/L	ug/L
Compound/Dilution Factor		1	2	1	2
Aluminum	NS	NR	25300	NR	3930
Antimony	3	NR	0.83 J	NR	2 U
Arsenic	25	NR	7.1	NR	1.3 J
Barium	1,000	NR	111	NR	95.9
Beryllium	3	NR	0.62 J	NR	0.8 U
Cadmium	5	NR	2 U	NR	2 U
Calcium	NS	NR	36000	NR	NR
Chromium, Total	50	NR	40.6	NR	7.5
Cobalt	NS	NR	8.9	NR	3.8 J
Copper	200	NR	26.6	NR	8.3
Iron	300	NR	19000	NR	9120
Lead	25	NR	18.5	NR	11.4
Magnesium	35,000	NR	8450	NR	42000
Manganese	300	NR	176	NR	2980
Mercury	0.7	0.2 U	NR	0.2 U	NR
Nickel	100	NR	41.2	NR	6.2
Potassium	NS	NR	18400	NR	107000
Selenium	10	NR	10 U	NR	6 J
Silver	50	NR	2 U	NR	2 U
Sodium	20,000	NR	38800	NR	105000
Thallium	0.5	NR	0.2 J	NR	0.8 U
Vanadium	NS	NR	62.9	NR	11.2
Zinc	2,000	NR	51.7	NR	12.4 J

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Groundwater - Total Metals

AKRF Sample ID	NYSDEC AWQSGV	RI-MW-04_20190221	RI-MW-05_20190221	RI-MW-05_20190221	RI-MW-05_20190221
Laboratory Sample ID		460-175945-4	460-175945-5	460-175945-5	460-175945-5
Date Sampled		2/21/2019	2/21/2019	2/21/2019	2/21/2019
Unit		ug/L	ug/L	ug/L	ug/L
Compound/Dilution Factor		20	1	2	20
Aluminum	NS	NR	NR	4640	NR
Antimony	3	NR	NR	0.59 J	NR
Arsenic	25	NR	NR	4	NR
Barium	1,000	NR	NR	244	NR
Beryllium	3	NR	NR	0.8 U	NR
Cadmium	5	NR	NR	2 U	NR
Calcium	NS	367000	NR	NR	316000
Chromium, Total	50	NR	NR	15.3	NR
Cobalt	NS	NR	NR	3.9 J	NR
Copper	200	NR	NR	22.3	NR
Iron	300	NR	NR	**23500**	NR
Lead	25	NR	NR	**87.4**	NR
Magnesium	35,000	NR	NR	**48400**	NR
Manganese	300	NR	NR	**1370**	NR
Mercury	0.7	NR	0.18 J	NR	NR
Nickel	100	NR	NR	6.8	NR
Potassium	NS	NR	NR	100000	NR
Selenium	10	NR	NR	10 U	NR
Silver	50	NR	NR	2 U	NR
Sodium	20,000	NR	NR	**156000**	NR
Thallium	0.5	NR	NR	0.8 U	NR
Vanadium	NS	NR	NR	11.1	NR
Zinc	2,000	NR	NR	19.3	NR

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Groundwater - Total Metals

AKRF Sample ID	NYSDEC AWQSGV	RI-MW-06_20190221	RI-MW-06_20190221	RI-MW-X01_20190221	RI-MW-X01_20190221
Laboratory Sample ID		460-175945-6	460-175945-6	460-175945-9	460-175945-9
Date Sampled		2/21/2019	2/21/2019	2/21/2019	2/21/2019
Unit		ug/L	ug/L	ug/L	ug/L
Compound/Dilution Factor		1	2	1	2
Aluminum	NS	NR	112	NR	108
Antimony	3	NR	2 U	NR	2 U
Arsenic	25	NR	2 U	NR	2 U
Barium	1,000	NR	60.5	NR	59.7
Beryllium	3	NR	0.8 U	NR	0.8 U
Cadmium	5	NR	2 U	NR	2 U
Calcium	NS	NR	86500	NR	83600
Chromium, Total	50	NR	4 U	NR	4 UJ
Cobalt	NS	NR	4 U	NR	4 U
Copper	200	NR	4 U	NR	4 U
Iron	300	NR	217	NR	184
Lead	25	NR	1.4	NR	1 J
Magnesium	35,000	NR	8380	NR	8300
Manganese	300	NR	297	NR	281
Mercury	0.7	0.2 U	NR	0.2 U	NR
Nickel	100	NR	4 U	NR	4 U
Potassium	NS	NR	23300	NR	22800
Selenium	10	NR	**18.7**	NR	**18.6**
Silver	50	NR	2 U	NR	2 U
Sodium	20,000	NR	**52200**	NR	**51900**
Thallium	0.5	NR	0.8 U	NR	0.8 U
Vanadium	NS	NR	4 U	NR	4 U
Zinc	2,000	NR	16 U	NR	16 U

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Groundwater - Total Metals

AKRF Sample ID	NYSDEC AWQSGV	RI-MW-07_20190221	RI-MW-07_20190221	RI-FB-W_20190221	RI-FB-W_20190221
Laboratory Sample ID		460-175945-7	460-175945-7	460-175945-8	460-175945-8
Date Sampled		2/21/2019	2/21/2019	2/21/2019	2/21/2019
Unit		ug/L	ug/L	ug/L	ug/L
Compound/Dilution Factor		1	2	1	2
Aluminum	NS	NR	825	NR	40 U
Antimony	3	NR	2 U	NR	2 U
Arsenic	25	NR	1.6 J	NR	2 U
Barium	1,000	NR	19.9	NR	4 U
Beryllium	3	NR	0.8 U	NR	0.8 U
Cadmium	5	NR	2 U	NR	2 U
Calcium	NS	NR	49400	NR	200 U
Chromium, Total	50	NR	2.6 JJ	NR	4 U
Cobalt	NS	NR	4 U	NR	4 U
Copper	200	NR	5.6	NR	4 U
Iron	300	NR	**532**	NR	120 U
Lead	25	NR	2.1	NR	1.2 U
Magnesium	35,000	NR	2230	NR	200 U
Manganese	300	NR	60.3	NR	8 U
Mercury	0.7	0.2 U	NR	0.2 U	NR
Nickel	100	NR	4 U	NR	4 U
Potassium	NS	NR	17400	NR	200 U
Selenium	10	NR	**11.4**	NR	10 U
Silver	50	NR	2 U	NR	2 U
Sodium	20,000	NR	**21400**	NR	200 U
Thallium	0.5	NR	0.8 U	NR	0.8 U
Vanadium	NS	NR	4	NR	4 U
Zinc	2,000	NR	16 U	NR	16 U

Attached Table 12
Hope Street Project
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Groundwater - Dissolved Metals

AKRF Sample ID Laboratory Sample ID Date Sampled Unit Dilution Factor Compound	NYSDEC AWQSGV	RI-MW-01_20190221 460-175945-1 2/21/2019 ug/L 1	RI-MW-01_20190221 460-175945-1 2/21/2019 ug/L 2	RI-MW-02_20190221 460-175945-2 2/21/2019 ug/L 1	RI-MW-02_20190221 460-175945-2 2/21/2019 ug/L 2
Aluminum	**NS**	NR	26.7 J	NR	40 U
Antimony	**3**	NR	2.2	NR	2 U
Arsenic	**25**	NR	16	NR	2.9
Barium	**1,000**	NR	20.9	NR	315
Beryllium	**3**	NR	0.8 U	NR	0.8 U
Cadmium	**5**	NR	2 U	NR	2 U
Calcium	**NS**	NR	94200	NR	199000
Chromium, Total	**50**	NR	**85.1**	NR	4 U
Cobalt	**NS**	NR	4 U	NR	1.7 J
Copper	**200**	NR	8.5	NR	4 U
Iron	**300**	NR	120 U	NR	**30000**
Lead	**25**	NR	0.73 J	NR	1.2 U
Magnesium	**35,000**	NR	9110	NR	**60500**
Manganese	**300**	NR	8 U	NR	**399**
Mercury	**0.7**	0.2 U	NR	0.2 U	NR
Nickel	**100**	NR	4.8	NR	5.3
Potassium	**NS**	NR	34200	NR	47700
Selenium	**10**	NR	10 U	NR	10 U
Silver	**50**	NR	2 U	NR	2 U
Sodium	**20,000**	NR	**89000**	NR	**102000**
Thallium	**0.5**	NR	0.8 U	NR	0.8 U
Vanadium	**NS**	NR	6.4	NR	1.1 J
Zinc	**2,000**	NR	16 U	NR	16 U

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Groundwater - Dissolved Metals

AKRF Sample ID Laboratory Sample ID Date Sampled Unit Dilution Factor Compound	NYSDEC AWQSGV	RI-MW-03_20190221 460-175945-3 2/21/2019 ug/L 1	RI-MW-03_20190221 460-175945-3 2/21/2019 ug/L 2	RI-MW-04_20190221 460-175945-4 2/21/2019 ug/L 1	RI-MW-04_20190221 460-175945-4 2/21/2019 ug/L 2
Aluminum	**NS**	NR	271	NR	40 U
Antimony	**3**	NR	0.52 J	NR	2 U
Arsenic	**25**	NR	4.2	NR	2 U
Barium	**1,000**	NR	23.7	NR	87
Beryllium	**3**	NR	0.8 U	NR	0.8 U
Cadmium	**5**	NR	2 U	NR	2 U
Calcium	**NS**	NR	39500	NR	NR
Chromium, Total	**50**	NR	4 U	NR	4 U
Cobalt	**NS**	NR	1.6 J	NR	1.7 J
Copper	**200**	NR	4 U	NR	4 U
Iron	**300**	NR	68.6 J	NR	**2200**
Lead	**25**	NR	1.2 U	NR	1.2 U
Magnesium	**35,000**	NR	5070	NR	**43700**
Manganese	**300**	NR	23.3	NR	**3390**
Mercury	**0.7**	0.2 U	NR	0.2 U	NR
Nickel	**100**	NR	19.7	NR	4 U
Potassium	**NS**	NR	18800	NR	110000
Selenium	**10**	NR	10 U	NR	10 U
Silver	**50**	NR	2 U	NR	2 U
Sodium	**20,000**	NR	**43800**	NR	**111000**
Thallium	**0.5**	NR	0.8 U	NR	0.8 U
Vanadium	**NS**	NR	11.8	NR	4 U
Zinc	**2,000**	NR	16 U	NR	16 U

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Groundwater - Dissolved Metals

AKRF Sample ID Laboratory Sample ID Date Sampled Unit Dilution Factor Compound	NYSDEC AWQSGV	RI-MW-04_20190221 460-175945-4 2/21/2019 ug/L 20	RI-MW-05_20190221 460-175945-5 2/21/2019 ug/L 1	RI-MW-05_20190221 460-175945-5 2/21/2019 ug/L 2	RI-MW-05_20190221 460-175945-5 2/21/2019 ug/L 20
Aluminum	**NS**	NR	NR	40 U	NR
Antimony	**3**	NR	NR	2 U	NR
Arsenic	**25**	NR	NR	1.4 J	NR
Barium	**1,000**	NR	NR	228	NR
Beryllium	**3**	NR	NR	0.8 U	NR
Cadmium	**5**	NR	NR	2 U	NR
Calcium	**NS**	388000	NR	NR	355000
Chromium, Total	**50**	NR	NR	4 U	NR
Cobalt	**NS**	NR	NR	4 U	NR
Copper	**200**	NR	NR	4 U	NR
Iron	**300**	NR	NR	**16600**	NR
Lead	**25**	NR	NR	1.2 U	NR
Magnesium	**35,000**	NR	NR	**52300**	NR
Manganese	**300**	NR	NR	**1410**	NR
Mercury	**0.7**	NR	0.2 U	NR	NR
Nickel	**100**	NR	NR	4 U	NR
Potassium	**NS**	NR	NR	108000	NR
Selenium	**10**	NR	NR	10 U	NR
Silver	**50**	NR	NR	2 U	NR
Sodium	**20,000**	NR	NR	**170000**	NR
Thallium	**0.5**	NR	NR	0.8 U	NR
Vanadium	**NS**	NR	NR	4 U	NR
Zinc	**2,000**	NR	NR	16 U	NR

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Groundwater - Dissolved Metals

AKRF Sample ID Laboratory Sample ID Date Sampled Unit Dilution Factor Compound	NYSDEC AWQSGV	RI-MW-06_20190221 460-175945-6 2/21/2019 ug/L 1	RI-MW-06_20190221 460-175945-6 2/21/2019 ug/L 2	RI-MW-X01_20190221 460-175945-9 2/21/2019 ug/L 1	RI-MW-X01_20190221 460-175945-9 2/21/2019 ug/L 2
Aluminum	**NS**	NR	40 U	NR	40 U
Antimony	**3**	NR	2 U	NR	2 U
Arsenic	**25**	NR	2 U	NR	2 U
Barium	**1,000**	NR	57.2	NR	56.4
Beryllium	**3**	NR	0.8 U	NR	0.8 U
Cadmium	**5**	NR	2 U	NR	2 U
Calcium	**NS**	NR	86300	NR	87000
Chromium, Total	**50**	NR	4 U	NR	4 UJ
Cobalt	**NS**	NR	4 U	NR	4 U
Copper	**200**	NR	4 U	NR	4 U
Iron	**300**	NR	120 U	NR	120 U
Lead	**25**	NR	1.2 U	NR	1.2 U
Magnesium	**35,000**	NR	8430	NR	8280
Manganese	**300**	NR	298	NR	293
Mercury	**0.7**	0.2 U	NR	0.2 U	NR
Nickel	**100**	NR	4 U	NR	4 U
Potassium	**NS**	NR	23500	NR	23200
Selenium	**10**	NR	**18.7**	NR	**18.7**
Silver	**50**	NR	2 U	NR	2 U
Sodium	**20,000**	NR	**52300**	NR	**51700**
Thallium	**0.5**	NR	0.8 U	NR	0.8 U
Vanadium	**NS**	NR	4 U	NR	4 U
Zinc	**2,000**	NR	16 U	NR	16 U

Attached Table 12
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Groundwater - Dissolved Metals

AKRF Sample ID Laboratory Sample ID Date Sampled Unit Dilution Factor Compound	NYSDEC AWQSGV	RI-MW-07_20190221 460-175945-7 2/21/2019 ug/L 1	RI-MW-07_20190221 460-175945-7 2/21/2019 ug/L 2	RI-FB-W_20190221 460-175945-8 2/21/2019 ug/L 1	RI-FB-W_20190221 460-175945-8 2/21/2019 ug/L 2
Aluminum	**NS**	NR	178	NR	40 U
Antimony	**3**	NR	2 U	NR	2 U
Arsenic	**25**	NR	0.85 J	NR	2 U
Barium	**1,000**	NR	19.2	NR	4 U
Beryllium	**3**	NR	0.8 U	NR	0.8 U
Cadmium	**5**	NR	2 U	NR	2 U
Calcium	**NS**	NR	49300	NR	200 U
Chromium, Total	**50**	NR	4 UJ	NR	4 U
Cobalt	**NS**	NR	4 U	NR	4 U
Copper	**200**	NR	3.5 J	NR	4 U
Iron	**300**	NR	120 U	NR	120 U
Lead	**25**	NR	1.2 U	NR	1.2 U
Magnesium	**35,000**	NR	2070	NR	200 U
Manganese	**300**	NR	51.8	NR	8 U
Mercury	**0.7**	0.2 U	NR	0.2 U	NR
Nickel	**100**	NR	4 U	NR	4 U
Potassium	**NS**	NR	17500	NR	200 U
Selenium	**10**	NR	**11**	NR	10 U
Silver	**50**	NR	2 U	NR	2 U
Sodium	**20,000**	NR	**20900**	NR	200 U
Thallium	**0.5**	NR	0.8 U	NR	0.8 U
Vanadium	**NS**	NR	3.4 J	NR	4 U
Zinc	**2,000**	NR	16 U	NR	16 U

Attached Table 13
Hope Street Project
134 Hope Street
Brooklyn, New York
Groundwater - Per- and Polyfluoroalkyl Substances (PFAS)

AKRF Sample ID	RI-MW-03_20190221	RI-MW-06_20190221	RI-MW-X01_20190221	RI-FB-W_20190221
Laboratory Sample ID	200-47551-1	200-47551-2	200-47551-3	200-47551-4
Date Sampled	2/21/2019	2/21/2019	2/21/2019	2/21/2019
Unit	ng/L	ng/L	ng/L	ng/L
Dilution Factor	5	1	1	1
Compound				
6:2 Fluorotelomer sulfonate	87 U	18 U	17.7 U	16.5 U
8:2 Fluorotelomer sulfonate	87 U	18 U	17.7 U	16.5 U
N-ethyl perfluorooctanesulfonamidoacetic acid	87 U	18 U	17.7 U	16.5 U
N-methyl perfluorooctanesulfonamidoacetic acid	87 U	18 U	17.7 U	16.5 U
Perfluorobutanesulfonic acid	8.7 U	2.15	2.34	1.65 U
Perfluorobutanoic acid	6.28 J	1.68 J	1.12 J	1.65 U
Perfluorodecanesulfonic acid	8.7 U	1.8 U	1.77 U	1.65 U
Perfluorodecanoic acid	8.7 U	1.8 U	1.77 U	1.65 U
Perfluorododecanoic acid	8.7 U	1.8 U	1.77 U	1.65 U
Perfluoroheptanesulfonic acid	8.7 U	1.8 U	1.77 U	1.65 U
Perfluoroheptanoic acid	8.73	1.81	2.04	1.65 U
Perfluorohexanesulfonic acid	12.3	0.95 J	1.36 J	1.65 U
Perfluorohexanoic acid	12.5	2.44 J	1.35 JL	1.65 U
Perfluorononanoic acid	1.43 J	1.53 J	1.51 J	1.65 U
Perfluorooctanesulfonic acid	37.2	22.4	22.1	1.65 U
Perfluorooctanoic acid	41	17.1	18.1	1.65 U
Perfluoropentanoic acid	8.7 U	2.61	3.25	1.65 U
Perfluorotetradecanoic acid	8.7 U	1.8 U	1.77 U	1.65 U
Perfluorotridecanoic acid	8.7 UJ	1.8 U	1.77 U	1.65 U
Perfluoroundecanoic acid	8.7 U	1.8 U	1.77 U	1.65 U
Perfluroroctanesulfonamide	8.7 U	1.8 U	1.77 U	1.65 U
Total PFAS	119 J	52.7 J	53.2 JL	1.65 U

Attached Table 14
Hope Street Project
134 Hope Street
Brooklyn, New York
Ambient Air and Soil Vapor - Volatile Organic Compounds (VOCs)

AKRF Sample ID	RI-AA-01_20190214	RI-SV-01_20190214	RI-SV-01_20190214
Laboratory Sample ID	200-47417-1	200-47417-2	200-47417-2
Date Sampled	2/14/2019	2/14/2019	2/14/2019
Unit	ug/m^3	ug/m^3	ug/m^3
Dilution Factor	1	1	2
Compound			
1,1,1-Trichloroethane	1.1 UJ	1.1 U	NR
1,1,2,2-Tetrachloroethane	1.4 UJ	1.4 U	NR
1,1,2-Trichloro-1,2,2-Trifluoroethane	0.51 J	0.43 J	NR
1,1,2-Trichloroethane	1.1 UJ	1.1 U	NR
1,1-Dichloroethane	0.81 UJ	0.81 U	NR
1,1-Dichloroethene	0.14 UJ	0.14 U	NR
1,2,4-Trichlorobenzene	3.7 UJ	3.7 U	NR
1,2,4-Trimethylbenzene	0.98 UJ	1.5	NR
1,2-Dibromoethane (Ethylene Dibromide)	1.5 UJ	1.5 U	NR
1,2-Dichlorobenzene	1.2 UJ	1.2 U	NR
1,2-Dichloroethane	0.81 UJ	0.81 U	NR
1,2-Dichloropropane	0.92 UJ	0.92 U	NR
1,2-Dichlorotetrafluoroethane	1.4 UJ	1.4 U	NR
1,3,5-Trimethylbenzene (Mesitylene)	0.98 UJ	0.54 J	NR
1,3-Butadiene	0.44 UJ	0.21 J	NR
1,3-Dichlorobenzene	1.2 UJ	1.2 U	NR
1,4-Dichlorobenzene	1.2 UJ	1.2 U	NR
2,2,4-Trimethylpentane	2.4 J	1	NR
2-Chlorotoluene	1 UJ	1 U	NR
2-Hexanone	2 UJ	16	NR
4-Ethyltoluene	0.98 UJ	0.62 J	NR
Acetone	7.9 J	20	NR
Allyl Chloride (3-Chloropropene)	1.6 UJ	1.6 U	NR
Benzene	1.2 J	0.58 J	NR
Benzyl Chloride	1 UJ	1 U	NR
Bromodichloromethane	1.3 UJ	1.3 U	NR
Bromoform	2.1 UJ	2.1 U	NR
Bromomethane	0.78 UJ	0.78 U	NR
Carbon Disulfide	1.6 UJ	1.6 U	NR
Carbon Tetrachloride	0.45 J	0.34	NR
Chlorobenzene	0.92 UJ	0.92 U	NR
Chloroethane	1.3 UJ	1.3 U	NR
Chloroform	0.98 UJ	0.98 U	NR
Chloromethane	0.95 J	1 U	NR
Cis-1,2-Dichloroethylene	0.2 UJ	0.66	NR
Cis-1,3-Dichloropropene	0.91 UJ	0.91 U	NR
Cyclohexane	1.7 J	0.77	NR
Cymene	1.1 UJ	1.1 U	NR
Dibromochloromethane	1.7 UJ	1.7 U	NR
Dichlorodifluoromethane	1.7 J	2.1 J	NR
Ethylbenzene	0.53 J	4.7	NR
Isopropanol	12 UJ	12 U	NR
Isopropylbenzene (Cumene)	0.42 J	0.56 J	NR
M,P-Xylenes	2 J	20	NR
Methyl Ethyl Ketone (2-Butanone)	1.5 UJ	NR	160 D
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	2 UJ	2 U	NR
Methylene Chloride	13 J	5	NR
N-Butylbenzene	1.1 UJ	1.1 U	NR
N-Heptane	0.82 UJ	0.82 U	NR
N-Hexane	3.3 J	1.7	NR
N-Propylbenzene	0.98 UJ	0.66 J	NR
O-Xylene (1,2-Dimethylbenzene)	1	6.7	NR
Sec-Butylbenzene	1.1 UJ	1.1 U	NR
Styrene	0.84 J	0.99	NR
T-Butylbenzene	1.1 UJ	1.1 U	NR
Tert-Butyl Alcohol	15 UJ	15 U	NR
Tert-Butyl Methyl Ether	0.72 UJ	0.72 U	NR
Tetrachloroethylene (PCE)	1.4 UJ	90	NR
Tetrahydrofuran	15 UJ	15 U	NR
Toluene	3 J	3.5	NR
Trans-1,2-Dichloroethene	0.79 UJ	0.79 U	NR
Trans-1,3-Dichloropropene	0.91 UJ	0.91 U	NR
Trichloroethylene (TCE)	0.19 UJ	0.73	NR
Trichlorofluoromethane	1.3 J	1.2 U	NR
Vinyl Bromide	0.87 UJ	0.87 U	NR
Vinyl Chloride	0.2 UJ	0.2 U	NR

Attached Table 14
Hope Street Project
134 Hope Street
Brooklyn, New York
Ambient Air and Soil Vapor - Volatile Organic Compounds (VOCs)

AKRF Sample ID	RI-SV-02_20190214	RI-SV-03_20190214	RI-SV-03_20190214
Laboratory Sample ID	200-47417-3	200-47417-4	200-47417-4
Date Sampled	2/14/2019	2/14/2019	2/14/2019
Unit	ug/m^3	ug/m^3	ug/m^3
Dilution Factor	14	37	179
Compound			
1,1,1-Trichloroethane	15 U	40 U	NR
1,1,2,2-Tetrachloroethane	19 U	51 U	NR
1,1,2-Trichloro-1,2,2-Trifluoroethane	21 U	57 U	NR
1,1,2-Trichloroethane	15 U	40 U	NR
1,1-Dichloroethane	11 U	30 U	NR
1,1-Dichloroethene	1.9 U	5.1 U	NR
1,2,4-Trichlorobenzene	52 UJ	140 UJ	NR
1,2,4-Trimethylbenzene	14 U	36 U	NR
1,2-Dibromoethane (Ethylene Dibromide)	22 U	57 U	NR
1,2-Dichlorobenzene	17 U	44 U	NR
1,2-Dichloroethane	11 U	30 U	NR
1,2-Dichloropropane	13 U	34 U	NR
1,2-Dichlorotetrafluoroethane	20 U	52 U	NR
1,3,5-Trimethylbenzene (Mesitylene)	14 U	36 U	NR
1,3-Butadiene	6.2 U	16 U	NR
1,3-Dichlorobenzene	17 U	44 U	NR
1,4-Dichlorobenzene	17 U	44 U	NR
2,2,4-Trimethylpentane	13 U	35 U	NR
2-Chlorotoluene	14 U	38 U	NR
2-Hexanone	29 U	76 U	NR
4-Ethyltoluene	14 U	36 U	NR
Acetone	170 U	440 U	NR
Allyl Chloride (3-Chloropropene)	22 U	58 U	NR
Benzene	48	21 J	NR
Benzyl Chloride	14 UJ	38 UJ	NR
Bromodichloromethane	19 U	50 U	NR
Bromoform	29 UJ	76 UJ	NR
Bromomethane	11 U	29 U	NR
Carbon Disulfide	940	NR	12000 D
Carbon Tetrachloride	3.1 U	8.1 U	NR
Chlorobenzene	13 U	34 U	NR
Chloroethane	18 U	49 U	NR
Chloroform	14 U	36 U	NR
Chloromethane	14 U	38 U	NR
Cis-1,2-Dichloroethylene	2.8 U	7.4 U	NR
Cis-1,3-Dichloropropene	13 U	34 U	NR
Cyclohexane	9.6 U	25 U	NR
Cymene	15 UJ	41 UJ	NR
Dibromochloromethane	24 U	63 U	NR
Dichlorodifluoromethane	35 U	91 U	NR
Ethylbenzene	4.4 J	32 U	NR
Isopropanol	170 U	450 U	NR
Isopropylbenzene (Cumene)	14 U	36 U	NR
M,P-Xylenes	12 J	16 J	NR
Methyl Ethyl Ketone (2-Butanone)	130	260	NR
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	29 U	76 U	NR
Methylene Chloride	24 U	64 U	NR
N-Butylbenzene	15 UJ	41 UJ	NR
N-Heptane	370	33	NR
N-Hexane	1100	110	NR
N-Propylbenzene	14 U	36 U	NR
O-Xylene (1,2-Dimethylbenzene)	12 U	32 U	NR
Sec-Butylbenzene	15 U	41 U	NR
Styrene	12 U	32 U	NR
T-Butylbenzene	15 U	41 U	NR
Tert-Butyl Alcohol	210 U	560 U	NR
Tert-Butyl Methyl Ether	10 U	27 U	NR
Tetrachloroethylene (PCE)	9.1 J	620	NR
Tetrahydrofuran	210 U	550 U	NR
Toluene	16	19 J	NR
Trans-1,2-Dichloroethene	11 U	29 U	NR
Trans-1,3-Dichloropropene	13 U	34 U	NR
Trichloroethylene (TCE)	2.6 U	13	NR
Trichlorofluoromethane	16 U	42 U	NR
Vinyl Bromide	12 U	32 U	NR
Vinyl Chloride	2.8 U	7.4 U	NR

Attached Table 14
Hope Street Project
134 Hope Street
Brooklyn, New York
Ambient Air and Soil Vapor - Volatile Organic Compounds (VOCs)

AKRF Sample ID	RI-SV-04_20190214	RI-SV-04_20190214	RI-SV-05_20190214
Laboratory Sample ID	200-47417-5	200-47417-5	200-47417-6
Date Sampled	2/14/2019	2/14/2019	2/14/2019
Unit	ug/m^3	ug/m^3	ug/m^3
Dilution Factor	8	40	1
Compound			
1,1,1-Trichloroethane	8.7 U	NR	1.1 U
1,1,2,2-Tetrachloroethane	11 U	NR	1.4 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	12 U	NR	0.27 J
1,1,2-Trichloroethane	8.7 U	NR	1.1 U
1,1-Dichloroethane	6.5 U	NR	0.81 U
1,1-Dichloroethene	1.1 U	NR	0.14 U
1,2,4-Trichlorobenzene	30 UJ	NR	3.7 U
1,2,4-Trimethylbenzene	7.9 U	NR	0.88 J
1,2-Dibromoethane (Ethylene Dibromide)	12 U	NR	1.5 U
1,2-Dichlorobenzene	9.6 U	NR	1.2 U
1,2-Dichloroethane	6.5 U	NR	0.81 U
1,2-Dichloropropane	7.4 U	NR	0.92 U
1,2-Dichlorotetrafluoroethane	11 U	NR	1.4 U
1,3,5-Trimethylbenzene (Mesitylene)	7.9 U	NR	0.42 J
1,3-Butadiene	3.5 U	NR	2
1,3-Dichlorobenzene	9.6 U	NR	1.2 U
1,4-Dichlorobenzene	9.6 U	NR	1.2 U
2,2,4-Trimethylpentane	7.5 U	NR	1.2
2-Chlorotoluene	8.3 U	NR	1 U
2-Hexanone	24	NR	12
4-Ethyltoluene	7.9 U	NR	0.45 J
Acetone	95 U	NR	19
Allyl Chloride (3-Chloropropene)	13 U	NR	1.6 U
Benzene	26	NR	1.4
Benzyl Chloride	8.3 UJ	NR	1 U
Bromodichloromethane	11 U	NR	1.3 U
Bromoform	17 UJ	NR	2.1 U
Bromomethane	6.2 U	NR	0.78 U
Carbon Disulfide	21	NR	1.7
Carbon Tetrachloride	1.8 U	NR	0.22 U
Chlorobenzene	7.4 U	NR	0.92 U
Chloroethane	11 U	NR	1.3 U
Chloroform	7.8 U	NR	0.98 U
Chloromethane	8.3 U	NR	1 U
Cis-1,2-Dichloroethylene	1.6 U	NR	0.2 U
Cis-1,3-Dichloropropene	7.3 U	NR	0.91 U
Cyclohexane	5.5 U	NR	1.1
Cymene	8.8 UJ	NR	1.1 U
Dibromochloromethane	14 U	NR	1.7 U
Dichlorodifluoromethane	20 U	NR	1.9 J
Ethylbenzene	16	NR	5.6
Isopropanol	98 U	NR	12 U
Isopropylbenzene (Cumene)	7.9 U	NR	0.85 J
M,P-Xylenes	23	NR	19
Methyl Ethyl Ketone (2-Butanone)	220	NR	110
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	16 U	NR	2 U
Methylene Chloride	14 U	NR	5.2
N-Butylbenzene	8.8 UJ	NR	1.1 U
N-Heptane	NR	1300 D	0.82 U
N-Hexane	NR	2500 D	2.6
N-Propylbenzene	7.9 U	NR	0.55 J
O-Xylene (1,2-Dimethylbenzene)	8.1	NR	6.6
Sec-Butylbenzene	8.8 U	NR	1.1 U
Styrene	6.8 U	NR	0.89
T-Butylbenzene	8.8 U	NR	1.1 U
Tert-Butyl Alcohol	120 U	NR	15 U
Tert-Butyl Methyl Ether	5.8 U	NR	0.72 U
Tetrachloroethylene (PCE)	190	NR	100
Tetrahydrofuran	120 U	NR	15 U
Toluene	49	NR	7.7
Trans-1,2-Dichloroethene	6.3 U	NR	0.79 U
Trans-1,3-Dichloropropene	7.3 U	NR	0.91 U
Trichloroethylene (TCE)	1.5 U	NR	0.19 U
Trichlorofluoromethane	9 U	NR	2.2 U
Vinyl Bromide	7 U	NR	0.87 U
Vinyl Chloride	1.6 U	NR	0.2 U

AKRF Sample ID	RI-SV-06_20190214	RI-SV-06_20190214	RI-SV-07_20190214
Laboratory Sample ID	200-47417-7	200-47417-7	200-47417-8
Date Sampled	2/14/2019	2/14/2019	2/14/2019
Unit	ug/m^3	ug/m^3	ug/m^3
Dilution Factor	1	2.98	1
Compound			
1,1,1-Trichloroethane	1.1 U	NR	1.1 U
1,1,2,2-Tetrachloroethane	1.4 U	NR	1.4 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	0.52 J	NR	0.47 J
1,1,2-Trichloroethane	1.1 U	NR	1.1 U
1,1-Dichloroethane	0.81 U	NR	0.81 U
1,1-Dichloroethene	0.14 U	NR	0.14 U
1,2,4-Trichlorobenzene	3.7 U	NR	3.7 U
1,2,4-Trimethylbenzene	0.75 J	NR	0.98 U
1,2-Dibromoethane (Ethylene Dibromide)	1.5 U	NR	1.5 U
1,2-Dichlorobenzene	1.2 U	NR	1.2 U
1,2-Dichloroethane	0.81 U	NR	0.81 U
1,2-Dichloropropane	0.92 U	NR	0.92 U
1,2-Dichlorotetrafluoroethane	1.4 U	NR	1.4 U
1,3,5-Trimethylbenzene (Mesitylene)	0.32 J	NR	0.98 U
1,3-Butadiene	5	NR	0.33 J
1,3-Dichlorobenzene	1.2 U	NR	1.2 U
1,4-Dichlorobenzene	1.2 U	NR	1.2 U
2,2,4-Trimethylpentane	4.4	NR	1.9
2-Chlorotoluene	1 U	NR	1 U
2-Hexanone	7	NR	11
4-Ethyltoluene	0.37 J	NR	0.98 U
Acetone	23	NR	23
Allyl Chloride (3-Chloropropene)	1.6 U	NR	1.6 U
Benzene	1.5	NR	1.2
Benzyl Chloride	1 U	NR	1 U
Bromodichloromethane	1.3 U	NR	1.3 U
Bromoform	2.1 U	NR	2.1 U
Bromomethane	0.78 U	NR	0.78 U
Carbon Disulfide	0.76 J	NR	4.2
Carbon Tetrachloride	0.15 J	NR	0.35
Chlorobenzene	0.92 U	NR	0.25 J
Chloroethane	1.3 U	NR	1.3 U
Chloroform	0.98 U	NR	0.98 U
Chloromethane	1 U	NR	1 U
Cis-1,2-Dichloroethylene	0.2 U	NR	0.2 U
Cis-1,3-Dichloropropene	0.91 U	NR	0.91 U
Cyclohexane	1.7	NR	1.3
Cymene	1.1 U	NR	1.1 U
Dibromochloromethane	1.7 U	NR	1.7 U
Dichlorodifluoromethane	2.1 J	NR	2.1 J
Ethylbenzene	2.7	NR	6
Isopropanol	12 U	NR	12 U
Isopropylbenzene (Cumene)	0.6 J	NR	0.43 J
M,P-Xylenes	11	NR	16
Methyl Ethyl Ketone (2-Butanone)	81	NR	110
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	1.6 J	NR	2 U
Methylene Chloride	1.7 U	NR	1.7 U
N-Butylbenzene	1.1 U	NR	1.1 U
N-Heptane	0.82 U	NR	0.82 U
N-Hexane	2.3	NR	2.9
N-Propylbenzene	0.48 J	NR	0.98 U
O-Xylene (1,2-Dimethylbenzene)	3.8	NR	4.4
Sec-Butylbenzene	1.1 U	NR	1.1 U
Styrene	0.95	NR	0.85 U
T-Butylbenzene	1.1 U	NR	1.1 U
Tert-Butyl Alcohol	15 U	NR	15 U
Tert-Butyl Methyl Ether	0.36 J	NR	0.72 U
Tetrachloroethylene (PCE)	NR	520 D	33
Tetrahydrofuran	15 U	NR	15 U
Toluene	3.1	NR	7.2
Trans-1,2-Dichloroethene	0.79 U	NR	0.79 U
Trans-1,3-Dichloropropene	0.91 U	NR	0.91 U
Trichloroethylene (TCE)	1.8	NR	0.19 U
Trichlorofluoromethane	1.1 U	NR	1.1 U
Vinyl Bromide	0.87 U	NR	0.87 U
Vinyl Chloride	0.2 U	NR	0.2 U

Attached Table 14
Hope Street Project
134 Hope Street
Brooklyn, New York
Ambient Air and Soil Vapor - Volatile Organic Compounds (VOCs)

AKRF Sample ID Laboratory Sample ID Date Sampled Unit Dilution Factor Compound	RI-SV-08_20190214 200-47417-9 2/14/2019 ug/m^3 1	RI-SV-08_20190214 200-47417-9 2/14/2019 ug/m^3 4	RI-SV-09_20190214 200-47417-10 2/14/2019 ug/m^3 1
1,1,1-Trichloroethane	1.1 U	NR	1.1 U
1,1,2,2-Tetrachloroethane	1.4 U	NR	1.4 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	0.48 J	NR	0.45 J
1,1,2-Trichloroethane	1.1 U	NR	1.1 U
1,1-Dichloroethane	0.81 U	NR	0.81 U
1,1-Dichloroethene	0.13 J	NR	0.14 U
1,2,4-Trichlorobenzene	3.7 U	NR	3.7 U
1,2,4-Trimethylbenzene	2.2	NR	1.6
1,2-Dibromoethane (Ethylene Dibromide)	1.5 U	NR	1.5 U
1,2-Dichlorobenzene	1.2 U	NR	1.2 U
1,2-Dichloroethane	0.81 U	NR	0.81 U
1,2-Dichloropropane	0.92 U	NR	0.92 U
1,2-Dichlorotetrafluoroethane	1.4 U	NR	1.4 U
1,3,5-Trimethylbenzene (Mesitylene)	0.94 J	NR	0.71 J
1,3-Butadiene	2	NR	2.8
1,3-Dichlorobenzene	1.2 U	NR	1.2 U
1,4-Dichlorobenzene	1.2 U	NR	1.2 U
2,2,4-Trimethylpentane	20	NR	5.8
2-Chlorotoluene	1 U	NR	1 U
2-Hexanone	27	NR	34
4-Ethyltoluene	1.1	NR	0.85 J
Acetone	42	NR	28
Allyl Chloride (3-Chloropropene)	1.6 U	NR	1.6 U
Benzene	21	NR	4
Benzyl Chloride	1 U	NR	1 U
Bromodichloromethane	1.3 U	NR	1.3 U
Bromoform	2.1 U	NR	2.1 U
Bromomethane	0.78 U	NR	0.78 U
Carbon Disulfide	36	NR	9
Carbon Tetrachloride	0.35	NR	0.42
Chlorobenzene	0.92 U	NR	0.92 U
Chloroethane	1.3 U	NR	1.3 U
Chloroform	2.4	NR	1.8
Chloromethane	0.89 J	NR	1.4
Cis-1,2-Dichloroethylene	0.2 U	NR	2.6
Cis-1,3-Dichloropropene	0.91 U	NR	0.91 U
Cyclohexane	5.4	NR	2.1
Cymene	1.1 U	NR	1.1 U
Dibromochloromethane	1.7 U	NR	1.7 U
Dichlorodifluoromethane	2 J	NR	1.8 J
Ethylbenzene	8.9	NR	7.2
Isopropanol	12 U	NR	12 U
Isopropylbenzene (Cumene)	1.3	NR	1
M,P-Xylenes	28	NR	25
Methyl Ethyl Ketone (2-Butanone)	NR	130 D	NR
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	6	NR	2.6
Methylene Chloride	5.7	NR	2.1
N-Butylbenzene	1.1 U	NR	1.1 U
N-Heptane	10	NR	0.82 U
N-Hexane	19	NR	5.8
N-Propylbenzene	1.3	NR	1
O-Xylene (1,2-Dimethylbenzene)	9.4	NR	8.4
Sec-Butylbenzene	1.1 U	NR	1.1 U
Styrene	1	NR	1.2
T-Butylbenzene	1.1 U	NR	1.1 U
Tert-Butyl Alcohol	15 U	NR	15 U
Tert-Butyl Methyl Ether	1	NR	1.9
Tetrachloroethylene (PCE)	6.2	NR	4.3
Tetrahydrofuran	15 U	NR	15 U
Toluene	29	NR	8.3
Trans-1,2-Dichloroethene	0.79 U	NR	0.79 U
Trans-1,3-Dichloropropene	0.91 U	NR	0.91 U
Trichloroethylene (TCE)	0.22	NR	9.3
Trichlorofluoromethane	1.4	NR	1.4
Vinyl Bromide	0.87 U	NR	0.87 U
Vinyl Chloride	0.2 U	NR	3.3

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Hope Street Project
134 Hope Street
Brooklyn, New York
Ambient Air and Soil Vapor - Volatile Organic Compounds (VOCs)

AKRF Sample ID	RI-SV-09_20190214	RI-SV-10_20190214	RI-SV-10_20190214
Laboratory Sample ID	200-47417-10	200-47417-11	200-47417-11
Date Sampled	2/14/2019	2/14/2019	2/14/2019
Unit	ug/m^3	ug/m^3	ug/m^3
Dilution Factor	2.98	1	7.14
Compound			
1,1,1-Trichloroethane	NR	1.1 U	NR
1,1,2,2-Tetrachloroethane	NR	1.4 U	NR
1,1,2-Trichloro-1,2,2-Trifluoroethane	NR	0.53 J	NR
1,1,2-Trichloroethane	NR	1.1 U	NR
1,1-Dichloroethane	NR	0.81 U	NR
1,1-Dichloroethene	NR	0.14 U	NR
1,2,4-Trichlorobenzene	NR	3.7 U	NR
1,2,4-Trimethylbenzene	NR	1.7	NR
1,2-Dibromoethane (Ethylene Dibromide)	NR	1.5 U	NR
1,2-Dichlorobenzene	NR	1.2 U	NR
1,2-Dichloroethane	NR	0.81 U	NR
1,2-Dichloropropane	NR	0.92 U	NR
1,2-Dichlorotetrafluoroethane	NR	1.4 U	NR
1,3,5-Trimethylbenzene (Mesitylene)	NR	0.66 J	NR
1,3-Butadiene	NR	2.9	NR
1,3-Dichlorobenzene	NR	1.2 U	NR
1,4-Dichlorobenzene	NR	1.2 U	NR
2,2,4-Trimethylpentane	NR	6.3	NR
2-Chlorotoluene	NR	1 U	NR
2-Hexanone	NR	24	NR
4-Ethyltoluene	NR	0.77 J	NR
Acetone	NR	28	NR
Allyl Chloride (3-Chloropropene)	NR	1.6 U	NR
Benzene	NR	4	NR
Benzyl Chloride	NR	1 U	NR
Bromodichloromethane	NR	1.3 U	NR
Bromoform	NR	2.1 U	NR
Bromomethane	NR	0.78 U	NR
Carbon Disulfide	NR	4.2	NR
Carbon Tetrachloride	NR	0.2 J	NR
Chlorobenzene	NR	0.92 U	NR
Chloroethane	NR	1.3 U	NR
Chloroform	NR	1.1	NR
Chloromethane	NR	1 U	NR
Cis-1,2-Dichloroethylene	NR	8.4	NR
Cis-1,3-Dichloropropene	NR	0.91 U	NR
Cyclohexane	NR	3.4	NR
Cymene	NR	1.1 U	NR
Dibromochloromethane	NR	1.7 U	NR
Dichlorodifluoromethane	NR	2.7	NR
Ethylbenzene	NR	9.8	NR
Isopropanol	NR	12 U	NR
Isopropylbenzene (Cumene)	NR	0.72 J	NR
M,P-Xylenes	NR	32	NR
Methyl Ethyl Ketone (2-Butanone)	220 D	NR	99 D
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	NR	2 U	NR
Methylene Chloride	NR	3.9	NR
N-Butylbenzene	NR	1.1 U	NR
N-Heptane	NR	18	NR
N-Hexane	NR	26	NR
N-Propylbenzene	NR	0.79 J	NR
O-Xylene (1,2-Dimethylbenzene)	NR	10	NR
Sec-Butylbenzene	NR	1.1 U	NR
Styrene	NR	1.1	NR
T-Butylbenzene	NR	1.1 U	NR
Tert-Butyl Alcohol	NR	15 U	NR
Tert-Butyl Methyl Ether	NR	0.72 U	NR
Tetrachloroethylene (PCE)	NR	NR	1200 D
Tetrahydrofuran	NR	15 U	NR
Toluene	NR	24	NR
Trans-1,2-Dichloroethene	NR	0.44 J	NR
Trans-1,3-Dichloropropene	NR	0.91 U	NR
Trichloroethylene (TCE)	NR	NR	320 D
Trichlorofluoromethane	NR	1.6	NR
Vinyl Bromide	NR	0.87 U	NR
Vinyl Chloride	NR	0.2 U	NR

Attached Table 14
Hope Street Project
134 Hope Street
Brooklyn, New York
Ambient Air and Soil Vapor - Volatile Organic Compounds (VOCs)

AKRF Sample ID	RI-SV-11_20190214	RI-SV-12_20190214	RI-SV-13_20190214
Laboratory Sample ID	200-47417-12	200-47417-13	200-47417-14
Date Sampled	2/14/2019	2/14/2019	2/14/2019
Unit	ug/m^3	ug/m^3	ug/m^3
Dilution Factor	1	1	1
Compound			
1,1,1-Trichloroethane	1.1 UJ	1.1 U	1.1 U
1,1,2,2-Tetrachloroethane	1.4 UJ	1.4 U	1.4 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	0.49 J	0.57 J	0.49 J
1,1,2-Trichloroethane	1.1 UJ	1.1 U	1.1 U
1,1-Dichloroethane	0.81 UJ	0.81 U	0.81 U
1,1-Dichloroethene	0.14 UJ	0.14 U	0.14 U
1,2,4-Trichlorobenzene	3.7 UJ	3.7 U	3.7 U
1,2,4-Trimethylbenzene	0.57 J	1.5	3
1,2-Dibromoethane (Ethylene Dibromide)	1.5 UJ	1.5 U	1.5 U
1,2-Dichlorobenzene	1.2 UJ	1.2 U	1.2 U
1,2-Dichloroethane	0.81 UJ	0.81 U	0.81 U
1,2-Dichloropropane	0.92 UJ	0.92 U	0.92 U
1,2-Dichlorotetrafluoroethane	1.4 UJ	1.4 U	1.4 U
1,3,5-Trimethylbenzene (Mesitylene)	0.98 UJ	0.6 J	1.1
1,3-Butadiene	0.75 J	3.6	1.5
1,3-Dichlorobenzene	1.2 UJ	1.2 U	1.2 U
1,4-Dichlorobenzene	1.2 UJ	1.2 U	1.2 U
2,2,4-Trimethylpentane	1.9 J	5.8	3.6
2-Chlorotoluene	1 UJ	1 U	1 U
2-Hexanone	5 J	13	15
4-Ethyltoluene	0.98 UJ	0.68 J	1.1
Acetone	11 J	47	35
Allyl Chloride (3-Chloropropene)	1.6 UJ	1.6 U	1.6 U
Benzene	1.8 J	15	12
Benzyl Chloride	1 UJ	1 U	1 U
Bromodichloromethane	1.3 UJ	1.3 U	1.3 U
Bromoform	2.1 UJ	2.1 U	2.1 U
Bromomethane	0.78 UJ	0.78 U	0.78 U
Carbon Disulfide	1.9 J	9.8	24
Carbon Tetrachloride	0.39 J	0.39	0.35
Chlorobenzene	0.92 UJ	0.92 U	0.92 U
Chloroethane	1.3 UJ	1.3 U	1.3 U
Chloroform	0.98 UJ	1.1	0.48 J
Chloromethane	0.8 J	0.54 J	0.69 J
Cis-1,2-Dichloroethylene	0.2 UJ	0.2 U	0.2 U
Cis-1,3-Dichloropropene	0.91 UJ	0.91 U	0.91 U
Cyclohexane	0.63 J	1.5	2.1
Cymene	1.1 UJ	1.1 U	1.1 U
Dibromochloromethane	1.7 UJ	1.7 U	1.7 U
Dichlorodifluoromethane	2.1 J	1.7 J	1.8 J
Ethylbenzene	1.4 J	5.6	7
Isopropanol	12 UJ	12 U	12 U
Isopropylbenzene (Cumene)	0.98 UJ	0.81 J	0.8 J
M,P-Xylenes	5.2 J	18	25
Methyl Ethyl Ketone (2-Butanone)	42 J	110	100
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	2 UJ	3.3	3.2
Methylene Chloride	1.7 UJ	1.6 J	1.7 U
N-Butylbenzene	1.1 UJ	1.1 U	1.1 U
N-Heptane	1.7 J	3.7	4.1
N-Hexane	2.3 J	4.1	5.5
N-Propylbenzene	0.98 UJ	0.8 J	1.1
O-Xylene (1,2-Dimethylbenzene)	1.9 J	6.5	8.7
Sec-Butylbenzene	1.1 UJ	1.1 U	1.1 U
Styrene	0.45 J	3	1.3
T-Butylbenzene	1.1 UJ	1.1 U	1.1 U
Tert-Butyl Alcohol	15 UJ	15 U	15 U
Tert-Butyl Methyl Ether	0.72 UJ	0.77	0.34 J
Tetrachloroethylene (PCE)	1.4 J	1.6	1.6
Tetrahydrofuran	15 UJ	15 U	15 U
Toluene	3.4 J	12	8.6
Trans-1,2-Dichloroethene	0.79 UJ	0.79 U	0.79 U
Trans-1,3-Dichloropropene	0.91 UJ	0.91 U	0.91 U
Trichloroethylene (TCE)	2.4 J	0.25	0.26
Trichlorofluoromethane	1.3 J	1.3	1.3
Vinyl Bromide	0.87 UJ	0.87 U	0.87 U
Vinyl Chloride	0.2 UJ	0.2 U	0.2 U

Table 15
Hope Street Project
Soil Analytical Results
Volatile Organic Compounds

COMPOUND	NYSDEC Part 375.6 Groundwater Protection Soil Cleanup Objectives	NYSDEC Part 375.6 Unrestricted Use Soil Cleanup Objectives	NYDEC Part 375.6 Restricted Residential Soil Cleanup Objectives*	NYDEC Part 375.6 Restricted Commercial Soil Cleanup Objectives	428-B1		428-B1		428-B2		428-B2	
					(0-2')		(10-12')		(0-2')		(10-12')	
					7/3/2020		7/3/2020		7/3/2020		7/3/2020	
					µg/Kg		µg/Kg		µg/Kg		µg/Kg	
		µg/Kg	µg/Kg	µg/Kg	Result	RL	Result	RL	Result	RL	Result	RL
1,1,1,2-Tetrachlorothane					< 19	19	< 1200	1,200	< 4.5	4.5	< 45	45
1,1,1-Trichloroethane	680	680	100,000	500,000	< 4.8	4.8	< 680	680	< 4.5	4.5	< 11	11
1,1,2,2-Tetrachloroethane					< 4.8	4.8	< 1200	1,200	< 4.5	4.5	< 440	440
1,1,2-Trichloroethane					< 4.8	4.8	< 1200	1,200	< 4.5	4.5	< 11	11
1,1-Dichloroethane	270	270	26,000	240,000	< 4.8	4.8	< 270	270	< 4.5	4.5	< 11	11
1,1-Dichloroethene	330	330	100,000	500,000	< 4.8	4.8	< 330	330	< 4.5	4.5	< 11	11
1,1-Dichloropropene					< 4.8	4.8	< 1200	1,200	< 4.5	4.5	< 11	11
1,2,3-Trichlorobenzene					< 4.8	4.8	< 1200	1,200	< 4.5	4.5	< 440	440
1,2,3-Trichloropropane					< 4.8	4.8	< 1200	1,200	< 4.5	4.5	< 440	440
1,2,4-Trichlorobenzene					< 4.8	4.8	< 1200	1,200	< 4.5	4.5	< 440	440
1,2,4-Trimethylbenzene	3,600	3,600	52,000	190,000	< 4.8	4.8	**18,000**	1,200	< 4.5	4.5	< 440	440
1,2-Dibromo-3-chloropropane					< 4.8	4.8	< 1200	1,200	< 4.5	4.5	< 440	440
1,2-Dibromoethane					< 4.8	4.8	< 1200	1,200	< 4.5	4.5	< 11	11
1,2-Dichlorobenzene	1,100	1,100	100,000	500,000	< 4.8	4.8	< 1100	1,100	< 4.5	4.5	< 440	440
1,2-Dichloroethane	20	20	3,100	30,000	< 4.8	4.8	< 120	120	< 4.5	4.5	< 11	11
1,2-Dichloropropane					< 4.8	4.8	< 1200	1,200	< 4.5	4.5	< 11	11
1,3,5-Trimethylbenzene	8,400	8,400	52,000	190,000	< 4.8	4.8	**4,600**	1,200	< 4.5	4.5	< 440	440
1,3-Dichlorobenzene	2,400	2,400	4,900	280,000	< 4.8	4.8	< 1200	1,200	< 4.5	4.5	< 440	440
1,3-Dichloropropane					< 4.8	4.8	< 1200	1,200	< 4.5	4.5	< 11	11
1,4-Dichlorobenzene	1,800	1,800	13,000	130,000	< 4.8	4.8	< 1200	1,200	< 4.5	4.5	< 440	440
1,4-Dioxane		100	13,000	130,000	< 72	72	< 74	74	< 74	74	< 91	91
2,2-Dichloropropane					< 4.8	4.8	< 1200	1,200	< 4.5	4.5	< 11	11
2-Chlorotoluene					< 4.8	4.8	< 1200	1,200	< 4.5	4.5	< 440	440
2-Hexanone (Methyl Butyl Ketone)					< 24	24	< 6100	6,100	< 22	22	< 56	56
2-Isopropyltoluene					< 4.8	4.8	**270**	1,200	< 4.5	4.5	< 440	440
4-Chlorotoluene					< 4.8	4.8	< 1200	1,200	< 4.5	4.5	< 440	440
4-Methyl-2-Pentanone					< 24	24	< 6100	6,100	< 22	22	< 56	56
Acetone	50	50	100,000	500,000	< 24	24	< 1200	1,200	< 22	22	**68**	50
Acrolein					< 4.8	4.8	< 1200	1,200	< 4.5	4.5	< 11	11
Acrylonitrile					< 19	19	< 4900	4,900	< 9.0	9.0	< 45	45
Benzene	60	60	4,800	44,000	< 4.8	4.8	**130**	120	< 4.5	4.5	< 11	11
Bromobenzene					< 4.8	4.8	< 1200	1,200	< 4.5	4.5	< 440	440
Bromochloromethane					< 4.8	4.8	< 1200	1,200	< 4.5	4.5	< 11	11
Bromodichloromethane					< 4.8	4.8	< 1200	1,200	< 4.5	4.5	< 11	11
Bromoform					< 4.8	4.8	< 1200	1,200	< 4.5	4.5	< 11	11
Bromomethane					< 4.8	4.8	< 1200	1,200	< 4.5	4.5	< 11	11
Carbon Disulfide					< 4.8	4.8	< 1200	1,200	< 4.5	4.5	< 11	11
Carbon tetrachloride	760	760	2,400	22	< 4.8	4.8	< 760	760	< 4.5	4.5	< 11	11
Chlorobenzene	1,100	1,100	100,000	500,000	< 4.8	4.8	< 1100	1,100	< 4.5	4.5	< 11	11
Chloroethane					< 4.8	4.8	< 1200	1,200	< 4.5	4.5	< 11	11
Chloroform	370	370	49,000	350,000	< 4.8	4.8	< 370	370	< 4.5	4.5	< 11	11
Chloromethane					< 4.8	4.8	< 1200	1,200	< 4.5	4.5	< 11	11
cis-1,2-Dichloroethene	250	250	100,000	500,000	< 4.8	4.8	< 250	250	< 4.5	4.5	< 11	11
cis-1,3-Dichloropropene					< 4.8	4.8	< 1200	1,200	< 4.5	4.5	< 11	11
Dibromochloromethane					< 4.8	4.8	< 1200	1,200	< 4.5	4.5	< 11	11
Dibromomethane					< 4.8	4.8	< 1200	1,200	< 4.5	4.5	< 11	11
Dichlorodifluoromethane					< 4.8	4.8	< 1200	1,200	< 4.5	4.5	< 11	11
Ethylbenzene	1,000	1,000	41,000	390,000	< 4.8	4.8	**3,200**	1,200	< 4.5	4.5	< 11	11
Hexachlorobutadiene					< 4.8	4.8	< 1200	1,200	< 4.5	4.5	< 440	440
Isopropylbenzene					< 4.8	4.8	**1,200**	1,200	< 4.5	4.5	< 440	440
m&p-Xylenes	160	260	100,000	500,000	< 4.8	4.8	**11,000**	1,200	< 4.5	4.5	< 11	11
Methyl Ethyl Ketone (2-Butanone)	120	120	100,000	500,000	< 29	29	< 490	490	< 27	27	**17**	67
Methyl t-butyl ether (MTBE)	930	930	100,000	500,000	< 9.7	9.7	< 930	930	< 9.0	9.0	< 22	22
Methylene chloride	50	50	100,000	500,000	< 4.8	4.8	< 490	490	< 4.5	4.5	< 11	11
Naphthalene	12,000	12,000	100,000	500,000	< 4.8	4.8	**2,800**	1,200	< 4.5	4.5	< 440	440
n-Butylbenzene	12,000	12,000	100,000	500,000	< 4.8	4.8	**3,200**	1,200	< 4.5	4.5	< 440	440
n-Propylbenzene	3,900	3,900	100,000	500,000	< 4.8	4.8	**3,500**	1,200	< 4.5	4.5	< 440	440
o-Xylene	160	260	100,000	500,000	< 4.8	4.8	**5,000**	1,200	< 4.5	4.5	< 11	11
p-Isopropyltoluene					< 4.8	4.8	**1,200**	1,200	< 4.5	4.5	< 440	440
sec-Butylbenzene	11,000	11,000	100,000	500,000	< 4.8	4.8	**2,100**	1,200	< 4.5	4.5	< 440	440
Styrene					< 4.8	4.8	< 1200	1,200	< 4.5	4.5	< 11	11
tert-Butly alcohol					< 97	97	< 24000	24,000	< 90	90	< 220	220
tert-Butylbenzene	5,900	5,900	100,000	500,000	< 4.8	4.8	< 1200	1,200	< 4.5	4.5	< 440	440
Tetrachloroethene	1,300	1,300	19,000	150,000	< 4.8	4.8	< 1200	1,200	< 4.5	4.5	< 11	11
Tetrahydrofuran (THF)					< 9.7	9.7	< 2400	2,400	< 9.0	9.0	< 22	22
Toluene	700	700	100,000	500,000	< 4.8	4.8	**810**	700	< 4.5	4.5	< 11	11
trans-1,2-Dichloroethene	190	190	100,000	500,000	< 4.8	4.8	< 190	190	< 4.5	4.5	< 11	11
trans-1,3-Dichloropropene					< 4.8	4.8	< 1200	1,200	< 4.5	4.5	< 11	11
trans-1,4-dichloro-2-butene					< 9.7	9.7	< 2400	2,400	< 9.0	9.0	< 890	890
Trichloroethene	470	470	21,000	200,000	< 4.8	4.8	< 470	470	< 4.5	4.5	< 11	11
Trichlorofluoromethane					< 4.8	4.8	< 1200	1,200	< 4.5	4.5	< 11	11
Trichlorotrifluoroethane					< 4.8	4.8	< 1200	1,200	< 4.5	4.5	< 11	11
Vinyl Chloride	20	20	900	13,000	< 4.8	4.8	< 120	120	< 4.5	4.5	< 11	11
Total BTEX Concentration					0		20140		0		0	
Total VOCs Concentration					0.0		57010.0		0.0		85.0	

Notes:

* - 6 NYCRR Part 375-6 Remedial Program Soil Cleanup Objectives
RL - Reporting Limit
Bold/highlighted- Indicated exceedance of the NYSDEC GWP Guidance Value
Bold/highlighted- Indicated exceedance of the NYSDEC UUSCO Guidance Value
Bold/highlighted- Indicated exceedance of the NYSDEC RRSCO Guidance Value
Bold/highlighted- Indicated exceedance of the NYSDEC RCSCO Guidance Value

Table 15
Hope Street Project
Soil Analytical Results
Volatile Organic Compounds

COMPOUND	NYSDEC Part 375.6 Groundwater Protection Soil Cleanup Objectives	NYSDEC Part 375.6 Unrestricted Use Soil Cleanup Objectives	NYDEC Part 375.6 Restricted Residential Soil Cleanup Objectives*	NYDEC Part 375.6 Restricted Commercial Soil Cleanup Objectives	428-B3		428-B3		428-B4		428-B4		Duplicate	
					(0-2')		(10-12')		(0-2')		(10-12')		428-B2 (0-2')	
					7/3/2020		7/3/2020		7/3/2020		7/3/2020		7/3/2020	
					μg/Kg		μg/Kg		μg/Kg		μg/Kg		μg/Kg	
		μg/Kg	μg/Kg	μg/Kg	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL
1,1,1,2-Tetrachlorothane					< 4.0	4.0	< 26	26	< 20	20	< 6.7	6.7	< 17	17
1,1,1-Trichloroethane	680	680	100,000	500,000	< 4.0	4.0	< 6.6	6.6	< 4.9	4.9	< 6.7	6.7	< 4.2	4.2
1,1,2,2-Tetrachloroethane					< 4.0	4.0	< 350	350	< 290	290	< 6.7	6.7	< 4.2	4.2
1,1,2-Trichloroethane					< 4.0	4.0	< 6.6	6.6	< 4.9	4.9	< 6.7	6.7	< 4.2	4.2
1,1-Dichloroethane	270	270	26,000	240,000	< 4.0	4.0	< 6.6	6.6	< 4.9	4.9	< 6.7	6.7	< 4.2	4.2
1,1-Dichloroethene	330	330	100,000	500,000	< 4.0	4.0	< 6.6	6.6	< 4.9	4.9	< 6.7	6.7	< 4.2	4.2
1,1-Dichloropropene					< 4.0	4.0	< 6.6	6.6	< 4.9	4.9	< 6.7	6.7	< 4.2	4.2
1,2,3-Trichlorobenzene					< 4.0	4.0	< 350	350	< 290	290	< 6.7	6.7	< 4.2	4.2
1,2,3-Trichloropropane					< 4.0	4.0	< 350	350	< 290	290	< 6.7	6.7	< 4.2	4.2
1,2,4-Trichlorobenzene					< 4.0	4.0	< 350	350	< 290	290	< 6.7	6.7	< 4.2	4.2
1,2,4-Trimethylbenzene	3,600	3,600	52,000	190,000	< 4.0	4.0	< 350	350	< 290	290	< 6.7	6.7	< 4.2	4.2
1,2-Dibromo-3-chloropropane					< 4.0	4.0	< 350	350	< 290	290	< 6.7	6.7	< 4.2	4.2
1,2-Dibromoethane					< 4.0	4.0	< 6.6	6.6	< 4.9	4.9	< 6.7	6.7	< 4.2	4.2
1,2-Dichlorobenzene	1,100	1,100	100,000	500,000	< 4.0	4.0	< 350	350	< 290	290	< 6.7	6.7	< 4.2	4.2
1,2-Dichloroethane	20	20	3,100	30,000	< 4.0	4.0	< 6.6	6.6	< 4.9	4.9	< 6.7	6.7	< 4.2	4.2
1,2-Dichloropropane					< 4.0	4.0	< 6.6	6.6	< 4.9	4.9	< 6.7	6.7	< 4.2	4.2
1,3,5-Trimethylbenzene	8,400	8,400	52,000	190,000	< 4.0	4.0	< 350	350	< 290	290	< 6.7	6.7	< 4.2	4.2
1,3-Dichlorobenzene	2,400	2,400	4,900	280,000	< 4.0	4.0	< 350	350	< 290	290	< 6.7	6.7	< 4.2	4.2
1,3-Dichloropropane					< 4.0	4.0	< 6.6	6.6	< 4.9	4.9	< 6.7	6.7	< 4.2	4.2
1,4-Dichlorobenzene	1,800	1,800	13,000	130,000	< 4.0	4.0	< 350	350	< 290	290	< 6.7	6.7	< 4.2	4.2
1,4-Dioxane		100	13,000	130,000	< 74	74	< 79	79	< 77	77	< 93	93	< 74	74
2,2-Dichloropropane					< 4.0	4.0	< 6.6	6.6	< 4.9	4.9	< 6.7	6.7	< 4.2	4.2
2-Chlorotoluene					< 4.0	4.0	< 350	350	< 290	290	< 6.7	6.7	< 4.2	4.2
2-Hexanone (Methyl Butyl Ketone)					< 20	20	< 33	33	< 25	25	< 33	33	< 21	21
2-Isopropyltoluene					< 4.0	4.0	< 350	350	< 290	290	< 6.7	6.7	< 4.2	4.2
4-Chlorotoluene					< 4.0	4.0	< 350	350	< 290	290	< 6.7	6.7	< 4.2	4.2
4-Methyl-2-Pentanone					< 20	20	< 33	33	< 25	25	< 33	33	< 21	21
Acetone	50	50	100,000	500,000	< 20	20	**40**	30	< 25	25	**77**	33	< 21	21
Acrolein					< 4.0	4.0	< 6.6	6.6	< 4.9	4.9	< 6.7	6.7	< 4.2	4.2
Acrylonitrile					< 16	16	< 26	26	< 20	20	< 27	27	< 17	17
Benzene	60	60	4,800	44,000	< 4.0	4.0	< 6.6	6.6	< 4.9	4.9	< 6.7	6.7	< 4.2	4.2
Bromobenzene					< 4.0	4.0	< 350	350	< 290	290	< 6.7	6.7	< 4.2	4.2
Bromochloromethane					< 4.0	4.0	< 6.6	6.6	< 4.9	4.9	< 6.7	6.7	< 4.2	4.2
Bromodichloromethane					< 4.0	4.0	< 6.6	6.6	< 4.9	4.9	< 6.7	6.7	< 4.2	4.2
Bromoform					< 4.0	4.0	< 6.6	6.6	< 4.9	4.9	< 6.7	6.7	< 4.2	4.2
Bromomethane					< 4.0	4.0	< 6.6	6.6	< 4.9	4.9	< 6.7	6.7	< 4.2	4.2
Carbon Disulfide					< 4.0	4.0	< 6.6	6.6	< 4.9	4.9	< 6.7	6.7	< 4.2	4.2
Carbon tetrachloride	760	760	2,400	22	< 4.0	4.0	< 6.6	6.6	< 4.9	4.9	< 6.7	6.7	< 4.2	4.2
Chlorobenzene	1,100	1,100	100,000	500,000	< 4.0	4.0	< 6.6	6.6	< 4.9	4.9	< 6.7	6.7	< 4.2	4.2
Chloroethane					< 4.0	4.0	< 6.6	6.6	< 4.9	4.9	< 6.7	6.7	< 4.2	4.2
Chloroform	370	370	49,000	350,000	< 4.0	4.0	< 6.6	6.6	< 4.9	4.9	< 6.7	6.7	< 4.2	4.2
Chloromethane					< 4.0	4.0	< 6.6	6.6	< 4.9	4.9	< 6.7	6.7	< 4.2	4.2
cis-1,2-Dichloroethene	250	250	100,000	500,000	< 4.0	4.0	< 6.6	6.6	< 4.9	4.9	< 6.7	6.7	< 4.2	4.2
cis-1,3-Dichloropropene					< 4.0	4.0	< 6.6	6.6	< 4.9	4.9	< 6.7	6.7	< 4.2	4.2
Dibromochloromethane					< 4.0	4.0	< 6.6	6.6	< 4.9	4.9	< 6.7	6.7	< 4.2	4.2
Dibromomethane					< 4.0	4.0	< 6.6	6.6	< 4.9	4.9	< 6.7	6.7	< 4.2	4.2
Dichlorodifluoromethane					< 4.0	4.0	< 6.6	6.6	< 4.9	4.9	< 6.7	6.7	< 4.2	4.2
Ethylbenzene	1,000	1,000	41,000	390,000	< 4.0	4.0	< 6.6	6.6	< 4.9	4.9	< 6.7	6.7	< 4.2	4.2
Hexachlorobutadiene					< 4.0	4.0	< 350	350	< 290	290	< 6.7	6.7	< 4.2	4.2
Isopropylbenzene					< 4.0	4.0	< 350	350	< 290	290	< 6.7	6.7	< 4.2	4.2
m&p-Xylenes	160	260	100,000	500,000	< 4.0	4.0	< 6.6	6.6	< 4.9	4.9	< 6.7	6.7	< 4.2	4.2
Methyl Ethyl Ketone (2-Butanone)	120	120	100,000	500,000	< 24	24	**15**	40	< 30	30	**17**	40	< 25	25
Methyl t-butyl ether (MTBE)	930	930	100,000	500,000	< 8.1	8.1	< 13	13	< 9.9	9.9	< 13	13	< 8.3	8.3
Methylene chloride	50	50	100,000	500,000	< 4.0	4.0	< 6.6	6.6	< 4.9	4.9	< 6.7	6.7	< 4.2	4.2
Naphthalene	12,000	12,000	100,000	500,000	< 4.0	4.0	< 350	350	**1,500**	290	< 6.7	6.7	< 4.2	4.2
n-Butylbenzene	12,000	12,000	100,000	500,000	< 4.0	4.0	< 350	350	< 290	290	< 6.7	6.7	< 4.2	4.2
n-Propylbenzene	3,900	3,900	100,000	500,000	< 4.0	4.0	< 350	350	< 290	290	< 6.7	6.7	< 4.2	4.2
o-Xylene	160	260	100,000	500,000	< 4.0	4.0	< 6.6	6.6	< 4.9	4.9	< 6.7	6.7	< 4.2	4.2
p-Isopropyltoluene					< 4.0	4.0	< 350	350	< 290	290	< 6.7	6.7	< 4.2	4.2
sec-Butylbenzene	11,000	11,000	100,000	500,000	< 4.0	4.0	< 350	350	< 290	290	< 6.7	6.7	< 4.2	4.2
Styrene					< 4.0	4.0	< 6.6	6.6	< 4.9	4.9	< 6.7	6.7	< 4.2	4.2
tert-Butly alcohol					< 81	81	< 130	130	< 99	99	< 130	130	< 83	83
tert-Butylbenzene	5,900	5,900	100,000	500,000	< 4.0	4.0	< 350	350	< 290	290	< 6.7	6.7	< 4.2	4.2
Tetrachloroethene	1,300	1,300	19,000	150,000	< 4.0	4.0	< 6.6	6.6	< 4.9	4.9	< 6.7	6.7	< 4.2	4.2
Tetrahydrofuran (THF)					< 8.1	8.1	< 13	13	< 9.9	9.9	< 13	13	< 8.3	8.3
Toluene	700	700	100,000	500,000	< 4.0	4.0	**170**	140	< 4.9	4.9	< 6.7	6.7	< 4.2	4.2
trans-1,2-Dichloroethene	190	190	100,000	500,000	< 4.0	4.0	< 6.6	6.6	< 4.9	4.9	< 6.7	6.7	< 4.2	4.2
trans-1,3-Dichloropropene					< 4.0	4.0	< 6.6	6.6	< 4.9	4.9	< 6.7	6.7	< 4.2	4.2
trans-1,4-dichloro-2-butene					< 8.1	8.1	< 700	700	< 570	570	< 13	13	< 8.3	8.3
Trichloroethene	470	470	21,000	200,000	< 4.0	4.0	< 6.6	6.6	< 4.9	4.9	< 6.7	6.7	< 4.2	4.2
Trichlorofluoromethane					< 4.0	4.0	< 6.6	6.6	< 4.9	4.9	< 6.7	6.7	< 4.2	4.2
Trichlorotrifluoroethane					< 4.0	4.0	< 6.6	6.6	< 4.9	4.9	< 6.7	6.7	< 4.2	4.2
Vinyl Chloride	20	20	900	13,000	< 4.0	4.0	< 6.6	6.6	< 4.9	4.9	< 6.7	6.7	< 4.2	4.2
Total BTEX Concentration					**0**		**170**		**0**		**0**		**0**	
Total VOCs Concentration					**0.0**		**225.0**		**1500.0**		**94.0**		**0.0**	

Notes:

* - 6 NYCRR Part 375-6 Remedial Program Soil Cleanup Objectives

RL - Reporting Limit

Bold/highlighted- Indicated exceedance of the NYSDEC GWP Guidance Value

Bold/highlighted- Indicated exceedance of the NYSDEC UUSCO Guidance Value

Bold/highlighted- Indicated exceedance of the NYSDEC RRSCO Guidance Value

Bold/highlighted- Indicated exceedance of the NYSDEC RCSCO Guidance Value

Table 16
Hope Street Project - Lot 4
Soil Analytical Results
Semi-Volatile Organic Compounds

COMPOUND	NYSDEC Part 375.6 Unrestricted Use Soil Cleanup Objectives	NYDEC Part 375.6 Restricted Residential Soil Cleanup Objectives*	NYDEC Part 375.6 Restricted Commercial Soil Cleanup Objectives	428-B1		428-B1		428-B2		428-B2	
				(0-2')		(10-12')		(0-2')		(10-12')	
				7/3/2020		7/3/2020		7/3/2020		7/3/2020	
				µg/Kg		µg/Kg		µg/Kg		µg/Kg	
	µg/Kg	µg/Kg	µg/Kg	Result	RL	Result	RL	Result	RL	Result	RL
1,2,4,5-Tetrachlorobenzene				< 250	250	< 260	260	< 260	260	< 320	320
1,2,4-Trichlorobenzene				< 250	250	< 260	260	< 260	260	< 320	320
1,2-Dichlorobenzene				< 250	250	< 260	260	< 260	260	< 320	320
1,2-Diphenylhydrazine				< 250	250	< 260	260	< 260	260	< 320	320
1,3-Dichlorobenzene				< 250	250	< 260	260	< 260	260	< 320	320
1,4-Dichlorobenzene				< 250	250	< 260	260	< 260	260	< 320	320
2,4,5-Trichlorophenol				< 250	250	< 260	260	< 260	260	< 320	320
2,4,6-Trichlorophenol				< 180	180	< 190	190	< 190	190	< 230	230
2,4-Dichlorophenol				< 180	180	< 190	190	< 190	190	< 230	230
2,4-Dimethylphenol				< 250	250	< 260	260	< 260	260	< 320	320
2,4-Dinitrophenol				< 250	250	< 260	260	< 260	260	< 320	320
2,4-Dinitrotoluene				< 180	180	< 190	190	< 190	190	< 230	230
2,6-Dinitrotoluene				< 180	180	< 190	190	< 190	190	< 230	230
2-Chloronaphthalene				< 250	250	< 260	260	< 260	260	< 320	320
2-Chlorophenol				< 250	250	< 260	260	< 260	260	< 320	320
2-Methylnaphthalene				< 250	250	**5,800**	260	< 260	260	< 320	320
2-Methylphenol (o-cresol)	330	100,000	500,000	< 250	250	< 260	260	< 260	260	< 320	320
2-Nitroaniline				< 250	250	< 260	260	< 260	260	< 320	320
2-Nitrophenol				< 250	250	< 260	260	< 260	260	< 320	320
3&4-Methylphenol (m&p-cresol)	330	100,000	500,000	< 250	250	< 260	260	< 260	260	**260**	320
3,3'-Dichlorobenzidine				< 180	180	< 190	190	< 190	190	< 230	230
3-Nitroaniline				< 360	360	< 380	380	< 370	370	< 460	460
4,6-Dinitro-2-methylphenol				< 220	220	< 230	230	< 220	220	< 270	270
4-Bromophenyl phenyl ether				< 250	250	< 260	260	< 260	260	< 320	320
4-Chloro-3-methylphenol				< 250	250	< 260	260	< 260	260	< 320	320
4-Chloroaniline				< 290	290	< 300	300	< 300	300	< 370	370
4-Chlorophenyl phenyl ether				< 250	250	< 260	260	< 260	260	< 320	320
4-Nitroaniline				< 360	360	< 380	380	< 370	370	< 460	460
4-Nitrophenol				< 360	360	< 380	380	< 370	370	< 460	460
Acenaphthene	20,000	100,000	500,000	< 250	250	**1,900**	260	< 260	260	< 320	320
Acenaphthylene	100,000	100,000	500,000	< 250	250	< 260	260	< 260	260	< 320	320
Acetophenone				< 250	250	< 260	260	< 260	260	< 320	320
Aniline				< 290	290	< 300	300	< 300	300	< 370	370
Anthracene	100,000	100,000	500,000	< 250	250	**2,900**	260	< 260	260	< 320	320
Benz(a)anthracene	1,000	1,000	5,600	< 250	250	**4,800**	260	< 260	260	< 320	320
Benzidine				< 360	360	< 380	380	< 370	370	< 460	460
Benzo(a)pyrene	1,000	1,000	1,000	< 180	180	**4,100**	190	< 190	190	< 230	230
Benzo(b)fluoranthene	1,000	1,000	5,600	< 250	250	**3,600**	260	< 260	260	< 320	320
Benzo(ghi)perylene	100,000	100,000	500,000	< 250	250	**1,800**	260	< 260	260	< 320	320
Benzo(k)fluoranthene	800	3,900	56,000	< 250	250	**3,100**	260	< 260	260	< 320	320
Benzoic acid				< 1800	1,800	< 1900	1,900	< 1900	1,900	< 2300	2,300
Benzyl butyl phthalate				< 250	250	**160**	260	< 260	260	< 320	320
Bis(2-chloroethoxy)methane				< 250	250	< 260	260	< 260	260	< 320	320
Bis(2-chloroethyl)ether				< 180	180	< 190	190	< 190	190	< 230	230
Bis(2-chloroisopropyl)ether				< 250	250	< 260	260	< 260	260	< 320	320
Bis(2-ethylhexyl)phthalate				< 250	250	**230**	260	< 260	260	< 320	320
Carbazole				< 180	180	**1,300**	190	< 190	190	< 230	230
Chrysene	1,000	3,900	56,000	< 250	250	**4,200**	260	< 260	260	< 320	320
Dibenz(a,h)anthracene	330	330	560	< 180	180	**560**	190	< 190	190	< 230	230
Dibenzofuran	7,000	59,000	59,000	< 250	250	**1,000**	260	< 260	260	< 320	320
Diethyl phthalate				< 250	250	< 260	260	< 260	260	< 320	320
Dimethylphthalate				< 250	250	< 260	260	< 260	260	< 320	320
Di-n-butylphthalate				< 250	250	< 260	260	< 260	260	< 320	320
Di-n-octylphthalate				< 250	250	< 260	260	< 260	260	< 320	320
Fluoranthene	100,000	100,000	500,000	< 250	250	**11,000**	2,600	< 260	260	< 320	320
Fluorene	30,000	100,000	500,000	< 250	250	**2,400**	260	< 260	260	< 320	320
Hexachlorobenzene				< 180	180	< 190	190	< 190	190	< 230	230
Hexachlorobutadiene				< 250	250	< 260	260	< 260	260	< 320	320
Hexachlorocyclopentadiene				< 250	250	< 260	260	< 260	260	< 320	320
Hexachloroethane				< 180	180	< 190	190	< 190	190	< 230	230
Indeno(1,2,3-cd)pyrene	500	500	5,600	< 250	250	**2,400**	260	< 260	260	< 320	320
Isophorone				< 180	180	< 190	190	< 190	190	< 230	230
Naphthalene	12,000	100,000	500,000	< 250	250	**2,300**	260	< 260	260	< 320	320
Nitrobenzene				< 180	180	< 190	190	< 190	190	< 230	230
N-Nitrosodimethylamine				< 250	250	< 260	260	< 260	260	< 320	320
N-Nitrosodi-n-propylamine				< 180	180	< 190	190	< 190	190	< 230	230
N-Nitrosodiphenylamine				< 250	250	< 260	260	< 260	260	< 320	320
Pentachloronitrobenzene				< 250	250	< 260	260	< 260	260	< 320	320
Pentachlorophenol	800	6,700	6,700	< 220	220	< 230	230	< 220	220	< 270	270
Phenanthrene	100,000	100,000	500,000	< 250	250	**9,900**	2,600	< 260	260	< 320	320
Phenol	330	100,000	500,000	< 250	250	< 260	260	< 260	260	< 320	320
Pyrene	100,000	100,000	500,000	< 250	250	**8,800**	2,600	< 260	260	< 320	320
Pyridine				< 250	250	< 260	260	< 260	260	< 320	320

Notes:

* - 6 NYCRR Part 375-6 Remedial Program Soil Cleanup Objectives

RL - Reporting Limit

Bold/highlighted- Indicated exceedance of the NYSDEC UUSCO Guidance Value

Bold/highlighted- Indicated exceedance of the NYSDEC RRSCO Guidance Value

Bold/highlighted- Indicated exceedance of the NYSDEC RCSCO Guidance Value

Table 16
Hope Street Project - Lot 4
Soil Analytical Results
Semi-Volatile Organic Compounds

COMPOUND	NYSDEC Part 375.6 Unrestricted Use Soil Cleanup Objectives	NYDEC Part 375.6 Restricted Residential Soil Cleanup Objectives*	NYDEC Part 375.6 Restricted Commercial Soil Cleanup Objectives	428-B3		428-B3		428-B4		428-B4		Duplicate	
				(0-2')		(10-12')		(0-2')		(10-12')		428-B2 (0-2')	
				7/3/2020		7/3/2020		7/3/2020		7/3/2020		7/3/2020	
				µg/Kg		µg/Kg		µg/Kg		µg/Kg		µg/Kg	
	µg/Kg	µg/Kg	µg/Kg	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL
1,2,4,5-Tetrachlorobenzene				< 260	260	< 270	270	< 270	270	< 320	320	< 250	250
1,2,4-Trichlorobenzene				< 260	260	< 270	270	< 270	270	< 320	320	< 250	250
1,2-Dichlorobenzene				< 260	260	< 270	270	< 270	270	< 320	320	< 250	250
1,2-Diphenylhydrazine				< 260	260	< 270	270	< 270	270	< 320	320	< 250	250
1,3-Dichlorobenzene				< 260	260	< 270	270	< 270	270	< 320	320	< 250	250
1,4-Dichlorobenzene				< 260	260	< 270	270	< 270	270	< 320	320	< 250	250
2,4,5-Trichlorophenol				< 260	260	< 270	270	< 270	270	< 320	320	< 250	250
2,4,6-Trichlorophenol				< 190	190	< 190	190	< 190	190	< 230	230	< 180	180
2,4-Dichlorophenol				< 190	190	< 190	190	< 190	190	< 230	230	< 180	180
2,4-Dimethylphenol				< 260	260	< 270	270	**440**	270	< 320	320	< 250	250
2,4-Dinitrophenol				< 260	260	< 270	270	< 270	270	< 320	320	< 250	250
2,4-Dinitrotoluene				< 190	190	< 190	190	< 190	190	< 230	230	< 180	180
2,6-Dinitrotoluene				< 190	190	< 190	190	< 190	190	< 230	230	< 180	180
2-Chloronaphthalene				< 260	260	< 270	270	< 270	270	< 320	320	< 250	250
2-Chlorophenol				< 260	260	< 270	270	< 270	270	< 320	320	< 250	250
2-Methylnaphthalene				< 260	260	< 270	270	**3,900**	270	< 320	320	< 250	250
2-Methylphenol (o-cresol)	330	100,000	500,000	< 260	260	< 270	270	**340**	270	< 320	320	< 250	250
2-Nitroaniline				< 260	260	< 270	270	< 270	270	< 320	320	< 250	250
2-Nitrophenol				< 260	260	< 270	270	< 270	270	< 320	320	< 250	250
3&4-Methylphenol (m&p-cresol)	330	100,000	500,000	< 260	260	< 270	270	**640**	270	< 320	320	< 250	250
3,3'-Dichlorobenzidine				< 190	190	< 190	190	< 190	190	< 230	230	< 180	180
3-Nitroaniline				< 380	380	< 390	390	< 390	390	< 460	460	< 360	360
4,6-Dinitro-2-methylphenol				< 230	230	< 230	230	< 230	230	< 280	280	< 220	220
4-Bromophenyl phenyl ether				< 260	260	< 270	270	< 270	270	< 320	320	< 250	250
4-Chloro-3-methylphenol				< 260	260	< 270	270	< 270	270	< 320	320	< 250	250
4-Chloroaniline				< 300	300	< 310	310	< 310	310	< 370	370	< 290	290
4-Chlorophenyl phenyl ether				< 260	260	< 270	270	< 270	270	< 320	320	< 250	250
4-Nitroaniline				< 380	380	< 390	390	< 390	390	< 460	460	< 360	360
4-Nitrophenol				< 380	380	< 390	390	< 390	390	< 460	460	< 360	360
Acenaphthene	20,000	100,000	500,000	< 260	260	< 270	270	**5,400**	270	< 320	320	< 250	250
Acenaphthylene	100,000	100,000	500,000	< 260	260	< 270	270	**1,100**	270	< 320	320	< 250	250
Acetophenone				< 260	260	< 270	270	< 270	270	< 320	320	< 250	250
Aniline				< 300	300	< 310	310	< 310	310	< 370	370	< 290	290
Anthracene	100,000	100,000	500,000	< 260	260	< 270	270	**11,000**	2,700	< 320	320	< 250	250
Benz(a)anthracene	1,000	1,000	5,600	< 260	260	< 270	270	**22,000**	2,700	< 320	320	< 250	250
Benzidine				< 380	380	< 390	390	< 390	390	< 460	460	< 360	360
Benzo(a)pyrene	1,000	1,000	1,000	< 190	190	< 190	190	**19,000**	1,900	< 230	230	< 180	180
Benzo(b)fluoranthene	1,000	1,000	5,600	< 260	260	< 270	270	**15,000**	2,700	< 320	320	< 250	250
Benzo(ghi)perylene	100,000	100,000	500,000	< 260	260	< 270	270	**3,800**	270	< 320	320	< 250	250
Benzo(k)fluoranthene	800	3,900	56,000	< 260	260	< 270	270	**14,000**	2,700	< 320	320	< 250	250
Benzoic acid				< 1900	1,900	< 1900	1,900	< 1900	1,900	< 2300	2,300	< 1800	1,800
Benzyl butyl phthalate				< 260	260	< 270	270	< 270	270	< 320	320	< 250	250
Bis(2-chloroethoxy)methane				< 260	260	< 270	270	< 270	270	< 320	320	< 250	250
Bis(2-chloroethyl)ether				< 190	190	< 190	190	< 190	190	< 230	230	< 180	180
Bis(2-chloroisopropyl)ether				< 260	260	< 270	270	< 270	270	< 320	320	< 250	250
Bis(2-ethylhexyl)phthalate				< 260	260	< 270	270	< 270	270	< 320	320	< 250	250
Carbazole				< 190	190	< 190	190	**4,400**	190	< 230	230	< 180	180
Chrysene	1,000	3,900	56,000	< 260	260	< 270	270	**21,000**	2,700	< 320	320	< 250	250
Dibenz(a,h)anthracene	330	330	560	< 190	190	< 190	190	**2,600**	190	< 230	230	< 180	180
Dibenzofuran	7,000	59,000	59,000	< 260	260	< 270	270	**5,300**	270	< 320	320	< 250	250
Diethyl phthalate				< 260	260	< 270	270	< 270	270	< 320	320	< 250	250
Dimethylphthalate				< 260	260	< 270	270	< 270	270	< 320	320	< 250	250
Di-n-butylphthalate				< 260	260	< 270	270	< 270	270	< 320	320	< 250	250
Di-n-octylphthalate				< 260	260	< 270	270	< 270	270	< 320	320	< 250	250
Fluoranthene	100,000	100,000	500,000	< 260	260	< 270	270	**44,000**	2,700	< 320	320	< 250	250
Fluorene	30,000	100,000	500,000	< 260	260	< 270	270	**4,800**	270	< 320	320	< 250	250
Hexachlorobenzene				< 190	190	< 190	190	< 190	190	< 230	230	< 180	180
Hexachlorobutadiene				< 260	260	< 270	270	< 270	270	< 320	320	< 250	250
Hexachlorocyclopentadiene				< 260	260	< 270	270	< 270	270	< 320	320	< 250	250
Hexachloroethane				< 190	190	< 190	190	< 190	190	< 230	230	< 180	180
Indeno(1,2,3-cd)pyrene	500	500	5,600	< 260	260	< 270	270	**6,700**	270	< 320	320	< 250	250
Isophorone				< 190	190	< 190	190	< 190	190	< 230	230	< 180	180
Naphthalene	12,000	100,000	500,000	< 260	260	< 270	270	**11,000**	2,700	< 320	320	< 250	250
Nitrobenzene				< 190	190	< 190	190	< 190	190	< 230	230	< 180	180
N-Nitrosodimethylamine				< 260	260	< 270	270	< 270	270	< 320	320	< 250	250
N-Nitrosodi-n-propylamine				< 190	190	< 190	190	< 190	190	< 230	230	< 180	180
N-Nitrosodiphenylamine				< 260	260	< 270	270	< 270	270	< 320	320	< 250	250
Pentachloronitrobenzene				< 260	260	< 270	270	< 270	270	< 320	320	< 250	250
Pentachlorophenol	800	6,700	6,700	< 230	230	< 230	230	< 230	230	< 280	280	< 220	220
Phenanthrene	100,000	100,000	500,000	< 260	260	< 270	270	**44,000**	2,700	< 320	320	< 250	250
Phenol	330	100,000	500,000	< 260	260	< 270	270	< 270	270	< 320	320	< 250	250
Pyrene	100,000	100,000	500,000	< 260	260	< 270	270	**41,000**	2,700	< 320	320	< 250	250
Pyridine				< 260	260	< 270	270	< 270	270	< 320	320	< 250	250

Notes:

* - 6 NYCRR Part 375-6 Remedial Program Soil Cleanup Objectives

RL - Reporting Limit

Bold/highlighted- Indicated exceedance of the NYSDEC UUSCO Guidance Value

Bold/highlighted- Indicated exceedance of the NYSDEC RRSCO Guidance Value

Bold/highlighted- Indicated exceedance of the NYSDEC RCSCO Guidance Value

Table 17
Hope Street Project - Lot 4
Soil Analytical Results
Pesticides PCBs

	COMPOUND	NYSDEC Part 375.6 Unrestricted Use Soil Cleanup Objectives	NYDEC Part 375.6 Restricted Residential Soil Cleanup Objectives*	NYDEC Part 375.6 Restricted Commercial Soil Cleanup Objectives	428-B1 (0-2') 7/3/2020 µg/Kg		428-B1 (10-12') 7/3/2020 µg/Kg		428-B2 (0-2') 7/3/2020 µg/Kg		428-B2 (10-12') 7/3/2020 µg/Kg	
		µg/Kg	µg/Kg	µg/Kg	Result	RL	Result	RL	Result	RL	Result	RL
Pesticides	4,4' -DDD	3.3	13,000	92,000	< 2.1	2.1	**24**	2.2	< 2.2	2.2	< 2.7	2.7
	4,4' -DDE	3.3	8,900	62,000	< 2.1	2.1	**8.3**	2.2	< 2.2	2.2	< 2.7	2.7
	4,4' -DDT	3.3	7,900	47,000	< 2.1	2.1	**28**	2.2	< 2.2	2.2	< 2.7	2.7
	a-BHC	20	480	3,400	< 7.0	7.0	< 7.5	7.5	< 7.4	7.4	< 9.1	9.1
	a-Chlordane	94	4,200	24,000	< 3.5	3.5	**130**	19	**23**	3.7	< 4.6	4.6
	Aldrin	5	97	680	< 3.5	3.5	**27**	3.7	< 3.7	3.7	< 4.6	4.6
	b-BHC	36	360	3,000	< 7.0	7.0	< 7.5	7.5	< 7.4	7.4	< 9.1	9.1
	Chlordane				< 35	35	**830**	190	**110**	37	< 46	46
	d-BHC	40	100,000	500,000	< 7.0	7.0	< 7.5	7.5	< 7.4	7.4	< 9.1	9.1
	Dieldrin	5	200	1,400	< 3.5	3.5	< 3.7	3.7	< 3.7	3.7	< 4.6	4.6
	Endosulfan I	2,400	24,000	200,000	< 7.0	7.0	< 7.5	7.5	< 7.4	7.4	< 9.1	9.1
	Endosulfan II	2,400	24,000	200,000	< 7.0	7.0	< 7.5	7.5	< 7.4	7.4	< 9.1	9.1
	Endosulfan sulfate	2,400	24,000	200,000	< 7.0	7.0	< 7.5	7.5	< 7.4	7.4	< 9.1	9.1
	Endrin	14	11,000	89,000	< 7.0	7.0	< 7.5	7.5	< 7.4	7.4	< 9.1	9.1
	Endrin aldehyde				< 7.0	7.0	**150**	37	< 7.4	7.4	< 9.1	9.1
	Endrin ketone				< 7.0	7.0	< 7.5	7.5	< 7.4	7.4	< 9.1	9.1
	g-BHC				< 1.4	1.4	< 1.5	1.5	< 1.5	1.5	< 1.8	1.8
	g-Chlordane				< 3.5	3.5	**120**	19	**14**	3.7	< 4.6	4.6
	Heptachlor	42	2,100	15,000	< 7.0	7.0	**20**	7.5	< 7.4	7.4	< 9.1	9.1
	Heptachlor epoxide				< 7.0	7.0	**19**	7.5	< 7.4	7.4	< 9.1	9.1
	Methoxychlor				< 35	35	< 37	37	< 37	37	< 46	46
	Toxaphene				< 140	140	< 150	150	< 150	150	< 180	180
PCBs	PCB-1016	100	1,000	1,000	< 70	70	< 370	370	< 74	74	< 91	91
	PCB-1221	100	1,000	1,000	< 70	70	< 370	370	< 74	74	< 91	91
	PCB-1232	100	1,000	1,000	< 70	70	< 370	370	< 74	74	< 91	91
	PCB-1242	100	1,000	1,000	< 70	70	< 370	370	< 74	74	< 91	91
	PCB-1248	100	1,000	1,000	< 70	70	< 370	370	< 74	74	< 91	91
	PCB-1254	100	1,000	1,000	< 70	70	**630**	370	< 74	74	< 91	91
	PCB-1260	100	1,000	1,000	< 70	70	< 370	370	< 74	74	< 91	91
	PCB-1262				< 70	70	< 370	370	< 74	74	< 91	91
	PCB-1268				< 70	70	< 370	370	< 74	74	< 91	91

Notes:

* - 6 NYCRR Part 375-6 Remedial Program Soil Cleanup Objectives

RL - Reporting Limit

Bold/highlighted- Indicated exceedance of the NYSDEC UUSCO Guidance Value

Bold/highlighted- Indicated exceedance of the NYSDEC RRSCO Guidance Value

Bold/highlighted- Indicated exceedance of the NYSDEC RCSCO Guidance Value

Table 17
Hope Street Project - Lot 4
Soil Analytical Results
Pesticides PCBs

	COMPOUND	NYSDEC Part 375.6 Unrestricted Use Soil Cleanup Objectives	NYDEC Part 375.6 Restricted Residential Soil Cleanup Objectives*	NYDEC Part 375.6 Restricted Commercial Soil Cleanup Objectives	428-B3		428-B3		428-B4		428-B4		Soil Duplicate	
					(0-2')		(10-12')		(0-2')		(10-12')		428-B2 (0-2')	
					7/3/2020		7/3/2020		7/3/2020		7/3/2020		7/3/2020	
					µg/Kg		µg/Kg		µg/Kg		µg/Kg		µg/Kg	
		µg/Kg	µg/Kg	µg/Kg	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL
Pesticides	4,4' -DDD	3.3	13,000	92,000	< 2.3	2.3	< 2.3	2.3	< 2.3	2.3	< 2.8	2.8	< 2.2	2.2
	4,4' -DDE	3.3	8,900	62,000	< 2.3	2.3	< 2.3	2.3	< 2.3	2.3	< 2.8	2.8	**4.5**	2.2
	4,4' -DDT	3.3	7,900	47,000	< 2.3	2.3	< 2.3	2.3	< 2.3	2.3	< 2.8	2.8	**2.9**	2.2
	a-BHC	20	480	3,400	< 7.6	7.6	< 7.8	7.8	< 7.5	7.5	< 9.2	9.2	< 7.3	7.3
	a-Chlordane	94	4,200	24,000	< 3.8	3.8	< 3.9	3.9	< 3.8	3.8	< 4.6	4.6	**12**	3.7
	Aldrin	5	97	680	< 3.8	3.8	< 3.9	3.9	< 3.8	3.8	< 4.6	4.6	< 3.7	3.7
	b-BHC	36	360	3,000	< 7.6	7.6	< 7.8	7.8	< 7.5	7.5	< 9.2	9.2	< 7.3	7.3
	Chlordane				< 38	38	< 39	39	< 38	38	< 46	46	**63**	37
	d-BHC	40	100,000	500,000	< 7.6	7.6	< 7.8	7.8	< 7.5	7.5	< 9.2	9.2	< 7.3	7.3
	Dieldrin	5	200	1,400	< 3.8	3.8	< 3.9	3.9	< 3.8	3.8	< 4.6	4.6	< 3.7	3.7
	Endosulfan I	2,400	24,000	200,000	< 7.6	7.6	< 7.8	7.8	< 7.5	7.5	< 9.2	9.2	< 7.3	7.3
	Endosulfan II	2,400	24,000	200,000	< 7.6	7.6	< 7.8	7.8	< 7.5	7.5	< 9.2	9.2	< 7.3	7.3
	Endosulfan sulfate	2,400	24,000	200,000	< 7.6	7.6	< 7.8	7.8	< 7.5	7.5	< 9.2	9.2	< 7.3	7.3
	Endrin	14	11,000	89,000	< 7.6	7.6	< 7.8	7.8	< 7.5	7.5	< 9.2	9.2	< 7.3	7.3
	Endrin aldehyde				< 7.6	7.6	< 7.8	7.8	< 7.5	7.5	< 9.2	9.2	< 7.3	7.3
	Endrin ketone				< 7.6	7.6	< 7.8	7.8	< 7.5	7.5	< 9.2	9.2	< 7.3	7.3
	g-BHC				< 1.5	1.5	< 1.6	1.6	< 1.5	1.5	< 1.8	1.8	< 1.5	1.5
	g-Chlordane				< 3.8	3.8	< 3.9	3.9	< 3.8	3.8	< 4.6	4.6	**7.9**	3.7
	Heptachlor	42	2,100	15,000	< 7.6	7.6	< 7.8	7.8	< 7.5	7.5	< 9.2	9.2	< 7.3	7.3
	Heptachlor epoxide				< 7.6	7.6	< 7.8	7.8	< 7.5	7.5	< 9.2	9.2	< 7.3	7.3
	Methoxychlor				< 38	38	< 39	39	< 38	38	< 46	46	< 37	37
	Toxaphene				< 150	150	< 160	160	< 150	150	< 180	180	< 150	150
PCBs	PCB-1016	100	1,000	1,000	< 74	74	< 78	78	< 75	75	< 92	92	< 73	73
	PCB-1221	100	1,000	1,000	< 74	74	< 78	78	< 75	75	< 92	92	< 73	73
	PCB-1232	100	1,000	1,000	< 74	74	< 78	78	< 75	75	< 92	92	< 73	73
	PCB-1242	100	1,000	1,000	< 74	74	< 78	78	< 75	75	< 92	92	< 73	73
	PCB-1248	100	1,000	1,000	< 74	74	< 78	78	< 75	75	< 92	92	< 73	73
	PCB-1254	100	1,000	1,000	< 74	74	< 78	78	< 75	75	< 92	92	< 73	73
	PCB-1260	100	1,000	1,000	< 74	74	< 78	78	< 75	75	< 92	92	< 73	73
	PCB-1262				< 74	74	< 78	78	< 75	75	< 92	92	< 73	73
	PCB-1268				< 74	74	< 78	78	< 75	75	< 92	92	< 73	73

Notes:

* - 6 NYCRR Part 375-6 Remedial Program Soil Cleanup Objectives

RL - Reporting Limit

Bold/highlighted- Indicated exceedance of the NYSDEC UUSCO Guidance Value

Bold/highlighted- Indicated exceedance of the NYSDEC RRSCO Guidance Value

Bold/highlighted- Indicated exceedance of the NYSDEC RCSCO Guidance Value

Table 18
Hope Street Project - Lot 4
Soil Analytical Results
Metals

COMPOUND	NYSDEC Part 375.6 Unrestricted Use Soil Cleanup Objectives mg/Kg	NYDEC Part 375.6 Restricted Residential Soil Cleanup Objectives* mg/Kg	NYDEC Part 375.6 Restricted Commercial Soil Cleanup Objectives mg/Kg	428-B1 (0-2') 7/3/2020 mg/Kg		428-B1 (10-12') 7/3/2020 mg/Kg		428-B2 (0-2') 7/3/2020 mg/Kg		428-B2 (10-12') 7/3/2020 mg/Kg	
				Result	RL	Result	RL	Result	RL	Result	RL
Aluminum				**7,460**	36	**8,080**	37	**8,300**	34	**16,000**	45
Antimony				< 3.6	3.6	< 3.7	3.7	< 3.4	3.4	< 4.5	4.5
Arsenic	13	16	16	**3.26**	0.72	**8.07**	0.75	**3.23**	0.69	**4.4**	0.89
Barium	350	400	400	**49.6**	0.7	**190**	0.7	**65.9**	0.7	**106**	0.9
Beryllium	7.2	72	590	**0.52**	0.29	**0.44**	0.30	**0.54**	0.27	**0.76**	0.36
Cadmium	2.5	4.3	9.3	**0.57**	0.36	**1.11**	0.37	**0.61**	0.34	**1.02**	0.45
Calcium				**911**	3.6	**46,800**	37	**1,940**	3.4	**7,580**	4.5
Chromium	30	180	1500	**13.9**	0.36	**27.7**	0.37	**14.6**	0.34	**28**	0.45
Cobalt				**5.92**	0.36	**6.47**	0.37	**6.22**	0.34	**10.4**	0.45
Copper	50	270	270	**14.9**	0.7	**62.4**	0.7	**22.3**	0.7	**29.7**	0.9
Iron				**13,500**	36	**14,400**	37	**13,700**	34	**26,400**	45
Lead	63	400	1000	**9.2**	0.7	**195**	0.7	**17.6**	0.7	**118**	0.9
Magnesium				**2,680**	3.6	**5,380**	37	**2,820**	3.4	**3,870**	4.5
Manganese	1,600	2,000	10,000	**335**	3.6	**220**	3.7	**315**	3.4	**534**	4.5
Mercury	0.18	0.81	2.8	< 0.03	0.03	**0.33**	0.07	**0.06**	0.03	**0.17**	0.04
Nickel	30	310	310	**16.8**	0.36	**21.3**	0.37	**15.3**	0.34	**21.1**	0.45
Potassium				**1,100**	7	**950**	7	**1,070**	7	**1,600**	9
Selenium	3.9	180	1500	< 1.4	1.4	< 1.5	1.5	< 1.4	1.4	< 1.8	1.8
Silver	2	180	1500	< 0.36	0.36	**0.78**	0.37	< 0.34	0.34	< 0.45	0.45
Sodium				**109**	7	**545**	7	**145**	7	**323**	9
Thallium				< 1.4	1.4	< 1.5	1.5	< 1.4	1.4	< 1.8	1.8
Vanadium				**23.3**	0.36	**27.8**	0.37	**25.2**	0.34	**44.5**	0.45
Zinc	109	10,000	10,000	**32.1**	0.7	**212**	7.5	**42.5**	0.7	**49.3**	0.9

Notes:

* - 6 NYCRR Part 375-6 Remedial Program Soil Cleanup Objectives

RL - Reporting Limit

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Bold/highlighted- Indicated exceedance of the NYSDEC RRSCO Guidance Value

Bold/highlighted- Indicated exceedance of the NYSDEC RCSCO Guidance Value

Table 18
Hope Street Project - Lot 4
Soil Analytical Results
Metals

COMPOUND	NYSDEC Part 375.6 Unrestricted Use Soil Cleanup Objectives	NYDEC Part 375.6 Restricted Residential Soil Cleanup Objectives*	NYDEC Part 375.6 Restricted Commercial Soil Cleanup Objectives	428-B3 (0-2') 7/3/2020 mg/Kg		428-B3 (10-12') 7/3/2020 mg/Kg		428-B4 (0-2') 7/3/2020 mg/Kg		428-B4 (10-12') 7/3/2020 mg/Kg		Soil Duplicate 428-B2 (0-2') 7/3/2020 mg/Kg	
	mg/Kg	mg/Kg	mg/Kg	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL
Aluminum				**15,300**	35	**15,800**	35	**11,600**	40	**32,400**	450	**8,950**	37
Antimony				< 3.5	3.5	< 3.5	3.5	< 4.0	4.0	< 4.5	4.5	< 3.7	3.7
Arsenic	13	16	16	**3.69**	0.70	**1.88**	0.71	**11.1**	0.81	**5.52**	0.90	**3.48**	0.75
Barium	350	400	400	**99.9**	0.7	**73.4**	0.7	**465**	0.8	**159**	0.9	**92.5**	0.7
Beryllium	7.2	72	590	**0.71**	0.28	**0.65**	0.28	**0.59**	0.32	**1.28**	0.36	**0.59**	0.30
Cadmium	2.5	4.3	9.3	**1.06**	0.35	**1.12**	0.35	**3.79**	0.40	**1.77**	0.45	**0.67**	0.37
Calcium				**1,570**	3.5	**1,220**	3.5	**2,800**	4.0	**4,160**	4.5	**1,890**	3.7
Chromium	30	180	1500	**34.1**	0.35	**32.6**	0.35	**35**	0.40	**49.4**	0.45	**15.9**	0.37
Cobalt				**8.25**	0.35	**9.25**	0.35	**8.24**	0.40	**17.8**	0.45	**6.36**	0.37
Copper	50	270	270	**27.3**	0.7	**24.1**	0.7	**274**	8.1	**48.9**	0.9	**33.2**	0.7
Iron				**30,900**	35	**34,900**	35	**37,800**	40	**45,100**	45	**14,500**	37
Lead	63	400	1000	**40.9**	0.7	**8.7**	0.7	**616**	0.8	**130**	0.9	**17**	0.7
Magnesium				**3,110**	3.5	**2,590**	3.5	**2,690**	4.0	**6,260**	4.5	**3,330**	3.7
Manganese	1,600	2,000	10,000	**373**	3.5	**210**	3.5	**259**	4.0	**1,100**	4.5	**316**	3.7
Mercury	0.18	0.81	2.8	**0.19**	0.03	< 0.03	0.03	**0.46**	0.07	**0.28**	0.09	**0.02**	0.03
Nickel	30	310	310	**16.6**	0.35	**18.1**	0.35	**23.5**	0.40	**38.1**	0.45	**15.2**	0.37
Potassium				**1,320**	7	**1,330**	7	**1,230**	8	**2,710**	9	**1,220**	7
Selenium	3.9	180	1500	< 1.4	1.4	< 1.4	1.4	< 1.6	1.6	< 1.8	1.8	< 1.5	1.5
Silver	2	180	1500	< 0.35	0.35	< 0.35	0.35	**0.42**	0.40	< 0.45	0.45	< 0.37	0.37
Sodium				**121**	7	**121**	7	**175**	8	**380**	9	**173**	7
Thallium				< 1.4	1.4	< 1.4	1.4	< 1.6	1.6	< 1.8	1.8	< 1.5	1.5
Vanadium				**46.3**	0.35	**49.1**	0.35	**35.5**	0.40	**64**	0.45	**27.8**	0.37
Zinc	109	10,000	10,000	**55.9**	0.7	**41.6**	0.7	**1,440**	8.1	**113**	90	**46.8**	0.7

Notes:
* - 6 NYCRR Part 375-6 Remedial Program Soil Cleanup Objectives
RL - Reporting Limit
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Bold/highlighted- Indicated exceedance of the NYSDEC RRSCO Guidance Value
Bold/highlighted- Indicated exceedance of the NYSDEC RCSCO Guidance Value

Table 19
Hope Street Project - Lot 4
Soil Analytical Results
Emerging Contaminants

Compound	428-B1		428-B1		428-B2		428-B2		428-B3		428-B3		428-B4		428-B4		Soil Dupicate	
	(0-2')		(10-12')		(0-2')		(10-12')		(0-2')		(10-12')		(0-2')		(10-12')		428-B2 (0-2')	
	7/3/2020		7/3/2020		7/3/2020		7/3/2020		7/3/2020		7/3/2020		7/3/2020		7/3/2020		7/3/2020	
	µg/Kg		µg/Kg		µg/Kg		µg/Kg		µg/Kg		µg/Kg		µg/Kg		µg/Kg		µg/Kg	
	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL
Perfluorobutanoic Acid (PFBA)	**0.041J**	0.542	ND	0.696	**0.075J**	0.535	ND	0.702	ND	0.517	ND	0.538	ND	0.575	ND	0.649	**0.049J**	0.558
Perfluoropentanoic Acid (PFPeA)	**0.086J**	0.542	**0.070J**	0.696	**0.109J**	0.535	ND	0.702	ND	0.517	ND	0.538	ND	0.575	ND	0.649	**0.082J**	0.558
Perfluorobutanesulfonic Acid (PFBS)	ND	0.542	ND	0.696	ND	0.535	ND	0.702	ND	0.517	ND	0.538	ND	0.575	ND	0.649	ND	0.558
Perfluorohexanoic Acid (PFHxA)	**0.079J**	0.542	**0.130J**	0.696	**0.117J**	0.535	ND	0.702	ND	0.517	ND	0.538	ND	0.575	**0.079J**	0.649	**0.085J**	0.558
Perfluoroheptanoic Acid (PFHpA)	ND	0.542	ND	0.696	**0.061J**	0.535	ND	0.702	ND	0.517	ND	0.538	ND	0.575	ND	0.649	ND	0.558
Perfluorohexanesulfonic Acid (PFHxS)	ND	0.542	ND	0.696	ND	0.535	ND	0.702	ND	0.517	ND	0.538	ND	0.575	ND	0.649	ND	0.558
Perfluorooctanoic Acid (PFOA)	**0.174J**	0.542	**0.148J**	0.696	**0.303J**	0.535	ND	0.702	ND	0.517	**0.065J**	0.538	ND	0.575	ND	0.649	**0.225J**	0.558
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND	0.542	ND	0.696	ND	0.535	ND	0.702	ND	0.517	ND	0.538	ND	0.575	ND	0.649	ND	0.558
Perfluoroheptanesulfonic Acid (PFHpS)	ND	0.542	ND	0.696	ND	0.535	ND	0.702	ND	0.517	ND	0.538	ND	0.575	ND	0.649	ND	0.558
Perfluorononanoic Acid (PFNA)	ND	0.542	ND	0.696	ND	0.535	ND	0.702	ND	0.517	ND	0.538	ND	0.575	ND	0.649	ND	0.558
Perfluorooctanesulfonic Acid (PFOS)	**0.312J**	0.542	**0.229J**	0.696	**0.376J**	0.535	ND	0.702	ND	0.517	ND	0.538	ND	0.575	ND	0.649	**0.290J**	0.558
Perfluorodecanoic Acid (PFDA)	**0.077J**	0.542	ND	0.696	**0.073J**	0.535	ND	0.702	ND	0.517	ND	0.538	ND	0.575	ND	0.649	ND	0.558
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND	0.542	ND	0.696	ND	0.535	ND	0.702	ND	0.517	ND	0.538	ND	0.575	ND	0.649	ND	0.558
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND	0.542	ND	0.696	ND	0.535	ND	0.702	ND	0.517	ND	0.538	ND	0.575	ND	0.649	ND	0.558
Perfluoroundecanoic Acid (PFUnA)	ND	0.542	ND	0.696	**0.056J**	0.535	ND	0.702	ND	0.517	ND	0.538	ND	0.575	ND	0.649	ND	0.558
Perfluorodecanesulfonic Acid (PFDS)	ND	0.542	ND	0.696	ND	0.535	ND	0.702	ND	0.517	ND	0.538	ND	0.575	ND	0.649	ND	0.558
Perfluorooctanesulfonamide (FOSA)	ND	5	ND	0.696	ND	0.535	ND	0.702	ND	0.517	ND	0.538	ND	0.575	ND	0.649	ND	0.558
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND	0.542	ND	0.696	ND	0.535	ND	0.702	ND	0.517	ND	0.538	ND	0.575	ND	0.649	ND	0.558
Perfluorododecanoic Acid (PFDoA)	ND	0.542	ND	0.696	ND	0.535	ND	0.702	ND	0.517	ND	0.538	ND	0.575	ND	0.649	ND	0.558
Perfluorotridecanoic Acid (PFTrDA)	ND	0.542	ND	0.696	ND	0.535	ND	0.702	ND	0.517	ND	0.538	ND	0.575	ND	0.649	ND	0.558
Perfluorotetradecanoic Acid (PFTA)	ND	0.542	ND	0.696	ND	0.535	ND	0.702	ND	0.517	ND	0.538	ND	0.575	ND	0.649	ND	0.558
Combined PFOA and PFOS	**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**	
Combined Total Detections	**0.06124J**		**0.577J**		**1.17J**		**ND**		**ND**		**0.065J**		**ND**		**0.079J**		**0.731**	

Compound	428-B1		428-B1		428-B2		428-B2		428-B3		428-B3		428-B4		428-B4		Soil Dupicate	
	(0-2')		(10-12')		(0-2')		(10-12')		(0-2')		(10-12')		(0-2')		(10-12')		428-B2 (0-2')	
	7/3/2020		7/3/2020		7/3/2020		7/3/2020		7/3/2020		7/3/2020		7/3/2020		7/3/2020		7/3/2020	
	µg/Kg		µg/Kg		µg/Kg		µg/Kg		µg/Kg		µg/Kg		µg/Kg		µg/Kg		µg/Kg	
	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL
1,4-dioxane	< 72	72	< 74	74	< 74	74	< 91	91	< 74	74	< 79	79	< 77	77	< 93	93	< 74	74

Notes:

DL- Detection Limit

J- The value is estimated.

ND- Not Detected

The USEPA Health Advisory Level for drinking water is 70 ng/L (ppt) for combined detections of PFOA and PFOs

Table 20
Hope Street Project - Lot 4
Groundwater Analytical Results
Volatile Organic Compounds

Compound	NYSDEC Groundwater Quality Standards	428 MW1		428 MW2		428 MW3		GW Duplicate	
		7/6/2020		7/6/2020		7/6/2020		7/6/2020	
		µg/L		µg/L		µg/L		µg/L	
	µg/L	Result	RL	Result	RL	Result	RL	Result	RL
1,1,1,2-Tetrachlorothane	5	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
1,1,1-Trichloroethane	5	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0
1,1,2,2-Tetrachloroethane	5	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
1,1,2-Trichloroethane	1	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
1,1-Dichloroethane	5	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0
1,1-Dichloroethene	5	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
1,1-Dichloropropene	5	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
1,2,3-Trichlorobenzene		< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
1,2,3-Trichloropropane	0.04	< 0.25	0.25	< 0.25	0.25	< 0.25	0.25	< 0.25	0.25
1,2,4-Trichlorobenzene		< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
1,2,4-Trimethylbenzene	5	**52**	5.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
1,2-Dibromo-3-chloropropane	0.04	< 0.50	0.50	< 0.50	0.50	< 0.50	0.50	< 0.50	0.50
1,2-Dibromoethane	0.0006	< 0.25	0.25	< 0.25	0.25	< 0.25	0.25	< 0.25	0.25
1,2-Dichlorobenzene		< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
1,2-Dichloroethane	0.6	< 0.60	0.60	< 0.60	0.60	< 0.60	0.60	< 0.60	0.60
1,2-Dichloropropane	1	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
1,3,5-Trimethylbenzene	5	**11**	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
1,3-Dichlorobenzene	3	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
1,3-Dichloropropane	5	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
1,4-Dichlorobenzene		< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
1,4-Dioxane		< 0.20	0.20	< 0.20	0.20	< 0.20	0.20	< 0.20	0.20
2,2-Dichloropropane	5	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
2-Chlorotoluene	5	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
2-Hexanone (Methyl Butyl Ketone)	50	< 2.5	2.5	< 2.5	2.5	< 2.5	2.5	< 2.5	2.5
2-Isopropyltoluene	5	**0.33**	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
4-Chlorotoluene	5	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
4-Methyl-2-Pentanone		< 2.5	2.5	< 2.5	2.5	< 2.5	2.5	< 2.5	2.5
Acetone	50	< 5.0	5.0	**16**	5.0	**3**	5.0	**3.3**	5.0
Acrolein	5	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0
Acrylonitrile	5	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0
Benzene	1	**12**	0.70	< 0.70	0.70	< 0.70	0.70	< 0.70	0.70
Bromobenzene	5	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
Bromochloromethane	5	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
Bromodichloromethane	50	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
Bromoform	50	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0
Bromomethane	5	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0
Carbon Disulfide		**0.96**	1.0	**0.5**	1.0	< 1.0	1.0	< 1.0	1.0
Carbon tetrachloride	5	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
Chlorobenzene	5	**1.1**	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0
Chloroethane	5	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0
Chloroform	7	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0
Chloromethane	5	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0
cis-1,2-Dichloroethene	5	< 1.0	1.0	**0.29**	1.0	< 1.0	1.0	< 1.0	1.0
cis-1,3-Dichloropropene	0.04	< 0.40	0.40	< 0.40	0.40	< 0.40	0.40	< 0.40	0.40
Dibromochloromethane	50	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
Dibromomethane	5	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
Dichlorodifluoromethane	5	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
Ethylbenzene	5	**27**	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
Hexachlorobutadiene	0.5	< 0.50	0.50	< 0.50	0.50	< 0.50	0.50	< 0.50	0.50
Isopropylbenzene	5	**3.6**	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
m&p-Xylenes		**93**	5.0	< 1.0	1.0	**0.32**	1.0	< 1.0	1.0
Methyl Ethyl Ketone (2-Butanone)	50	< 2.5	2.5	**3.4**	2.5	< 2.5	2.5	< 2.5	2.5
Methyl t-butyl ether (MTBE)		< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
Methylene chloride	5	< 3.0	3.0	< 3.0	3.0	< 3.0	3.0	< 3.0	3.0
Naphthalene	10	**9.6**	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
n-Butylbenzene	5	**2.7**	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
n-Propylbenzene	5	**7.8**	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
o-Xylene	5	**56**	5.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
p-Isopropyltoluene	5	**1.3**	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
sec-Butylbenzene	5	**2.7**	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
Styrene	5	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
Tert-butyl alcohol		< 50	50	< 50	50	< 50	50	< 50	50
tert-Butylbenzene	5	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
Tetrachloroethene	5	< 1.0	1.0	< 1.0	1.0	**0.3**	1.0	**0.3**	1.0
Tetrahydrofuran (THF)	50	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0
Toluene	5	**82**	5.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
trans-1,2-Dichloroethene	5	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0
trans-1,3-Dichloropropene	0.4	< 0.40	0.40	< 0.40	0.40	< 0.40	0.40	< 0.40	0.40
trans-1,4-dichloro-2-butene	5	< 2.5	2.5	< 2.5	2.5	< 2.5	2.5	< 2.5	2.5
Trichloroethene	5	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
Trichlorofluoromethane	5	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
Trichlorotrifluoroethane	5	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
Vinyl Chloride	2	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0

Notes:

RL - Reporting Limit

Bold/highlighted- Indicated exceedance of the NYSDEC Groundwater Standard

Table 21
Hope Street Project
Groundwater Analytical Results
Semi-Volatile Organic Compounds

Compound	NYSDEC Groundwater Quality Standards	428 MW1		428 MW2		428 MW3		GW Duplicate	
		7/6/2020		7/6/2020		7/6/2020		7/6/2020	
		µg/L		µg/L		µg/L		µg/L	
	µg/L	Result	RL	Result	RL	Result	RL	Result	RL
1,2,4,5-Tetrachlorobenzene		< 3.4	3.4	< 3.5	3.5	< 3.5	3.5	< 3.5	3.5
1,2,4-Trichlorobenzene		< 4.8	4.8	< 5.0	5.0	< 5.1	5.1	< 5.0	5.0
1,2-Dichlorobenzene		< 0.96	0.96	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
1,2-Diphenylhydrazine		< 4.8	4.8	< 5.0	5.0	< 5.1	5.1	< 5.0	5.0
1,3-Dichlorobenzene	3	< 0.96	0.96	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
1,4-Dichlorobenzene		< 0.96	0.96	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
2,4-Dichlorophenol	5	< 0.96	0.96	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
2,4-Dimethylphenol	1	< 0.96	0.96	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
2,4-Dinitrophenol	5	< 0.96	0.96	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
2,4-Dinitrotoluene	5	< 0.96	0.96	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
2,4,5-Trichlorophenol	1	< 0.96	0.96	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
2,4,6-Trichlorophenol	1	< 4.8	4.8	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0
2,6-Dinitrotoluene	5	< 4.8	4.8	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0
2-Chloronaphthalene	10	< 4.8	4.8	< 5.0	5.0	< 5.1	5.1	< 5.0	5.0
2-Chlorophenol	1	< 0.96	0.96	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
2-Methylnaphthalene		**2.2**	4.8	< 5.0	5.0	< 5.1	5.1	< 5.0	5.0
2-Methylphenol (o-cresol)	1	**1.3**	0.96	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
2-Nitroaniline	5	< 4.8	4.8	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0
2-Nitrophenol	1	< 0.96	0.96	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
3&4-Methylphenol (m&p-cresol)		< 0.96	0.96	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
3,3'-Dichlorobenzidine	5	< 4.8	4.8	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0
3-Nitroaniline	5	< 4.8	4.8	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0
4,6-Dinitro-2-methylphenol	1	< 0.96	0.96	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
4-Bromophenyl phenyl ether		< 4.8	4.8	< 5.0	5.0	< 5.1	5.1	< 5.0	5.0
4-Chloro-3-methylphenol	1	< 0.96	0.96	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
4-Chloroaniline	5	< 3.4	3.4	< 3.5	3.5	< 3.5	3.5	< 3.5	3.5
4-Chlorophenyl phenyl ether		< 4.8	4.8	< 5.0	5.0	< 5.1	5.1	< 5.0	5.0
4-Nitroaniline	5	< 4.8	4.8	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0
4-Nitrophenol	1	< 0.96	0.96	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
Acenaphthene	20	< 4.8	4.8	< 5.0	5.0	< 5.1	5.1	< 5.0	5.0
Acenaphthylene		< 0.48	0.48	< 0.54	0.54	< 0.51	0.51	< 0.50	0.50
Acetophenone		< 4.8	4.8	< 5.0	5.0	< 5.1	5.1	< 5.0	5.0
Aniline	5	< 3.4	3.4	< 3.5	3.5	< 3.5	3.5	< 3.5	3.5
Anthracene	50	< 4.8	4.8	< 5.0	5.0	< 5.1	5.1	< 5.0	5.0
Benzo(a)anthracene	0.002	< 0.02	0.02	< 0.02	0.02	< 0.02	0.02	< 0.02	0.02
Benzidine	5	< 4.3	4.3	< 4.5	4.5	< 4.5	4.5	< 4.5	4.5
Benzo(a)pyrene		< 0.02	0.02	< 0.02	0.02	< 0.02	0.02	< 0.02	0.02
Benzo(b)fluoranthene	0.002	< 0.02	0.02	< 0.02	0.02	< 0.02	0.02	< 0.02	0.02
Benzo(g,h,i)perylene		< 0.48	0.48	< 0.54	0.54	< 0.51	0.51	< 0.50	0.50
Benzo(k)fluoranthene	0.002	< 0.02	0.02	< 0.02	0.02	< 0.02	0.02	< 0.02	0.02
Benzoic Acid		< 24	24	< 25	25	< 25	25	< 25	25
Butyl benzyl phthalate	50	< 4.8	4.8	< 5.0	5.0	< 5.1	5.1	< 5.0	5.0
Bis(2-chloroethoxy)methane	5	< 4.8	4.8	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0
Bis(2-chloroethyl)ether	1	< 0.96	0.96	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
Bis(2-chloroisopropyl)ether		< 4.8	4.8	< 5.0	5.0	< 5.1	5.1	< 5.0	5.0
Bis(2-ethylhexyl)phthalate	5	< 0.96	0.96	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
Carbazole		< 4.8	4.8	< 5.0	5.0	< 5.1	5.1	< 5.0	5.0
Chrysene	0.002	< 0.02	0.02	< 0.02	0.02	< 0.02	0.02	< 0.02	0.02
Dibenzo(a,h)anthracene		< 0.48	0.48	< 0.54	0.54	< 0.51	0.51	< 0.50	0.50
Dibenzofuran		< 4.8	4.8	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0
Diethylphthalate	50	< 4.8	4.8	< 5.0	5.0	< 5.1	5.1	< 5.0	5.0
Dimethylphthalate	50	< 4.8	4.8	< 5.0	5.0	< 5.1	5.1	< 5.0	5.0
Di-n-butylphthalate	50	< 4.8	4.8	< 5.0	5.0	< 5.1	5.1	< 5.0	5.0
Di-n-octylphthalate	50	< 4.8	4.8	< 5.0	5.0	< 5.1	5.1	< 5.0	5.0
Fluoranthene	50	< 4.8	4.8	< 5.0	5.0	< 5.1	5.1	< 5.0	5.0
Fluorene	50	< 4.8	4.8	< 5.0	5.0	< 5.1	5.1	< 5.0	5.0
Hexachlorobenzene	0.04	< 0.04	0.04	< 0.04	0.04	< 0.04	0.04	< 0.04	0.04
Hexachlorobutadiene	0.5	< 0.48	0.48	< 0.50	0.50	< 0.50	0.50	< 0.50	0.50
Hexachlorocyclopentadiene	5	< 4.8	4.8	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0
Hexachloroethane	5	< 0.96	0.96	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
Indeno(1,2,3-cd)pyrene	0.002	< 0.02	0.02	< 0.02	0.02	< 0.02	0.02	< 0.02	0.02
Isophorone	50	< 4.8	4.8	< 5.0	5.0	< 5.1	5.1	< 5.0	5.0
Naphthalene	10	< 4.8	4.8	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0
Nitrobenzene	0.4	< 0.38	0.38	< 0.40	0.40	< 0.40	0.40	< 0.40	0.40
N-Nitrosodimethylamine		< 0.10	0.10	< 0.11	0.11	< 0.10	0.10	< 0.10	0.10
N-Nitrosodi-n-propylamine		< 4.8	4.8	< 5.0	5.0	< 5.1	5.1	< 5.0	5.0
N-Nitrosodiphenylamine	50	< 4.8	4.8	< 5.0	5.0	< 5.1	5.1	< 5.0	5.0
Pentachloronitrobenzene		< 2.4	2.4	< 2.5	2.5	< 2.5	2.5	< 2.5	2.5
Pentachlorophenol	1	< 0.48	0.48	< 0.54	0.54	< 0.61	0.61	**0.59**	0.50
Phenanthrene	50	< 0.48	0.48	< 0.54	0.54	< 0.51	0.51	< 0.50	0.50
Phenol	1	< 0.96	0.96	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
Pyrene	50	< 4.8	4.8	< 5.0	5.0	< 5.1	5.1	< 5.0	5.0
Pyridine	50	< 9.6	9.6	< 10	10	< 10	10	< 10	10

Notes:

RL - Reporting Limit

Bold/highlighted- Indicated exceedance of the NYSDEC Groundwater Standard

Table 22
Hope Street Project - Lot 4
Groundwater Analytical Results
Pesticides/PCBs

	Compound	NYSDEC Groundwater Quality Standards	428 MW1		428 MW2		428 MW3		GW Duplicate	
			7/6/2020		7/6/2020		7/6/2020		7/6/2020	
			µg/L		µg/L		µg/L		µg/L	
		µg/L	Result	RL	Result	RL	Result	RL	Result	RL
Pesticides	4,4-DDD	0.3	< 0.005	0.005	< 0.005	0.005	< 0.010	0.010	< 0.024	0.024
	4,4-DDE	0.2	< 0.005	0.005	< 0.005	0.005	< 0.010	0.010	< 0.024	0.024
	4,4-DDT	0.2	< 0.005	0.005	< 0.005	0.005	< 0.010	0.010	< 0.024	0.024
	a-BHC	0.01	< 0.005	0.005	< 0.005	0.005	< 0.010	0.010	< 0.024	0.024
	a-chlordane		< 0.010	0.010	< 0.010	0.010	< 0.051	0.051	< 0.048	0.048
	Alachlor	0.5	< 0.077	0.077	< 0.072	0.072	< 0.38	0.38	< 0.36	0.36
	Aldrin		< 0.002	0.002	< 0.001	0.001	< 0.008	0.008	< 0.007	0.007
	b-BHC	0.04	< 0.005	0.005	< 0.005	0.005	< 0.025	0.025	< 0.024	0.024
	Chlordane	0.05	< 0.021	0.021	< 0.048	0.048	< 0.050	0.050	< 0.24	0.24
	d-BHC	0.04	< 0.005	0.005	< 0.005	0.005	< 0.025	0.025	< 0.024	0.024
	Dieldrin	0.004	< 0.002	0.002	< 0.001	0.001	< 0.004	0.004	< 0.007	0.007
	Endosulfan I		< 0.010	0.010	< 0.010	0.010	< 0.051	0.051	< 0.048	0.048
	Endosulfan II		< 0.010	0.010	< 0.010	0.010	< 0.051	0.051	< 0.048	0.048
	Endosulfan Sulfate		< 0.010	0.010	< 0.010	0.010	< 0.051	0.051	< 0.048	0.048
	Endrin		< 0.005	0.005	< 0.010	0.010	< 0.010	0.010	< 0.048	0.048
	Endrin aldehyde	5	< 0.010	0.010	< 0.010	0.010	< 0.051	0.051	< 0.048	0.048
	Endrin ketone	5	< 0.010	0.010	< 0.010	0.010	< 0.30	0.30	< 0.50	0.50
	gamma-BHC	0.05	< 0.005	0.005	< 0.005	0.005	< 0.025	0.025	< 0.024	0.024
	g-chlordane		< 0.010	0.010	< 0.010	0.010	< 0.051	0.051	< 0.048	0.048
	Heptachlor	0.04	< 0.005	0.005	< 0.010	0.010	< 0.010	0.010	< 0.048	0.048
	Heptachlor epoxide	0.03	< 0.005	0.005	< 0.010	0.010	< 0.010	0.010	< 0.048	0.048
	Methoxychlor	35	< 0.10	0.10	< 0.096	0.096	< 0.51	0.51	< 0.48	0.48
	Toxaphene	0.06	< 0.21	0.21	< 0.19	0.19	< 0.25	0.25	< 0.97	0.97
PCBs	PCB-1016	0.09	< 0.052	0.052	< 0.048	0.048	**0.66**	0.25	**0.56**	0.24
	PCB-1221	0.09	< 0.052	0.052	< 0.048	0.048	< 0.25	0.25	< 0.24	0.24
	PCB-1232	0.09	< 0.052	0.052	< 0.048	0.048	< 0.25	0.25	< 0.24	0.24
	PCB-1242	0.09	< 0.052	0.052	< 0.048	0.048	< 0.25	0.25	< 0.24	0.24
	PCB-1248	0.09	< 0.052	0.052	< 0.048	0.048	< 0.25	0.25	< 0.24	0.24
	PCB-1254	0.09	< 0.052	0.052	< 0.048	0.048	< 0.25	0.25	< 0.24	0.24
	PCB-1260	0.09	< 0.052	0.052	< 0.048	0.048	< 0.25	0.25	< 0.24	0.24
	PCB-1262	0.09	< 0.052	0.052	< 0.048	0.048	< 0.25	0.25	< 0.24	0.24
	PCB-1268	0.09	< 0.052	0.052	< 0.048	0.048	< 0.25	0.25	< 0.24	0.24

Notes:
RL - Reporting Limit
Bold/highlighted- Indicated exceedance of the NYSDEC Groundwater Standard

Table 23
Hope Street Project - Lot 4
Groundwater Analytical Results
TAL Metals

Compound	NYSDEC Groundwater Quality Standards	428 MW1		428 MW2		428 MW3		GW Duplicate	
		7/6/2020		7/6/2020		7/6/2020		7/6/2020	
		mg/L		mg/L		mg/L		mg/L	
	mg/L	Result	RL	Result	RL	Result	RL	Result	RL
Aluminum	0.1	**79.9**	0.20	**10.7**	0.020	**1.04**	0.020	**0.714**	0.020
Antimony	0.003	< 0.0030	0.0030	< 0.0030	0.0030	**0.0033**	0.0030	**0.0033**	0.0030
Arsenic	0.025	**0.021**	0.004	**0.005**	0.004	**0.001**	0.004	**0.002**	0.004
Barium	1	**0.581**	0.010	**0.245**	0.010	**0.037**	0.010	**0.036**	0.010
Beryllium	0.003	**0.004**	0.001	< 0.001	0.001	< 0.001	0.001	< 0.001	0.001
Cadmium	0.005	**0.004**	0.004	**0.001**	0.004	< 0.004	0.004	< 0.004	0.004
Calcium		**134**	0.010	**62.8**	0.010	**130**	0.010	**131**	0.010
Chromium	0.05	**0.15**	0.001	**0.027**	0.001	**0.04**	0.001	**0.04**	0.001
Cobalt		**0.037**	0.005	**0.008**	0.005	**0.002**	0.005	**0.001**	0.005
Copper	0.2	**0.179**	0.005	**0.022**	0.005	**0.017**	0.005	**0.017**	0.005
Iron	0.3	**135**	0.10	**35.6**	0.01	**1.55**	0.01	**1.17**	0.01
Lead	0.025	**0.06**	0.002	**0.008**	0.002	**0.003**	0.002	**0.002**	0.002
Magnesium	35	**25.6**	0.010	**30.8**	0.010	**18.5**	0.010	**18.9**	0.010
Manganese	0.3	**1.63**	0.005	**2.26**	0.050	**0.03**	0.005	**0.026**	0.005
Mercury	0.0007	< 0.0002	0.0002	< 0.0002	0.0002	< 0.0002	0.0002	< 0.0002	0.0002
Nickel	0.1	**0.098**	0.004	**0.013**	0.004	**0.003**	0.004	**0.003**	0.004
Potassium		**27.4**	0.1	**18.6**	0.1	**40.3**	0.1	**41.5**	0.1
Selenium	0.01	**0.002**	0.01	**0.001**	0.010	**0.009**	0.010	**0.009**	0.010
Silver	0.05	< 0.005	0.005	< 0.005	0.005	< 0.005	0.005	< 0.005	0.005
Sodium	20	**165**	1.0	**45.8**	0.10	**57.7**	1.0	**58.2**	1.0
Thallium	0.0005	**0.0009**	0.0005	< 0.0005	0.0005	< 0.0005	0.0005	< 0.0005	0.0005
Vanadium		**0.202**	0.010	**0.045**	0.010	**0.003**	0.010	**0.004**	0.010
Zinc	5	**0.25**	0.010	**0.03**	0.010	**0.016**	0.010	**0.015**	0.010

Notes:

RL - Reporting Limit

Bold/highlighted- Indicated exceedance of the NYSDEC Groundwater Standard

Table 24
Hope Street Project
Groundwater Analytical Results
TAL Filtered Metals

Compound	NYSDEC Groundwater Quality Standards	428 MW1		428 MW2		428 MW3		GW Duplicate	
		7/6/2020		7/6/2020		7/6/2020		7/6/2020	
		mg/L		mg/L		mg/L		mg/L	
	mg/L	Result	RL	Result	RL	Result	RL	Result	RL
Aluminum (Dissolved)	0.1	**0.048**	0.011	< 0.011	0.011	**0.046**	0.011	**0.046**	0.011
Antimony (Dissolved)-LDL	0.003	**0.0001**	0.0003	**0.0001**	0.0003	**0.0029**	0.0003	**0.003**	0.0003
Arsenic, (Dissolved)	0.025	**0.002**	0.003	**0.002**	0.003	**0.001**	0.003	**0.002**	0.003
Barium (Dissolved)	1	**0.136**	0.011	**0.134**	0.011	**0.031**	0.011	**0.031**	0.011
Beryllium (Dissolved)	0.003	< 0.001	0.001	< 0.001	0.001	< 0.001	0.001	< 0.001	0.001
Cadmium (Dissolved)	0.005	< 0.004	0.004	< 0.004	0.004	< 0.004	0.004	< 0.004	0.004
Calcium (Dissolved)		**123**	0.01	**59.9**	0.01	**129**	0.01	**128**	0.01
Chromium (Dissolved)	0.05	< 0.001	0.001	**0.002**	0.001	**0.037**	0.001	**0.036**	0.001
Cobalt, (Dissolved)		< 0.005	0.005	**0.004**	0.005	< 0.005	0.005	< 0.005	0.005
Copper, (Dissolved)	0.2	< 0.005	0.005	**0.002**	0.005	**0.013**	0.005	**0.013**	0.005
Iron, (Dissolved)	0.3	< 0.01	0.01	**0.09**	0.01	< 0.01	0.01	< 0.01	0.01
Lead (Dissolved)	0.025	< 0.002	0.002	< 0.002	0.002	< 0.002	0.002	< 0.002	0.002
Magnesium (Dissolved)	35	**10.7**	0.01	**28.3**	0.01	**18.1**	0.01	**18.1**	0.01
Manganese, (Dissolved)	0.3	**0.583**	0.005	**1.84**	0.005	**0.008**	0.005	**0.008**	0.005
Mercury (Dissolved)	0.0007	< 0.0002	0.0002	< 0.0002	0.0002	< 0.0002	0.0002	< 0.0002	0.0002
Nickel, (Dissolved)	0.1	**0.001**	0.004	**0.003**	0.004	**0.002**	0.004	**0.002**	0.004
Potassium (Dissolved)		**16.9**	0.1	**17**	0.1	**40.5**	0.1	**41.4**	0.1
Selenium (Dissolved)-LDL	0.01	**0.002**	0.002	**0.002**	0.002	**0.008**	0.002	**0.007**	0.002
Silver (Dissolved)	0.05	< 0.005	0.005	< 0.005	0.005	< 0.005	0.005	< 0.005	0.005
Sodium (Dissolved)	20	**156**	11	**44.6**	0.11	**57.2**	1.1	**58.9**	1.1
Thallium (Dissolved)	0.0005	< 0.0003	0.0003	< 0.0003	0.0003	< 0.0003	0.0003	< 0.0003	0.0003
Vanadium, (Dissolved)		< 0.011	0.011	**0.003**	0.011	< 0.011	0.011	**0.002**	0.011
Zinc, (Dissolved)	5	< 0.011	0.011	< 0.011	0.011	**0.008**	0.011	**0.007**	0.011

Notes:
RL - Reporting Limit
Bold/highlighted- Indicated exceedance of the NYSDEC Groundwater Standard

Table 25
Hope Street Project - Lot 4
Groundwater Analytical Results
Emerging Contaminants

Compound	428 MW1		428 MW2		428 MW3		GW Duplicate	
	7/6/2020		7/6/2020		7/6/2020		7/6/2020	
	ng/L		ng/L		ng/L		ng/L	
	Result	RL	Result	RL	Result	RL	Result	RL
Perfluorobutanoic Acid (PFBA)	**22.5**	2.01	**15.7**	2.45	**23.5**	1.99	**23.4**	1.96
Perfluoropentanoic Acid (PFPeA)	**39.5**	2.01	**24.8**	2.45	**65.7**	1.99	**64.4**	1.96
Perfluorobutanesulfonic Acid (PFBS)	**9.43**	2.01	**7.96**	2.45	**7.78**	1.99	**7.34**	1.96
Perfluorohexanoic Acid (PFHxA)	**35.9**	2.01	**15.4**	2.45	**41.6**	1.99	**40.5**	1.96
Perfluoroheptanoic Acid (PFHpA)	**22.7**	2.01	**6.45**	2.45	**23.8**	1.99	**23.2**	1.96
Perfluorohexanesulfonic Acid (PFHxS)	**11.7F**	2.01	**3**	2.45	**5.13**	1.99	**5.02**	1.96
Perfluorooctanoic Acid (PFOA)	**45.8**	2.01	**39.2**	2.45	**108**	1.99	**107**	1.96
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	**56.3**	2.01	**26.6F**	2.45	**15.2**	1.99	**12.3**	1.96
Perfluoroheptanesulfonic Acid (PFHpS)	ND	2.01	ND	2.45	**1.79J**	1.99	**1.79J**	1.96
Perfluorononanoic Acid (PFNA)	**1.82J**	2.01	**0.545J**	2.45	**5.61**	1.99	**5.62**	1.96
Perfluorooctanesulfonic Acid (PFOS)	**15.6**	2.01	**3.82**	2.45	**27.2**	1.99	**26.6**	1.96
Perfluorodecanoic Acid (PFDA)	**3.02**	2.01	ND	2.45	**2.05**	1.99	**1.82J**	1.96
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND	2.01	ND	2.45	ND	1.99	ND	1.96
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	**0.940J**	2.01	ND	2.45	ND	1.99	ND	1.96
Perfluoroundecanoic Acid (PFUnA)	**0.374J**	2.01	ND	2.45	ND	1.99	ND	1.96
Perfluorodecanesulfonic Acid (PFDS)	ND	2.01	ND	2.45	ND	1.99	ND	1.96
Perfluorooctanesulfonamide (FOSA)	**1.42JF**	2.01	ND	2.45	ND	1.99	ND	1.96
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	**3.98F**	2.01	ND	2.45	ND	1.99	ND	1.96
Perfluorododecanoic Acid (PFDoA)	ND	2.01	ND	2.45	ND	1.99	ND	1.96
Perfluorotridecanoic Acid (PFTrDA)	ND	2.01	ND	2.45	ND	1.99	ND	1.96
Perfluorotetradecanoic Acid (PFTA)	ND	2.01	ND	2.45	ND	1.99	ND	1.96
Combined PFOA and PFOS	**61.4**		**43.02**		**135.2**		**133.6**	
Combined Total Detections	**270.984**		**143.475**		**327.36**		**318.99**	

Compound	428 MW1		428 MW2		428 MW3		GW Duplicate	
	7/6/2020		7/6/2020		7/6/2020		7/6/2020	
	µg/L		µg/L		µg/L		µg/L	
	Result	RL	Result	RL	Result	RL	Result	RL
1,4-dioxane	< 0.20	0.20	< 0.20	0.20	< 0.20	0.20	< 0.20	0.20

Notes:

DL- Detection Limit

J- The value is estimated.

ND- Not Detected

The USEPA Health Advisory Level for drinking water is 70 ng/L (ppt) for combined detections of PFOA and PFOs

Table 26
Hope Street Project - Lot 4
Soil Gas - Volatile Organic Compounds

COMPOUNDS	NYSDOH Maximum Sub-Slab Value	NYSDOH Soil Outdoor Background Levels	SV1		SV2		SV3		SV4	
			7/6/2020		7/6/2020		7/6/2020		7/6/2020	
			μg/m³		μg/m³		μg/m³		μg/m³	
	(μg/m³) (a)	(μg/m³) (b)	Result	RL	Result	RL	Result	RL	Result	RL
1,1,1,2-Tetrachloroethane			< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00
1,1,1-Trichloroethane	100	<2.0 - 2.8	**23.3**	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00
1,1,2,2-Tetrachloroethane		<1.5	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00
1,1,2-Trichloroethane		<1.0	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00
1,1-Dichloroethane		<1.0	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00
1,1-Dichloroethene		<1.0	< 0.20	0.20	< 0.20	0.20	< 0.20	0.20	< 0.20	0.20
1,2,4-Trichlorobenzene		NA	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00
1,2,4-Trimethylbenzene		<1.0	**2.87**	1.00	**2.79**	1.00	**2.65**	1.00	**5.4**	1.00
1,2-Dibromoethane		<1.5	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00
1,2-Dichlorobenzene		<2.0	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00
1,2-Dichloroethane		<1.0	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00
1,2-Dichloropropane			< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00
1,2-Dichlorotetrafluoroethane			< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00
1,3,5-Trimethylbenzene		<1.0	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	**5.31**	1.00
1,3-Butadiene		NA	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00
1,3-Dichlorobenzene		<2.0	**4.45**	1.00	**3.62**	1.00	**3.55**	1.00	**3.84**	1.00
1,4-Dichlorobenzene		NA	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00
1,4-Dioxane			< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00
2-Hexanone			< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00
4-Ethyltoluene		NA	**2.01**	1.00	**1.91**	1.00	**1.82**	1.00	**27**	1.00
4-Isopropyltoluene			**1.01**	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00
4-Methyl-2-pentanone			< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00
Acetone		NA	**39.2**	1.00	**27.3**	1.00	**44.4**	1.00	**31.6**	1.00
Acrylonitrile			< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00
Benzene		<1.6 - 4.7	**1.67**	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00
Benzyl Chloride		NA	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00
Bromodichloromethane		<5.0	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00
Bromoform		<1.0	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00
Bromomethane		<1.0	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00
Carbon Disulfide		NA	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00
Carbon Tetrachloride	5	<3.1	**0.76**	0.20	< 0.20	0.20	**0.57**	0.20	**0.41**	0.20
Chlorobenzene		<2.0	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00
Chloroethane		NA	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00
Chloroform		<2.4	< 1.00	1.00	< 1.00	1.00	**1.65**	1.00	< 1.00	1.00
Chloromethane		<1.0 - 1.4	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00
cis-1,2-Dichloroethene		<1.0	< 0.20	0.20	< 0.20	0.20	< 0.20	0.20	< 0.20	0.20
cis-1,3-Dichloropropene		NA	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00
Cyclohexane		NA	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00
Dibromochloromethane		<5.0	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00
Dichlorodifluromethane		NA	**1.49**	1.00	**2.79**	1.00	**5.34**	1.00	**1.71**	1.00
Ethanol			**230**	1.00	**198**	1.00	**286**	1.00	**243**	1.00
Ethyl Acetate		NA	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	**9.98**	1.00
Ethylbenzene		<4.3	**6.6**	1.00	**3.06**	1.00	**2.79**	1.00	**3.56**	1.00
Heptane		NA	**8.19**	1.00	**3.55**	1.00	**1.24**	1.00	< 1.00	1.00
Hexachlorobutadiene		NA	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00
Hexane		<1.5	**10.4**	1.00	**18.4**	1.00	< 1.00	1.00	**1.8**	1.00
Isopropylalcohol		NA	**6.29**	1.00	**4.42**	1.00	**5.55**	1.00	**19.4**	1.00
Isopropylbenzene			< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	**2.82**	1.00
Xylene (m&p)		<4.3	**16**	1.00	**10.5**	1.00	**10.2**	1.00	**11.6**	1.00
Methyl Ethyl Ketone			**20.6**	1.00	**17**	1.00	**23.9**	1.00	**16.3**	1.00
MTBE		NA	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00
Methylene Chloride		<3.4	< 3.00	3.00	< 3.00	3.00	< 3.00	3.00	< 3.00	3.00
n-Butylbenzene			< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00
Xylene (o)		<4.3	**5.9**	1.00	**3.78**	1.00	**3.93**	1.00	**6.86**	1.00
Propylene		NA	**5.97**	1.00	**6.76**	1.00	**2.6**	1.00	**1.43**	1.00
sec-Butylbenzene			< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00
Styrene		<1.0	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00
Tetrachloroethene	30		**1.98**	0.25	**1.84**	0.25	**2.46**	0.25	**6.53**	0.25
Tetrahydrofuran		NA	< 1.00	1.00	**11.9**	1.00	**2.98**	1.00	**2.3**	1.00
Toluene		1.0 - 6.1	**8.74**	1.00	**6.44**	1.00	**6.67**	1.00	**5.39**	1.00
trans-1,2-Dichloroethene		NA	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00
trans-1,3-Dichloropropene		NA	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00
Trichloroethene	2	<1.7	< 0.20	0.20	< 0.20	0.20	< 0.20	0.20	< 0.20	0.20
Trichlorofluoromethane		NA	**2.04**	1.00	**61.8**	1.00	**30.3**	1.00	**2.12**	1.00
Trichlorotrifluoroethane			< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00
Vinyl Chloride		<1.0	< 0.20	0.20	< 0.20	0.20	< 0.20	0.20	< 0.20	0.20
BTEX			**38.91**		**23.78**		**23.59**		**27.41**	
Total VOCs			**399.47**		**385.86**		**438.6**		**408.36**	

Notes:
NA No guidance value or standard available
(a) Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York. October 2006. New York State Department of Health.
(b) NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York, February 2005, Summary of Background Levels for Selected Compounds (NYSDOH Database, Outdoor values)

TABLE 27
Project Permit Listing
To Be Updated as Project Progresses

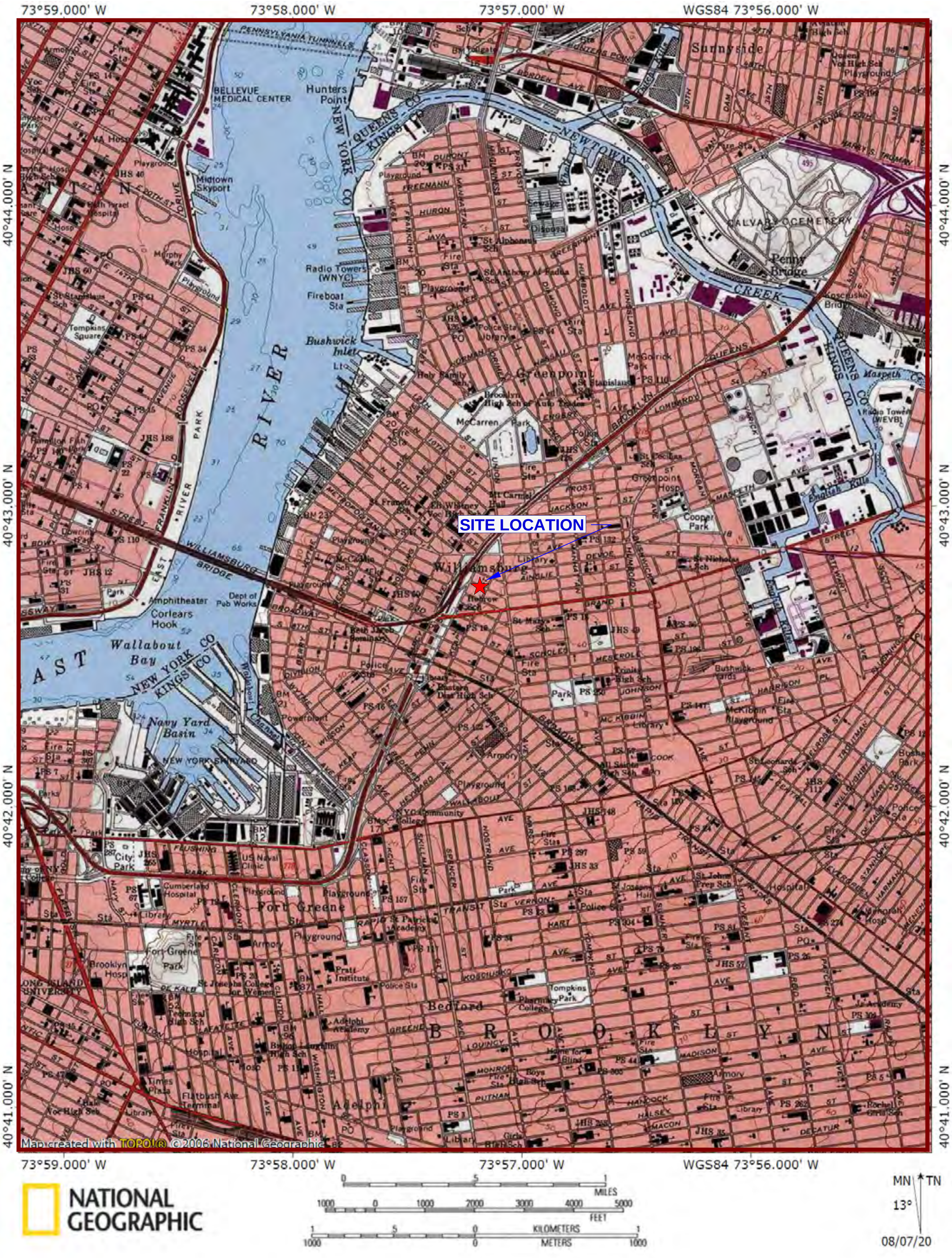
Permit	*Permit Number*	*Originating Agency*	*Pursuant to*	*Issued*	*Expires*	*Contact Phone*

Note: This list will be updated as the project progresses

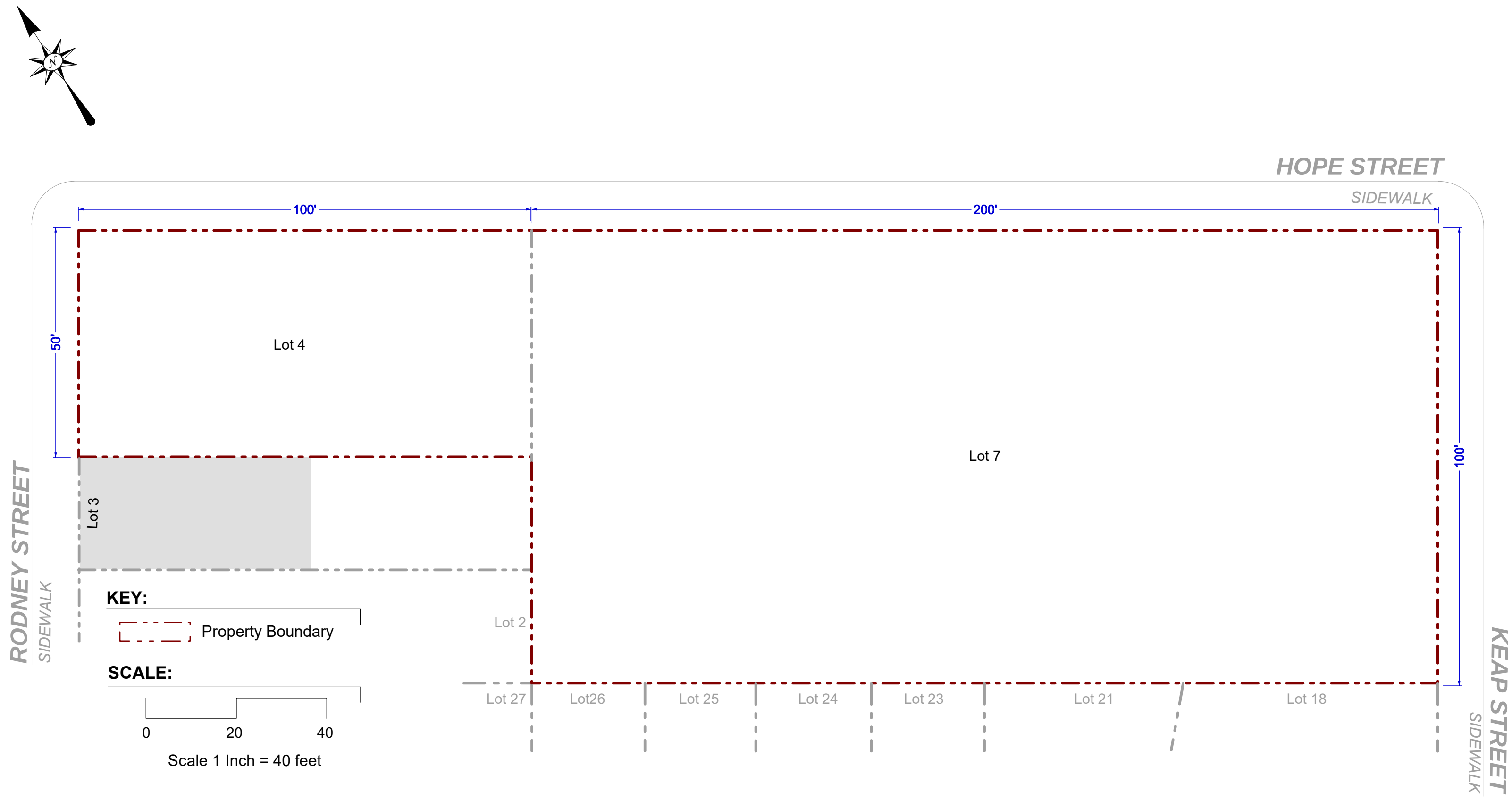
Table 28
Emergency Contact List

General Emergencies		911
NYC Police		911
NYC Fire Department		911
Woodhull Medical Center		(718) 963-8000
NYSDEC Spills Hotline		1-800-457-7362
NYSDEC Project Manager		(518) 402-9687
NYC Department of Health		(212) 676-2400
National Response Center		1-800-424-8802
Poison Control		1-800-222-1222
EBC Project Manager	Kevin Brussee	(631) 504-6000
EBC BCP Program Manager	Charles Sosik	(631) 504-6000
EBC Site Safety Officer	Thomas Gallo	(631) 504-6000
Remedial Engineer	Ariel Czemerinski	(516) 987-1662
Developer	Motty Binik	(347) 452-2897
Construction Manager	To be determined	

FIGURES



EBC Environmental Business Consultants Phone 631.504.6000 Fax 631. 924 .2870	Figure No. 1	Site Name:	Hope Street Project
		Site Address:	108-134 Hope Street, Brooklyn, NY
		Drawing Title:	Site Location Map



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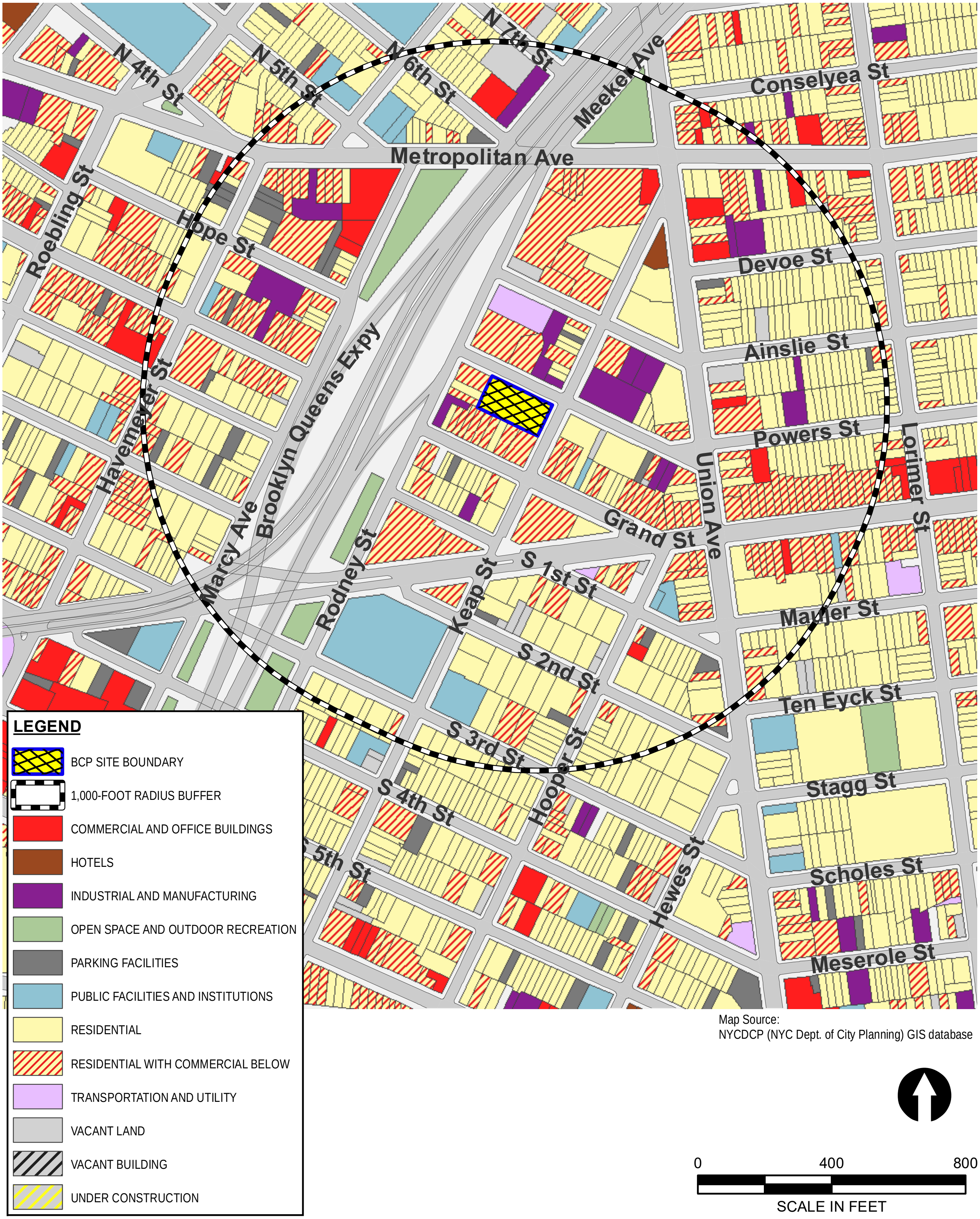
Fax 631. 924 .2870

Figure No.
2

Site Name:	Hope Street Project
Site Address:	108-134 Hope Street, Brookyln, NY
Drawing Title:	Site Plan



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

AKRF
440 Park Avenue South, New York, NY 10016

118 Hope Street
Brooklyn, New York

EXISTING LAND USE

DATE
5/7/2018

PROJECT NO.
180129

FIGURE
3

Map Source:
NYCDCP (NYC Dept. of City Planning 2015) GIS database.

Proposed Cellar Outline taken from Hill West Architects "Cellar Foundation Plan", Drawing No. FO-100.00, Dated 04/06/2018.

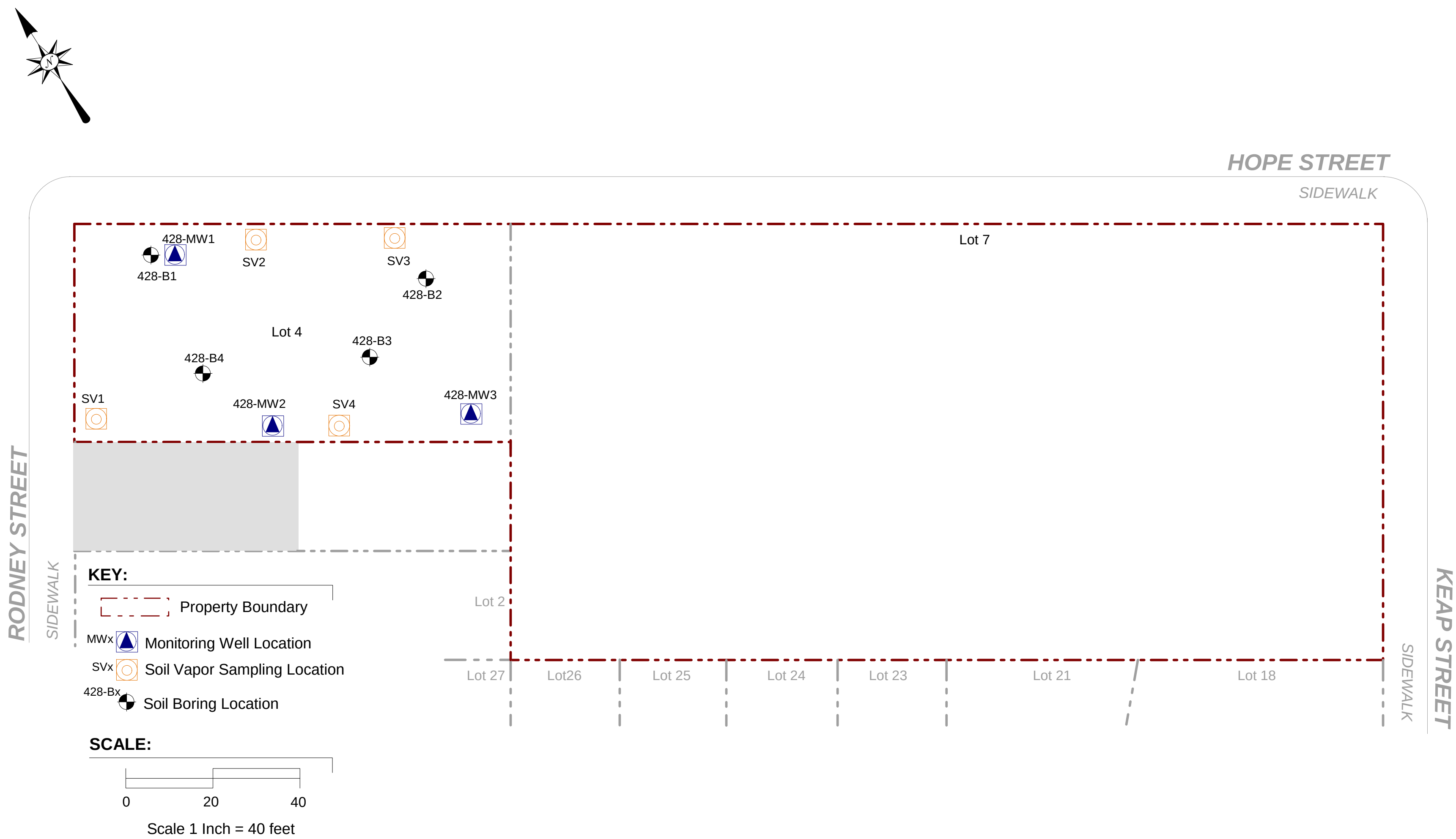


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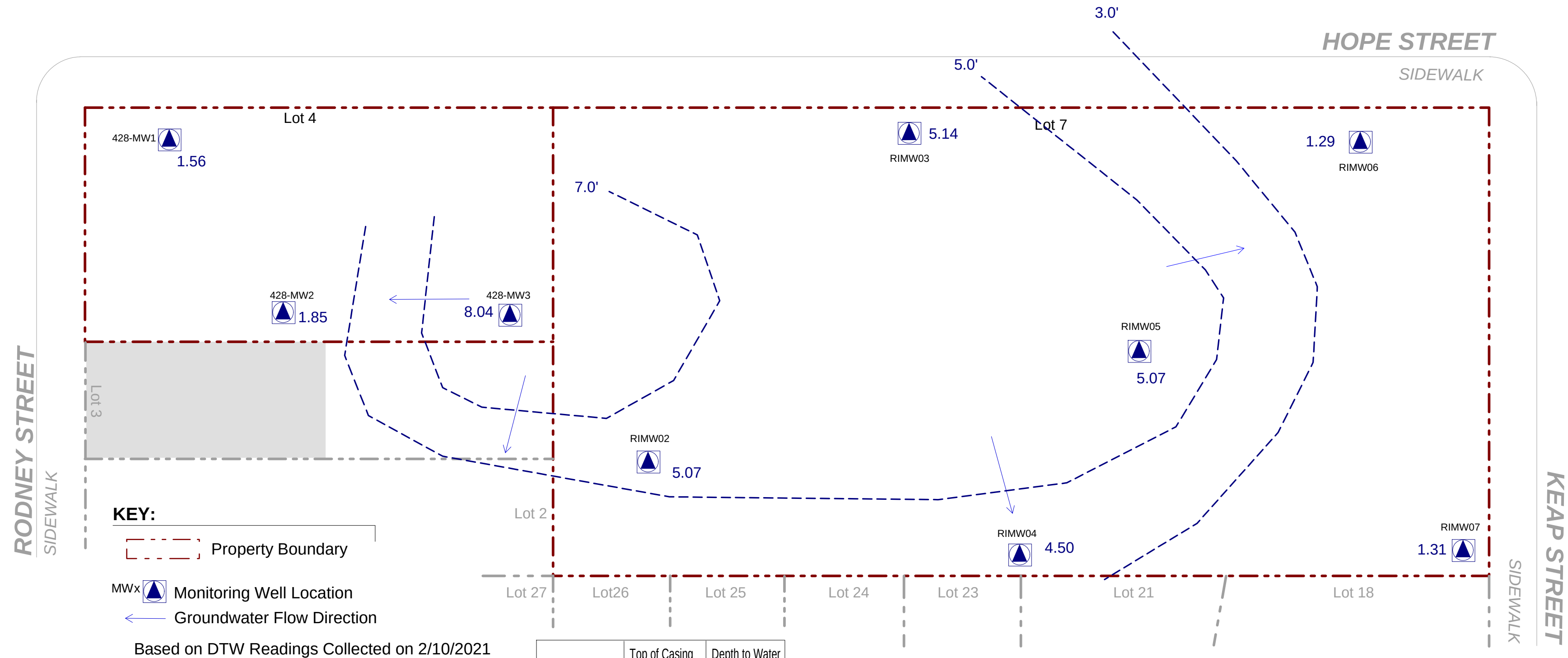
Figure No. 4b

Site Name: Hope Street Project

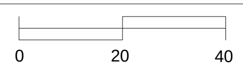
Site Address: 108-134 Hope Street, Brooklyn, NY

Drawing Title: Soil Gas and GW Sampling Locations



MW ID	Top of Casing Elevation	Depth to Water 2/10/2021
428-MW1	15.24'	13.68'
428-MW2	15.98'	14.13'
428-MW3	16.18'	8.14'
RIMW02	18.08'	13.01'
RIMW03	14.50'	9.36'
RIMW04	18.46'	13.96'
RIMW05	17.91'	12.84'
RIMW06	13.21'	11.92'
RIMW07	16.27'	14.96'

SCALE:



Scale 1 Inch = 40 feet

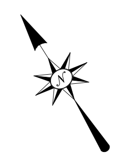


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Figure No.
5

Site Name: HOPE STREET PROJECT

Site Address: 108-134 HOPE STREET, BROOKLYN, NY

Drawing Title: GROUNDWATER CONTOUR MAP (2/10/2021)

Sample ID	NYSDEC	NYSDEC	B-1 (1-2)
Date Sampled	UUSCO	RRSCO	7/17/13
Volatile Organic Compounds			
Benzene	0.06	4.8	0.066
Methylene Chloride	0.05	100	0.49 J
Xylenes, Total	0.26	100	0.71
Metals			
Lead	63	400	550
Mercury	0.18	0.81	2.6

Sample ID	NYSDEC	NYSDEC	B-4 (1.5-3)
Date Sampled	UUSCO	RRSCO	7/18/13
Volatile Organic Compounds			
Acetone	0.05	100	0.73 J
Cis-1,2-dichloroethylene	0.25	100	0.29
Tetrachloroethylene	1.3	19	4.5
Toluene	0.7	100	7.3
Trichloroethylene	0.47	21	0.78
Xylenes, Total	0.26	100	0.68 J
Semivolatile Organic Compounds			
Benzo(a)anthracene	1	1	2.8
Benzo(a)pyrene	1	1	2.6
Benzo(b)fluoranthene	1	1	3.5
Benzo(k)fluoranthene	0.8	3.9	1.4
Chrysene	1	3.9	2.9
Dibenz(a,h)anthracene	0.33	0.33	0.58 J
Indeno(1,2,3-cd)pyrene	0.5	0.5	2.1
Metals			
Copper	50	270	200
Lead	63	400	860
Mercury	0.18	0.81	2.1
Nickel	30	310	62
Zinc	109	10,000	330

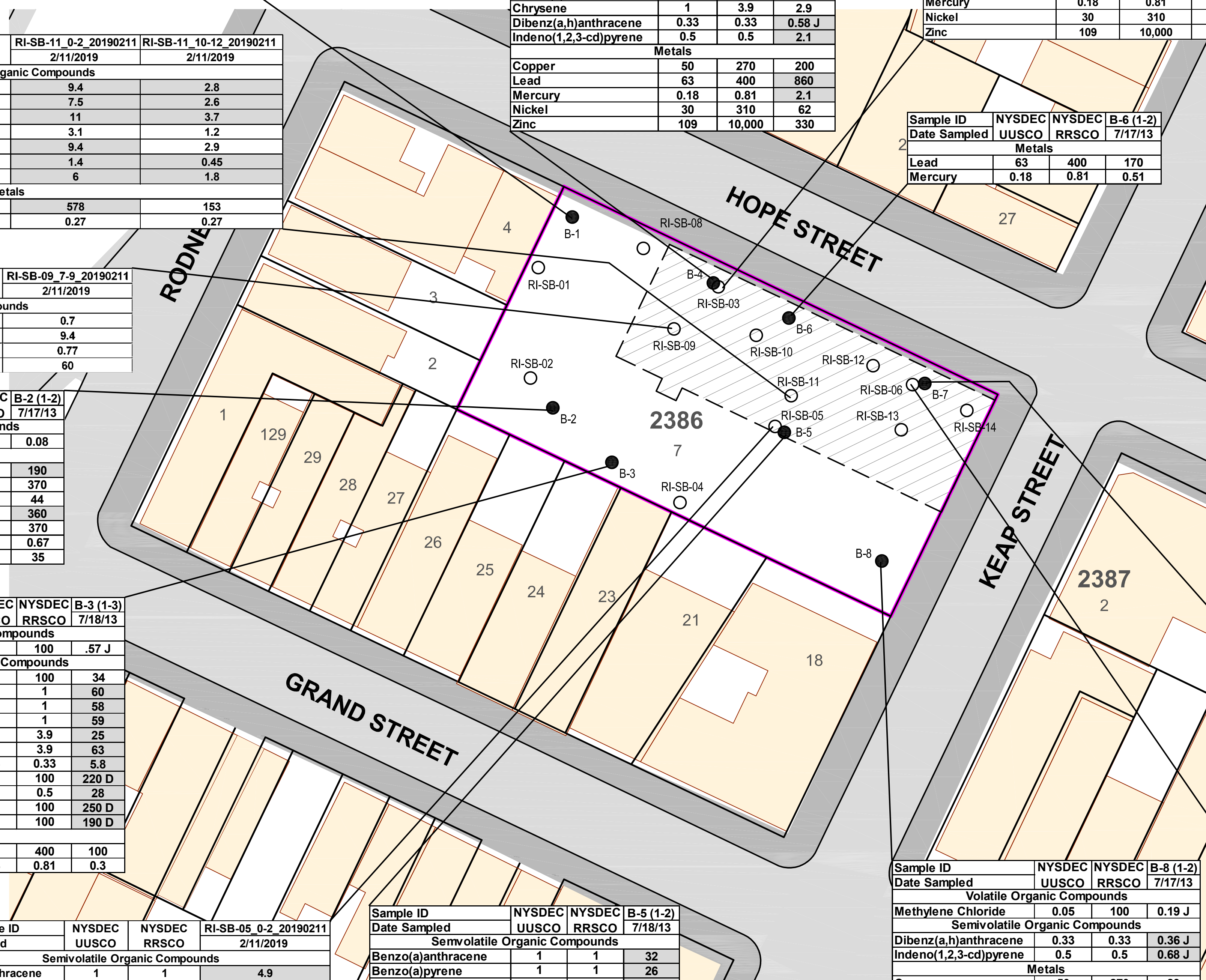
AKRF Sample ID	NYSDEC	NYSDEC	RI-SB-03_0-2_20190211	RI-SB-X01_0-2_20190211
Date Sampled	UUSCO	RRSCO	2/11/2019	2/11/2019
Semivolatile Organic Compounds				
Benzo(a)Anthracene	1	1	12	NE
Benzo(a)Pyrene	1	1	12	NE
Benzo(b)Fluoranthene	1	1	18	1.2 JL
Benzo(k)Fluoranthene	0.8	3.9	5.4	NE
Chrysene	1	3.9	13	NE
Dibenz(a,h)Anthracene	0.33	0.33	1.8	NE
Indeno(1,2,3-c,d)Pyrene	0.5	0.5	9.5	0.65 JL
Metals				
Copper	50	270	NE	58.7
Lead	63	400	195 JL	429
Mercury	0.18	0.81	0.36	0.38
Nickel	30	310	NE	134
Zinc	109	10,000	NE	121

AKRF Sample ID	NYSDEC	NYSDEC	RI-SB-11_0-2_20190211	RI-SB-11_10-12_20190211
Date Sampled	UUSCO	RRSCO	2/11/2019	2/11/2019
Semivolatile Organic Compounds				
Benzo(a)Anthracene	1	1	9.4	2.8
Benzo(a)Pyrene	1	1	7.5	2.6
Benzo(b)Fluoranthene	1	1	11	3.7
Benzo(k)Fluoranthene	0.8	3.9	3.1	1.2
Chrysene	1	3.9	9.4	2.9
Dibenz(a,h)Anthracene	0.33	0.33	1.4	0.45
Indeno(1,2,3-c,d)Pyrene	0.5	0.5	6	1.8
Metals				
Lead	63	400	578	153
Mercury	0.18	0.81	0.27	0.27

Sample ID	NYSDEC	NYSDEC	B-6 (1-2)
Date Sampled	UUSCO	RRSCO	7/17/13
Metals			
Lead	63	400	170
Mercury	0.18	0.81	0.51

AKRF Sample ID	NYSDEC	NYSDEC	RI-SB-09_7-9_20190211
Date Sampled	UUSCO	RRSCO	2/11/2019
Volatile Organic Compounds			
Benzene	0.06	4.8	0.7
Ethylbenzene	1	41	9.4
Toluene	0.7	100	0.77
Total Xylenes	0.26	100	60

Sample ID	NYSDEC	NYSDEC	B-2 (1-2)
Date Sampled	UUSCO	RRSCO	7/17/13
Volatile Organic Compounds			
Benzene	0.06	4.8	0.08
Metals			
Arsenic	13	16	190
Barium	350	400	370
Chromium	30	180	44
Copper	50	270	360
Lead	63	400	370
Mercury	0.18	0.81	0.67
Nickel	30	310	35



LEGEND

- BCP SITE BOUNDARY
- 7 — LOT BOUNDARY AND TAX LOT NUMBER
- 2386 — TAX BLOCK NUMBER
- BUILDING
- PROPOSED PARTIAL CELLAR
- REMEDIAL INVESTIGATION SOIL BORING LOCATION (AKRF, 2019)
- SOIL BORING LOCATION (FPM, 2013)

Part 375 Soil Cleanup Objectives:
Soil Cleanup Objectives listed in NYSDEC
(New York State Department of Environmental Conservation)
"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 (RRSCOS) are highlighted in gray.

Soil Sample RI-SB-X01_0-2_20190211 is a blind duplicate of sample RI-SB-03_0-2_20190211.

All results presented in mg/kg:milligrams per kilogram = parts per million (ppm)

NE: The reported concentration does not exceed UUSCOs and/or RRSCOs.

Sample ID	NYSDEC	NYSDEC	B-3 (1-3)
Date Sampled	UUSCO	RRSCO	7/18/13
Volatile Organic Compounds			
Acetone	0.05	100	.57 J
Semivolatile Organic Compounds			
Acenaphthene	20	100	34
Benzo(a)anthracene	1	1	60
Benzo(a)pyrene	1	1	58
Benzo(b)fluoranthene	1	1	59
Benzo(k)fluoranthene	0.8	3.9	25
Chrysene	1	3.9	63
Dibenz(a,h)anthracene	0.33	0.33	5.8
Fluoranthene	100	100	220 D
Indeno(1,2,3-cd)pyrene	0.5	0.5	28
Phenanthrene	100	100	250 D
Pyrene	100	100	190 D
Metals			
Lead	63	400	100
Mercury	0.18	0.81	0.3

Sample ID	NYSDEC	NYSDEC	B-7 (1-2)
Date Sampled	UUSCO	RRSCO	7/17/13
Volatile Organic Compounds			
Methylene Chloride	0.05	100	0.15 J
Tetrachloroethylene	1.3	19	1.5
Semivolatile Organic Compounds			
Benzo(a)anthracene	1	1	2.5
Benzo(a)pyrene	1	1	2
Benzo(b)fluoranthene	1	1	2.7
Benzo(k)fluoranthene	0.8	3.9	1.1
Chrysene	1	3.9	2.7
Dibenz(a,h)anthracene	0.33	0.33	0.56 J
Indeno(1,2,3-cd)pyrene	0.5	0.5	1.5
Metals			
Barium	350	400	430
Copper	50	270	68
Lead	63	400	540
Mercury	0.18	0.81	2.5
Zinc	109	10,000	350

Sample ID	NYSDEC	NYSDEC	B-8 (1-2)
Date Sampled	UUSCO	RRSCO	7/17/13
Volatile Organic Compounds			
Methylene Chloride	0.05	100	0.19 J
Semivolatile Organic Compounds			
Dibenz(a,h)anthracene	0.33	0.33	0.36 J
Indeno(1,2,3-cd)pyrene	0.5	0.5	0.68 J
Metals			
Copper	50	270	83
Lead	63	400	790
Mercury	0.18	0.81	3
Zinc	109	10,000	170

AKRF Sample ID	NYSDEC	NYSDEC	RI-SB-05_0-2_20190211
Date Sampled	UUSCO	RRSCO	2/11/2019
Semivolatile Organic Compounds			
Benzo(a)Anthracene	1	1	4.9
Benzo(a)Pyrene	1	1	3.5
Benzo(b)Fluoranthene	1	1	5
Benzo(k)Fluoranthene	0.8	3.9	1.7
Chrysene	1	3.9	4.7
Dibenz(a,h)Anthracene	0.33	0.33	0.46
Indeno(1,2,3-c,d)Pyrene	0.5	0.5	2.2
Metals			
Lead	63	400	268
Mercury	0.18	0.81	0.55

Sample ID	NYSDEC	NYSDEC	B-5 (1-2)
Date Sampled	UUSCO	RRSCO	7/18/13
Semvolatile Organic Compounds			
Benzo(a)anthracene	1	1	32
Benzo(a)pyrene	1	1	26
Benzo(b)fluoranthene	1	1	29
Benzo(k)fluoranthene	0.8	3.9	14
Chrysene	1	3.9	34
Dibenz(a,h)anthracene	0.33	0.33	4.1
Indeno(1,2,3-cd)pyrene	0.5	0.5	13
Metals			
Chromium	30	180	61
Copper	50	270	96
Lead	63	400	400
Mercury	0.18	0.81	4.6
Zinc	109	10,000	130

AKRF Sample ID	NYSDEC	NYSDEC	RI-SB-06_0-2_20190212	RI-SB-06_6-8_20190212
Date Sampled	UUSCO	RRSCO	2/12/2019	2/12/2019
Metals				
Arsenic	13	16	30.9	NE
Barium	350	400	628	NE
Copper	50	270	285	NE
Lead	63	400	1,750	68.7
Mercury	0.18	0.81	1.3	0.28
Selenium	3.9	180	6.8	NE
Zinc	109	10,000	434	199

Example key:

AKRF Sample ID	NYSDEC	NYSDEC	RI-SB-09_7-9_20190211
Date Sampled	UUSCO	RRSCO	2/11/2019
Volatile Organic Compounds			
Benzene	0.06	4.8	0.7
Ethylbenzene	1	41	9.4
Toluene	0.7	100	0.77

Sample ID
Sample Date
Concentration
Analyte/Compound

0 30 60 120
SCALE IN FEET

Map Source:
NYCDCP (NYC Dept. of City Planning 2015) GIS database.

Proposed Cellar Outline taken from Hill West Architects "Cellar Foundation Plan", Drawing No. FO-100.00, Dated 04/06/2018.

AKRF
440 Park Avenue South, New York, NY 10016

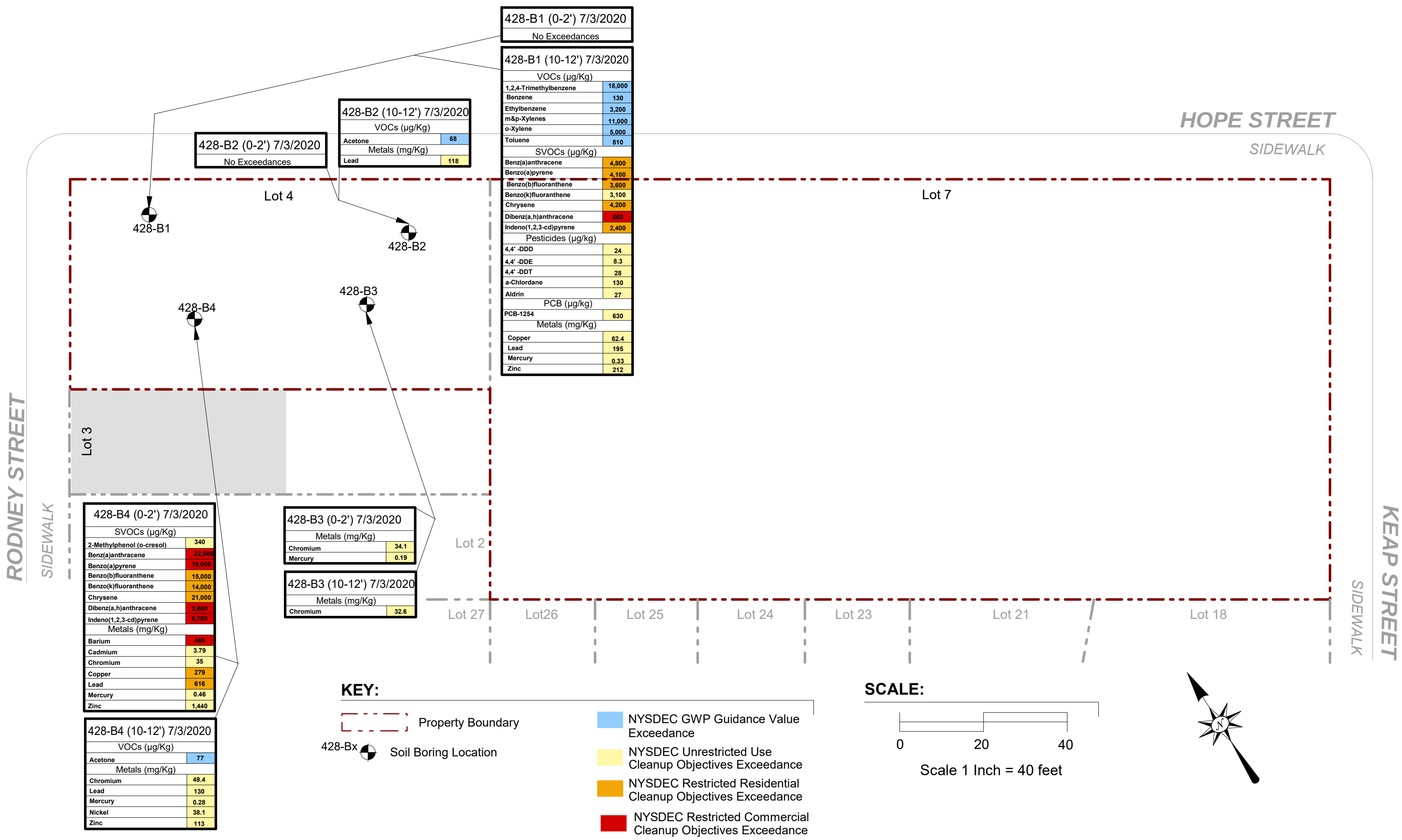
Hope Street Project
134 Hope Street
Brooklyn, New York

SOIL/FILL SAMPLE CONCENTRATIONS ABOVE UUSCOS AND/OR RRSCOS

DATE
5/20/2019

PROJECT NO.
180129

FIGURE
6a



428-B1 (0-2') 7/3/2020	
No Exceedances	

428-B1 (10-12') 7/3/2020	
VOCs (µg/Kg)	
1,2,4-Trimethylbenzene	18,000
Benzene	130
Ethylbenzene	3,200
m&p-Xylenes	11,000
o-Xylene	5,000
Toluene	810
SVOCs (µg/Kg)	
Benz(a)anthracene	4,800
Benzo(a)pyrene	4,100
Benzo(b)fluoranthene	3,600
Benzo(k)fluoranthene	3,100
Chrysene	4,200
Dibenz(a,h)anthracene	560
Indeno(1,2,3-cd)pyrene	2,400
Pesticides (µg/kg)	
4,4' -DDD	24
4,4' -DDE	8.3
4,4' -DDT	28
a-Chlordane	130
Aldrin	27
PCB (µg/kg)	
PCB-1254	630
Metals (mg/Kg)	
Copper	62.4
Lead	195
Mercury	0.33
Zinc	212

428-B2 (0-2') 7/3/2020	
No Exceedances	

428-B2 (10-12') 7/3/2020	
VOCs (µg/Kg)	
Acetone	68
Metals (mg/Kg)	
Lead	118

428-B3 (0-2') 7/3/2020	
Metals (mg/Kg)	
Chromium	34.1
Mercury	0.19

428-B3 (10-12') 7/3/2020	
Metals (mg/Kg)	
Chromium	32.6

428-B4 (0-2') 7/3/2020	
SVOCs (µg/Kg)	
2-Methylphenol (o-cresol)	340
Benz(a)anthracene	22,000
Benzo(a)pyrene	19,000
Benzo(b)fluoranthene	15,000
Benzo(k)fluoranthene	14,000
Chrysene	21,000
Dibenz(a,h)anthracene	2,600
Indeno(1,2,3-cd)pyrene	6,700
Metals (mg/Kg)	
Barium	465
Cadmium	3.79
Chromium	35
Copper	279
Lead	616
Mercury	0.46
Zinc	1,440

428-B4 (10-12') 7/3/2020	
VOCs (µg/Kg)	
Acetone	77
Metals (mg/Kg)	
Chromium	49.4
Lead	130
Mercury	0.28
Nickel	38.1
Zinc	113

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Phone 631.504.6000
Fax 631. 924 .2870

Figure No.
6b

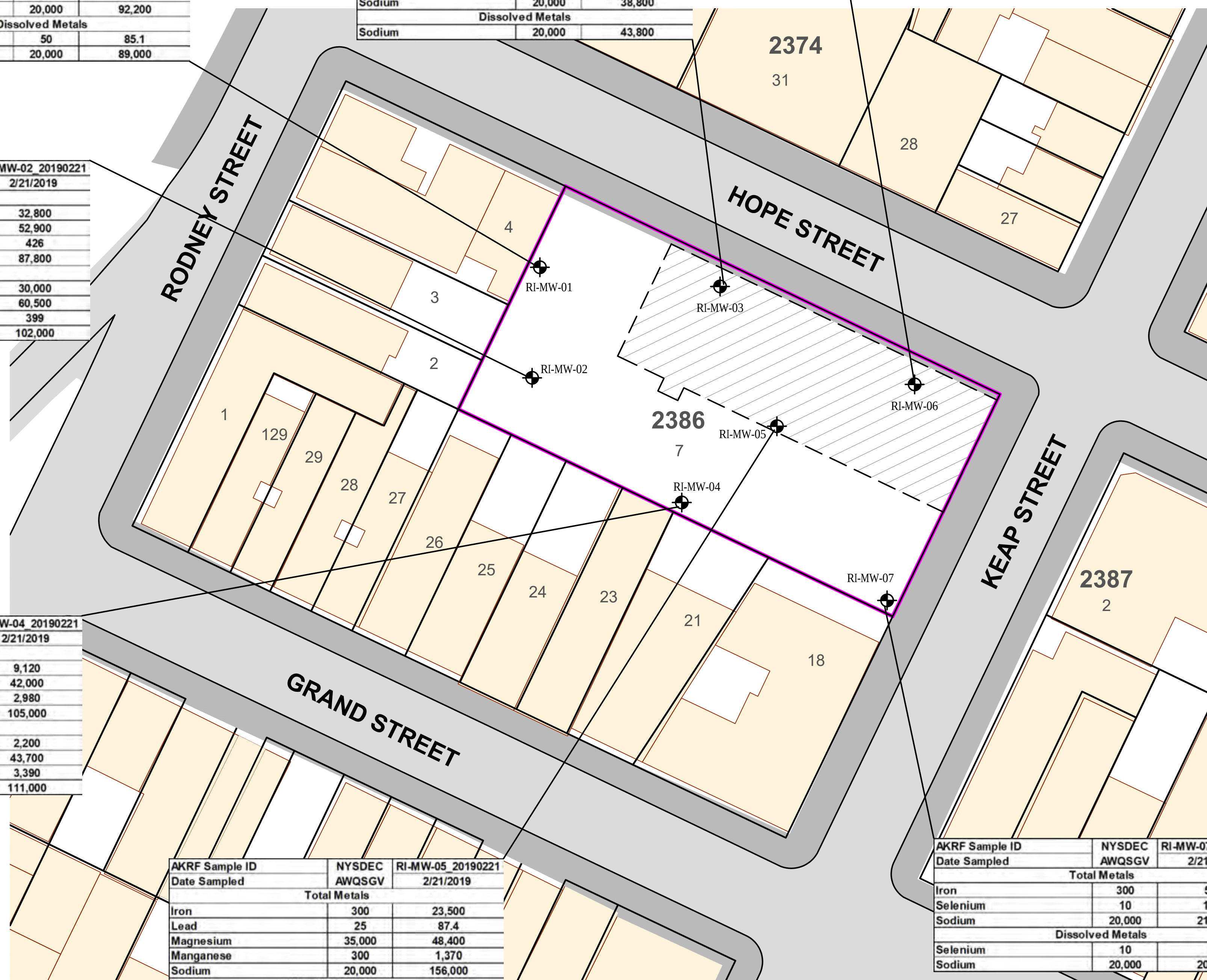
Site Name: HOPE STREET PROJECT
Site Address: 108-134 HOPE STREET, BROOKLYN, NY
Drawing Title: POSTED SOIL RESULTS ABOVE SCOs

AKRF Sample ID	NYSDEC	RI-MW-03_20190221
Date Sampled	AWQSGV	2/21/2019
Volatile Organic Compounds		
Benzene	1	53
Cis-1,2-Dichloroethylene	5	92
Ethylbenzene	5	31
Isopropylbenzene (Cumene)	5	30
Toluene	5	6.2
Vinyl Chloride	2	19
Total Metals		
Iron	300	19,000
Sodium	20,000	38,800
Dissolved Metals		
Sodium	20,000	43,800

AKRF Sample ID	NYSDEC	RI-MW-06_20190221	RI-MW-X01_20190221
Date Sampled	AWQSGV	2/21/2019	2/21/2019
Volatile Organic Compounds			
Tetrachloroethylene	5	10	14
Total Metals			
Selenium	10	18.7	18.6
Sodium	20,000	52,200	51,900
Dissolved Metals			
Selenium	10	18.7	18.7
Sodium	20,000	52,300	51,700

AKRF Sample ID	NYSDEC	RI-MW-01_20190221
Date Sampled	AWQSGV	2/21/2019
Total Metals		
Chromium, Total	50	94.1
Sodium	20,000	92,200
Dissolved Metals		
Chromium, Total	50	85.1
Sodium	20,000	89,000

AKRF Sample ID	NYSDEC	RI-MW-02_20190221
Date Sampled	AWQSGV	2/21/2019
Total Metals		
Iron	300	32,800
Magnesium	35,000	52,900
Manganese	300	426
Sodium	20,000	87,800
Dissolved Metals		
Iron	300	30,000
Magnesium	35,000	60,500
Manganese	300	399
Sodium	20,000	102,000



LEGEND

BCP SITE BOUNDARY

7 LOT BOUNDARY AND TAX LOT NUM

2386 TAX BLOCK NUMBER

BUILDING

PROPOSED PARTIAL CELLAR

REMEDIAL INVESTIGATION GROUN WELL LOCATION (AKRF, 2019)

NYSDEC Class GA Ambient Standard:
New York State Department of Environmental Cons and Operational Guidance Series (TOGS) (1.1.1): C Quality Standards and Guidance Values (AWQSGV

Only Exceedances of AWQSGVs are shown.

Groundwater Sample RI-MW-X01_20190211 is a bl of sample RI-MW-06_20190221.

All results presented in (µg/L) - micrograms per Liter = pa

AKRF Sample ID	NYSDEC	RI-MW-04_20190221
Date Sampled	AWQSGV	2/21/2019
Total Metals		
Iron	300	9,120
Magnesium	35,000	42,000
Manganese	300	2,980
Sodium	20,000	105,000
Dissolved Metals		
Iron	300	2,200
Magnesium	35,000	43,700
Manganese	300	3,390
Sodium	20,000	111,000

AKRF Sample ID	NYSDEC	RI-MW-07_20190221
Date Sampled	AWQSGV	2/21/2019
Total Metals		
Iron	300	532
Selenium	10	11.4
Sodium	20,000	21,400
Dissolved Metals		
Selenium	10	11
Sodium	20,000	20,900

AKRF Sample ID	NYSDEC	RI-MW-05_20190221
Date Sampled	AWQSGV	2/21/2019
Total Metals		
Iron	300	23,500
Lead	25	87.4
Magnesium	35,000	48,400
Manganese	300	1,370
Sodium	20,000	156,000
Dissolved Metals		
Iron	300	16,600
Magnesium	35,000	52,300
Manganese	300	1,410
Sodium	20,000	170,000

AKRF Sample ID	NYSDEC	RI-MW-01_20190221
Date Sampled	AWQSGV	2/21/2019
Total Metals		
Chromium, Total	50	94.1
Sodium	20,000	92,200
Dissolved Metals		
Chromium, Total	50	85.1
Sodium	20,000	89,000

Sample ID
Sample Date
Concentration
Analyte/Compound

0 30

Map Source:
NYCDCP (NYC Dept. of City Planning 2015) GIS database.

Proposed Cellar Outline taken from Hill West Architects "Cellar Foundation Plan", Drawing No. FO-100.00, Dated 04/06/2018.

428 MW1 7/6/2020	
VOCs (µg/L)	
1,2,4-Trimethylbenzene	52
1,3,5-Trimethylbenzene	11
Benzene	12
Ethylbenzene	27
Naphthalene	9.6
n-Propylbenzene	7.8
o-Xylene	56
Toluene	82
SVOCs (µg/L)	
2-Methylphenol (o-cresol)	1.3
Total Metals (mg/L)	
Aluminum	79.9
Beryllium	0.004
Chromium	0.15
Iron	135
Lead	0.06
Manganese	1.63
Sodium	165
Thallium	0.0009
Dissolved Metals (mg/L)	
Manganese (Dissolved)	0.583
Sodium (Dissolved)	156

428 MW3 7/6/2020	
PCB (µg/L)	
PCB-1016	0.66
Total Metals (mg/L)	
Aluminum	1.04
Antimony	0.0033
Iron	1.55
Sodium	57.7
Dissolved Metals (mg/L)	
Sodium (Dissolved)	57.2

428 MW2 7/6/2020	
Total Metals (mg/L)	
Aluminum	10.7
Iron	35.6
Manganese	2.26
Sodium	45.8
Dissolved Metals (mg/L)	
Manganese (Dissolved)	1.84
Sodium (Dissolved)	44.6

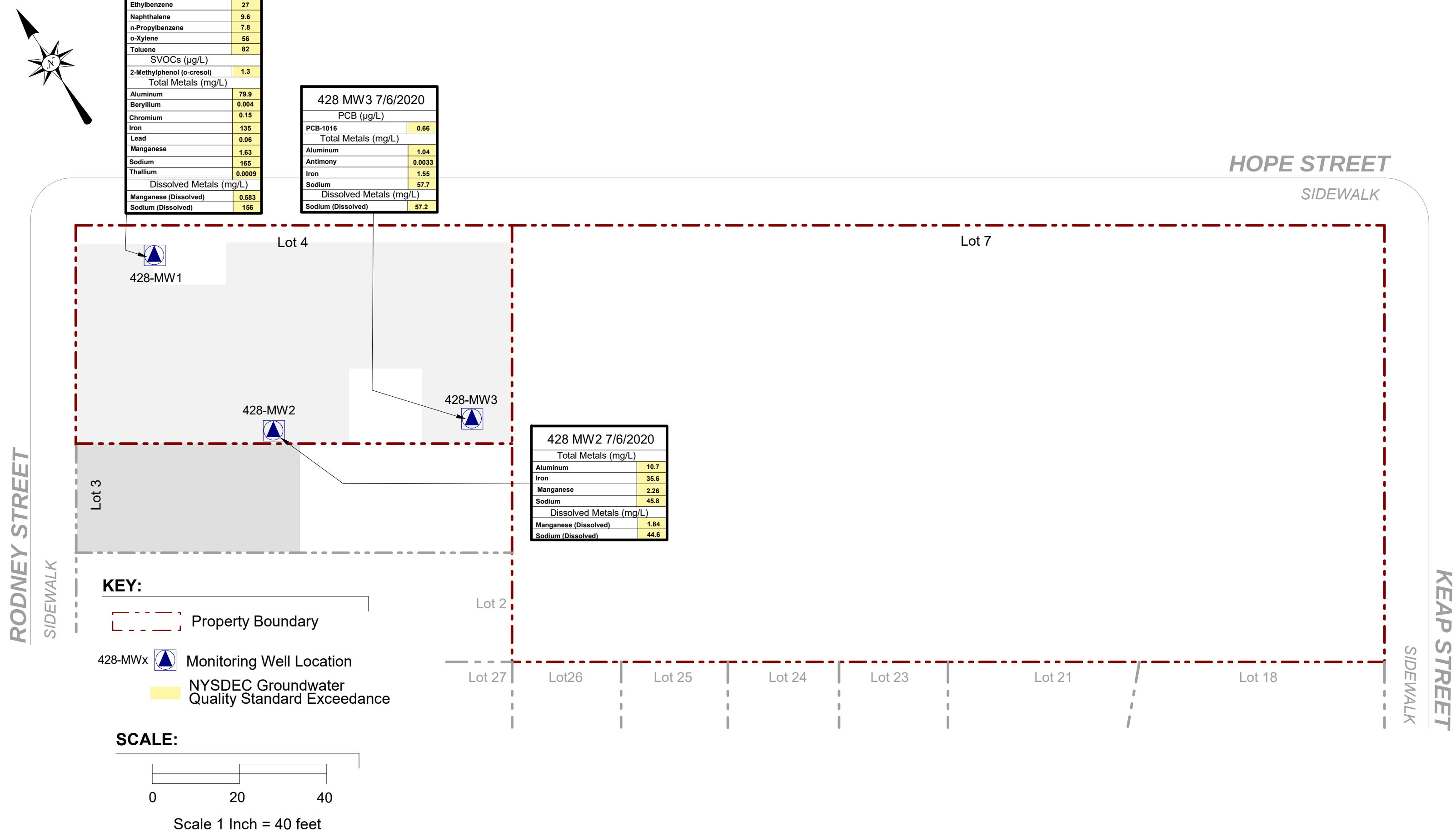


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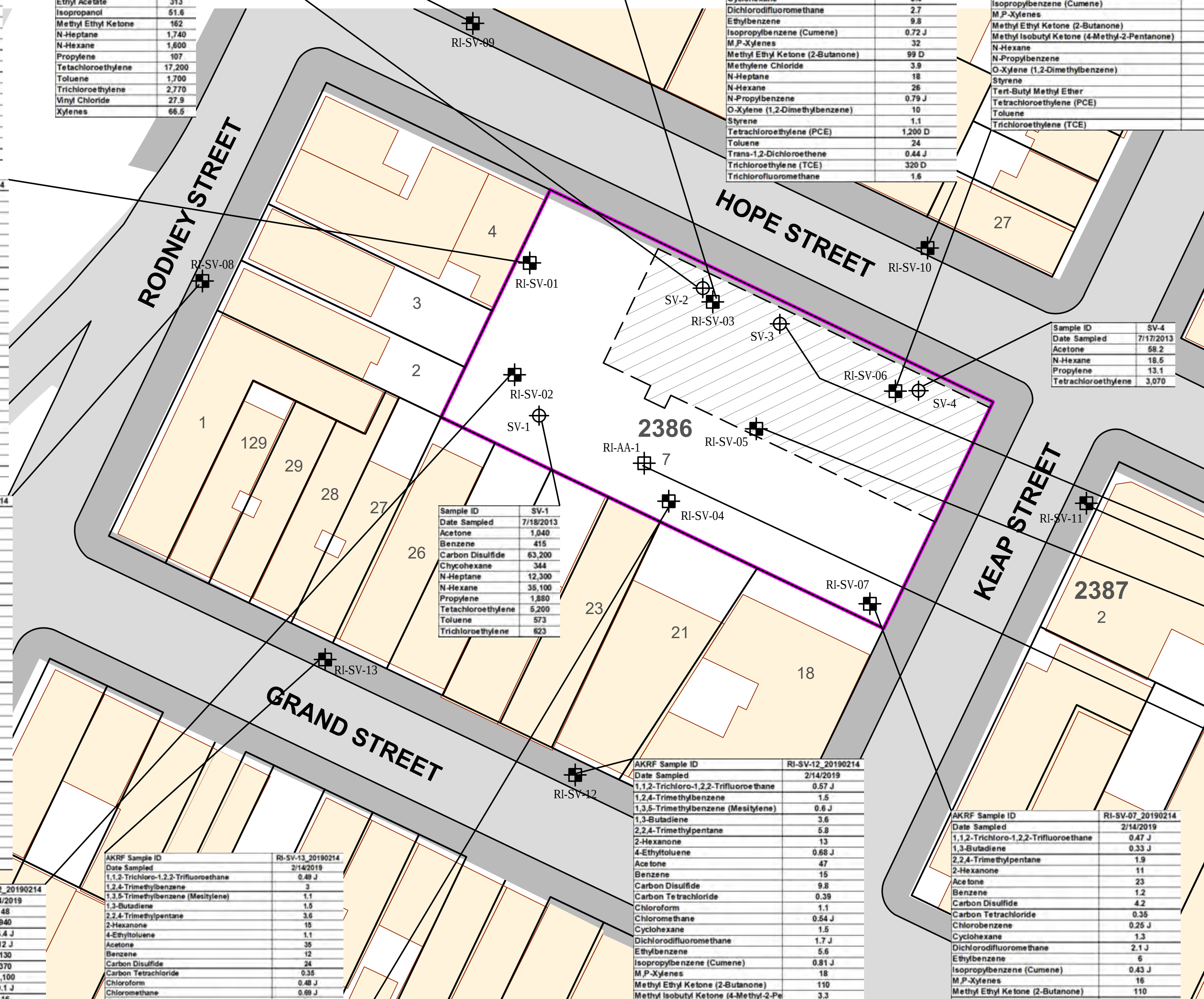
Figure No.
7b

Site Name:	HOPE STREET PROJECT
Site Address:	108-134 HOPE STREET, BROOKLYN, NY
Drawing Title:	GROUNDWATER EXCEEDANCE MAP



AKRF Sample ID	RI-SV-09_20190214
Date Sampled	2/14/2019
1,1,2-Trichloro-1,2,2-Trifluoroethane	0.45 J
1,2,4-Trimethylbenzene	1.6
1,3,5-Trimethylbenzene (Mesitylene)	0.71 J
1,3-Butadiene	2.8
2,2,4-Trimethylpentane	5.8
2-Hexanone	34
4-Ethyltoluene	0.85 J
Acetone	28
Benzene	4
Carbon Disulfide	9
Carbon Tetrachloride	0.42
Chloroform	1.8
Chloromethane	1.4
Cis-1,2-Dichloroethylene	2.6
Cyclohexane	2.1
Dichlorodifluoromethane	1.8 J
Ethylbenzene	7.2
Isopropylbenzene (Cumene)	1
M,P-Xylenes	25
Methyl Ethyl Ketone (2-Butanone)	220 D
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	2.6
Methylene Chloride	2.1
N-Hexane	5.8
N-Propylbenzene	1
O-Xylene (1,2-Dimethylbenzene)	8.4
Styrene	1.2
Tert-Butyl Methyl Ether	1.9
Tetrachloroethylene (PCE)	4.3
Toluene	8.3
Trichloroethylene (TCE)	9.3
Trichlorofluoromethane	1.4
Vinyl Chloride	3.3

Sample ID	SV-2
Date Sampled	7/18/2013
1,4-Dichlorobenzene	97.4
Acetone	801
Carbon Disulfide	25.2
Cis-1,2-Dichloroethylene	539
Cyclohexane	1,060
Ethyl Acetate	313
Isopropanol	51.6
Methyl Ethyl Ketone	162
N-Heptane	1,740
N-Hexane	1,600
Propylene	107
Tetachloroethylene	17,200
Toluene	1,700
Trichloroethylene	2,770
Vinyl Chloride	27.9
Xylenes	66.5

AKRF Sample ID	RI-SV-03_20190214
Date Sampled	2/14/2019
Benzene	21 J
Carbon Disulfide	12,000 D
M,P-Xylenes	16 J
Methyl Ethyl Ketone (2-Butanone)	260
N-Heptane	33
N-Hexane	110
Tetrachloroethylene (PCE)	620
Toluene	19 J
Trichloroethylene (TCE)	13

AKRF Sample ID	RI-SV-10_20190214
Date Sampled	2/14/2019
1,1,2-Trichloro-1,2,2-Trifluoroethane	0.53 J
1,2,4-Trimethylbenzene	1.7
1,3,5-Trimethylbenzene (Mesitylene)	0.66 J
1,3-Butadiene	2.9
2,2,4-Trimethylpentane	6.3
2-Hexanone	24
4-Ethyltoluene	0.77 J
Acetone	28
Benzene	4
Carbon Disulfide	4.2
Carbon Tetrachloride	0.2 J
Chloroform	1.1
Cis-1,2-Dichloroethylene	8.4
Cyclohexane	3.4
Dichlorodifluoromethane	2.7
Ethylbenzene	9.8
Isopropylbenzene (Cumene)	0.72 J
M,P-Xylenes	32
Methyl Ethyl Ketone (2-Butanone)	99 D
Methylene Chloride	3.9
N-Heptane	18
N-Hexane	26
N-Propylbenzene	0.79 J
O-Xylene (1,2-Dimethylbenzene)	10
Styrene	1.1
Tetrachloroethylene (PCE)	1,200 D
Toluene	24
Trans-1,2-Dichloroethene	0.44 J
Trichloroethylene (TCE)	320 D
Trichlorofluoromethane	1.6

AKRF Sample ID	RI-SV-06_20190214
Date Sampled	2/14/2019
1,1,2-Trichloro-1,2,2-Trifluoroethane	0.52 J
1,2,4-Trimethylbenzene	0.75 J
1,3,5-Trimethylbenzene (Mesitylene)	0.32 J
1,3-Butadiene	5
2,2,4-Trimethylpentane	4.4
2-Hexanone	7
4-Ethyltoluene	0.37 J
Acetone	23
Benzene	1.5
Carbon Disulfide	0.76 J
Carbon Tetrachloride	0.15 J
Cyclohexane	1.7
Dichlorodifluoromethane	2.1 J
Ethylbenzene	2.7
Isopropylbenzene (Cumene)	0.6 J
M,P-Xylenes	11
Methyl Ethyl Ketone (2-Butanone)	81
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	1.6 J
N-Hexane	2.3
N-Propylbenzene	0.48 J
O-Xylene (1,2-Dimethylbenzene)	3.8
Styrene	0.95
Tert-Butyl Methyl Ether	0.36 J
Tetrachloroethylene (PCE)	520 D
Toluene	3.1
Trichloroethylene (TCE)	1.8

LEGEND

BCP SITE BOUNDARY

7 LOT BOUNDARY AND TAX

2386 TAX BLOCK NUMBER

BUILDING

PROPOSED PARTIAL CELL

REMEDIAL INVESTIGATION POINT LOCATION (AKRF, 2

REMEDIAL INVESTIGATION LOCATION (AKRF, 2019)

TEMPORARY SOIL VAPOR LOCATION (FPM, 2013)

All results presented in (µg/m³): micrograms per cubic r

J: The analyte was detected at a concentration above tl and is approximate and may be inaccurate or imprecise

D: The reported concentration is a result of a diluted ana

AKRF Sample ID	RI-SV-01_20190214
Date Sampled	2/14/2019
1,1,2-Trichloro-1,2,2-Trifluoroethane	0.43 J
1,2,4-Trimethylbenzene	1.5
1,3,5-Trimethylbenzene (Mesitylene)	0.54 J
1,3-Butadiene	0.21 J
2,2,4-Trimethylpentane	1
2-Hexanone	16
4-Ethyltoluene	0.62 J
Acetone	20
Benzene	0.58 J
Carbon Tetrachloride	0.34
Cis-1,2-Dichloroethylene	0.66
Cyclohexane	0.77
Dichlorodifluoromethane	2.1 J
Ethylbenzene	4.7
Isopropylbenzene (Cumene)	0.56 J
M,P-Xylenes	20
Methyl Ethyl Ketone (2-Butanone)	160 D
Methylene Chloride	5
N-Hexane	1.7
N-Propylbenzene	0.66 J
O-Xylene (1,2-Dimethylbenzene)	6.7
Styrene	0.99
Tetrachloroethylene (PCE)	90
Toluene	3.5
Trichloroethylene (TCE)	0.73

Sample ID	SV-4
Date Sampled	7/17/2013
Acetone	58.2
N-Hexane	18.5
Propylene	13.1
Tetrachloroethylene	3,070

Sample ID	SV-3
Date Sampled	7/17/2013
1,2-Dichloropropane	6.84
1,4-Dichlorobenzene	80.6
Acetone	20.9
Benzene	3.99
Carbon Disulfide	4.48
Chloroform	31.7
Methyl Ethyl Ketone	3.54
N-Heptane	3.59
N-Hexane	7.4
Propylene	11.8
Tetrachloroethylene	1,450
Toluene	8.97
Trichloroethylene	4.84

AKRF Sample ID	RI-SV-08_20190214
Date Sampled	2/14/2019
1,1,2-Trichloro-1,2,2-Trifluoroethane	0.48 J
1,1-Dichloroethene	0.13 J
1,2,4-Trimethylbenzene	2.2
1,3,5-Trimethylbenzene (Mesitylene)	0.94 J
1,3-Butadiene	2
2,2,4-Trimethylpentane	20
2-Hexanone	27
4-Ethyltoluene	1.1
Acetone	42
Benzene	21
Carbon Disulfide	36
Carbon Tetrachloride	0.35
Chloroform	2.4
Chloromethane	0.89 J
Cyclohexane	5.4
Dichlorodifluoromethane	2 J
Ethylbenzene	8.9
Isopropylbenzene (Cumene)	1.3
M,P-Xylenes	28
Methyl Ethyl Ketone (2-Butanone)	130 D
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	6
Methylene Chloride	5.7
N-Heptane	10
N-Hexane	19
N-Propylbenzene	1.3
O-Xylene (1,2-Dimethylbenzene)	9.4
Styrene	1
Tert-Butyl Methyl Ether	1
Tetrachloroethylene (PCE)	6.2
Toluene	29
Trichloroethylene (TCE)	0.22
Trichlorofluoromethane	1.4

Sample ID	SV-1
Date Sampled	7/18/2013
Acetone	1,040
Benzene	415
Carbon Disulfide	63,200
Chycohexane	344
N-Heptane	12,300
N-Hexane	35,100
Propylene	1,880
Tetachloroethylene	5,200
Toluene	573
Trichloroethylene	623

AKRF Sample ID	RI-AA-01_20190214
Date Sampled	2/14/2019
1,1,2-Trichloro-1,2,2-Trifluoroethane	0.51 J
2,2,4-Trimethylpentane	2.4 J
Acetone	7.9 J
Benzene	1.2 J
Carbon Tetrachloride	0.45 J
Chloromethane	0.95 J
Cyclohexane	1.7 J
Dichlorodifluoromethane	1.7 J
Ethylbenzene	0.53 J
Isopropylbenzene (Cumene)	0.42 J
M,P-Xylenes	2 J
Methylene Chloride	13 J
N-Hexane	3.3 J
O-Xylene (1,2-Dimethylbenzene)	1
Styrene	0.84 J
Toluene	3 J
Trichlorofluoromethane	1.3 J

AKRF Sample ID	RI-SV-12_20190214
Date Sampled	2/14/2019
1,1,2-Trichloro-1,2,2-Trifluoroethane	0.57 J
1,2,4-Trimethylbenzene	1.5
1,3,5-Trimethylbenzene (Mesitylene)	0.6 J
1,3-Butadiene	3.6
2,2,4-Trimethylpentane	5.8
2-Hexanone	13
4-Ethyltoluene	0.68 J
Acetone	47
Benzene	15
Carbon Disulfide	9.8
Carbon Tetrachloride	0.39
Chloroform	1.1
Chloromethane	0.54 J
Cyclohexane	1.5
Dichlorodifluoromethane	1.7 J
Ethylbenzene	5.6
Isopropylbenzene (Cumene)	0.81 J
M,P-Xylenes	18
Methyl Ethyl Ketone (2-Butanone)	110
Methyl Isobutyl Ketone (4-Methyl-2-Pe	3.3
Methylene Chloride	1.6 J
N-Heptane	3.7
N-Hexane	4.1
N-Propylbenzene	0.8 J
O-Xylene (1,2-Dimethylbenzene)	6.5
Styrene	3
Tert-Butyl Methyl Ether	0.77
Tetrachloroethylene (PCE)	1.6
Toluene	12
Trichloroethylene (TCE)	0.25
Trichlorofluoromethane	1.3

AKRF Sample ID	RI-SV-07_20190214
Date Sampled	2/14/2019
1,1,2-Trichloro-1,2,2-Trifluoroethane	0.47 J
1,3-Butadiene	0.33 J
2,2,4-Trimethylpentane	1.9
2-Hexanone	11
Acetone	23
Benzene	1.2
Carbon Disulfide	4.2
Carbon Tetrachloride	0.35
Chlorobenzene	0.25 J
Cyclohexane	1.3
Dichlorodifluoromethane	2.1 J
Ethylbenzene	6
Isopropylbenzene (Cumene)	0.43 J
M,P-Xylenes	16
Methyl Ethyl Ketone (2-Butanone)	110
N-Hexane	2.9
O-Xylene (1,2-Dimethylbenzene)	4.4
Tetrachloroethylene (PCE)	33
Toluene	7.2

AKRF Sample ID	RI-SV-02_20190214
Date Sampled	2/14/2019
Benzene	48
Carbon Disulfide	940
Ethylbenzene	4.4 J
M,P-Xylenes	12 J
Methyl Ethyl Ketone (2-Butanone)	130
N-Heptane	370
N-Hexane	1,100
Tetrachloroethylene (PCE)	9.1 J
Toluene	16

AKRF Sample ID	RI-SV-13_20190214
Date Sampled	2/14/2019
1,1,2-Trichloro-1,2,2-Trifluoroethane	0.49 J
1,2,4-Trimethylbenzene	3
1,3,5-Trimethylbenzene (Mesitylene)	1.1
1,3-Butadiene	1.5
2,2,4-Trimethylpentane	3.6
2-Hexanone	15
4-Ethyltoluene	1.1
Acetone	35
Benzene	12
Carbon Disulfide	24
Carbon Tetrachloride	0.35
Chloroform	0.48 J
Chloromethane	0.69 J
Cyclohexane	2.1
Dichlorodifluoromethane	1.8 J
Ethylbenzene	7
Isopropylbenzene (Cumene)	0.8 J
M,P-Xylenes	25
Methyl Ethyl Ketone (2-Butanone)	100
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	3.2
N-Heptane	4.1
N-Hexane	5.5
N-Propylbenzene	1.1
O-Xylene (1,2-Dimethylbenzene)	8.7
Styrene	1.3
Tert-Butyl Methyl Ether	0.34 J
Tetrachloroethylene (PCE)	1.6
Toluene	8.6
Trichloroethylene (TCE)	0.26
Trichlorofluoromethane	1.3

AKRF Sample ID	RI-SV-04_20190214
Date Sampled	2/14/2019
2-Hexanone	24
Benzene	26
Carbon Disulfide	21
Ethylbenzene	16
M,P-Xylenes	23
Methyl Ethyl Ketone (2-Butanone)	220
N-Heptane	1,300 D
N-Hexane	2,500 D
O-Xylene (1,2-Dimethylbenzene)	8.1
Tetrachloroethylene (PCE)	190
Toluene	49

AKRF Sample ID	RI-SV-01_20190214
Date Sampled	2/14/2019
1,1,2-Trichloro-1,2,2-Trifluoroethane	0.43 J
1,2,4-Trimethylbenzene	1.5
1,3,5-Trimethylbenzene (Mesitylene)	0.54 J

Sample ID
Sample Date
Concentration
Analyte/Compound

0 30

Map Source:
NYCDCP (NYC Dept. of City Planning 2015) GIS database.

Proposed Cellar Outline taken from Hill West Architects "Cellar Foundation Plan", Drawing No. FO-100.00, Dated 04/06/2018.

SV1 7/6/2020	
VOCs (µg/m³)	
1,1,1-Trichloroethane	23.3
1,2,4-Trimethylbenzene	2.87
1,3-Dichlorobenzene	4.45
4-Ethyltoluene	2.01
4-Isopropyltoluene	1.01
Acetone	39.2
Benzene	1.67
Carbon Tetrachloride	0.76
Dichlorodifluromethane	1.49
Ethanol	230
Ethylbenzene	6.6
Heptane	8.19
Hexane	10.4
Isopropylalcohol	6.29
Xylene (m&p)	16
Methyl Ethyl Ketone	20.6
Xylene (o)	5.9
Propylene	5.97
Tetrachloroethene	1.98
Toluene	8.74
Trichlorofluoromethane	2.04

SV2 7/6/2020	
VOCs (µg/m³)	
1,2,4-Trimethylbenzene	2.79
1,3-Dichlorobenzene	3.62
4-Ethyltoluene	1.91
Acetone	27.3
Dichlorodifluromethane	2.79
Ethanol	198
Ethylbenzene	3.06
Heptane	3.55
Hexane	18.4
Isopropylalcohol	4.42
Xylene (m&p)	10.5
Methyl Ethyl Ketone	17
Xylene (o)	3.78
Propylene	6.76
Tetrachloroethene	1.84
Tetrahydrofuran	11.9
Toluene	6.44
Trichlorofluoromethane	61.8

SV3 7/6/2020	
VOCs (µg/m³)	
1,2,4-Trimethylbenzene	2.65
1,3-Dichlorobenzene	3.55
4-Ethyltoluene	1.82
Acetone	44.4
Carbon Tetrachloride	0.57
Chloroform	1.65
Dichlorodifluromethane	5.34
Ethanol	286
Ethylbenzene	2.79
Heptane	1.24
Isopropylalcohol	5.55
Xylene (m&p)	10.2
Methyl Ethyl Ketone	23.9
Xylene (o)	3.93
Propylene	2.6
Tetrachloroethene	2.46
Tetrahydrofuran	2.98
Toluene	6.67
Trichlorofluoromethane	30.3

SV4 7/6/2020	
VOCs (µg/m³)	
1,2,4-Trimethylbenzene	5.4
1,3,5-Trimethylbenzene	5.31
1,3-Dichlorobenzene	3.84
4-Ethyltoluene	27
Acetone	31.6
Carbon Tetrachloride	0.41
Dichlorodifluromethane	1.71
Ethanol	243
Ethyl Acetate	9.98
Ethylbenzene	3.56
Hexane	1.8
Isopropylalcohol	19.4
Isopropylbenzene	2.82
Xylene (m&p)	11.6
Methyl Ethyl Ketone	16.3
Xylene (o)	6.86
Propylene	1.43
Tetrachloroethene	6.53
Tetrahydrofuran	2.3
Toluene	5.39
Trichlorofluoromethane	2.12

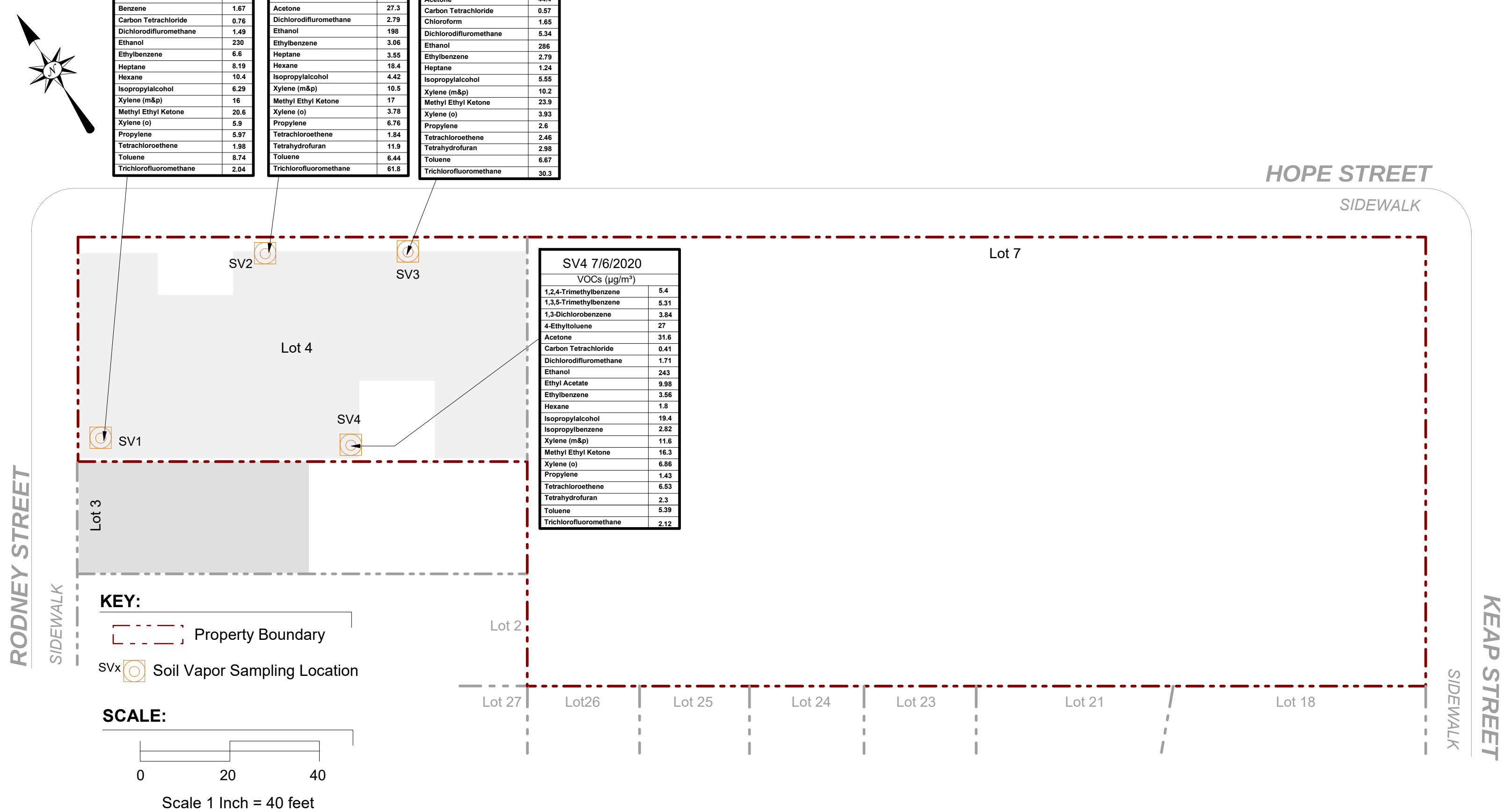


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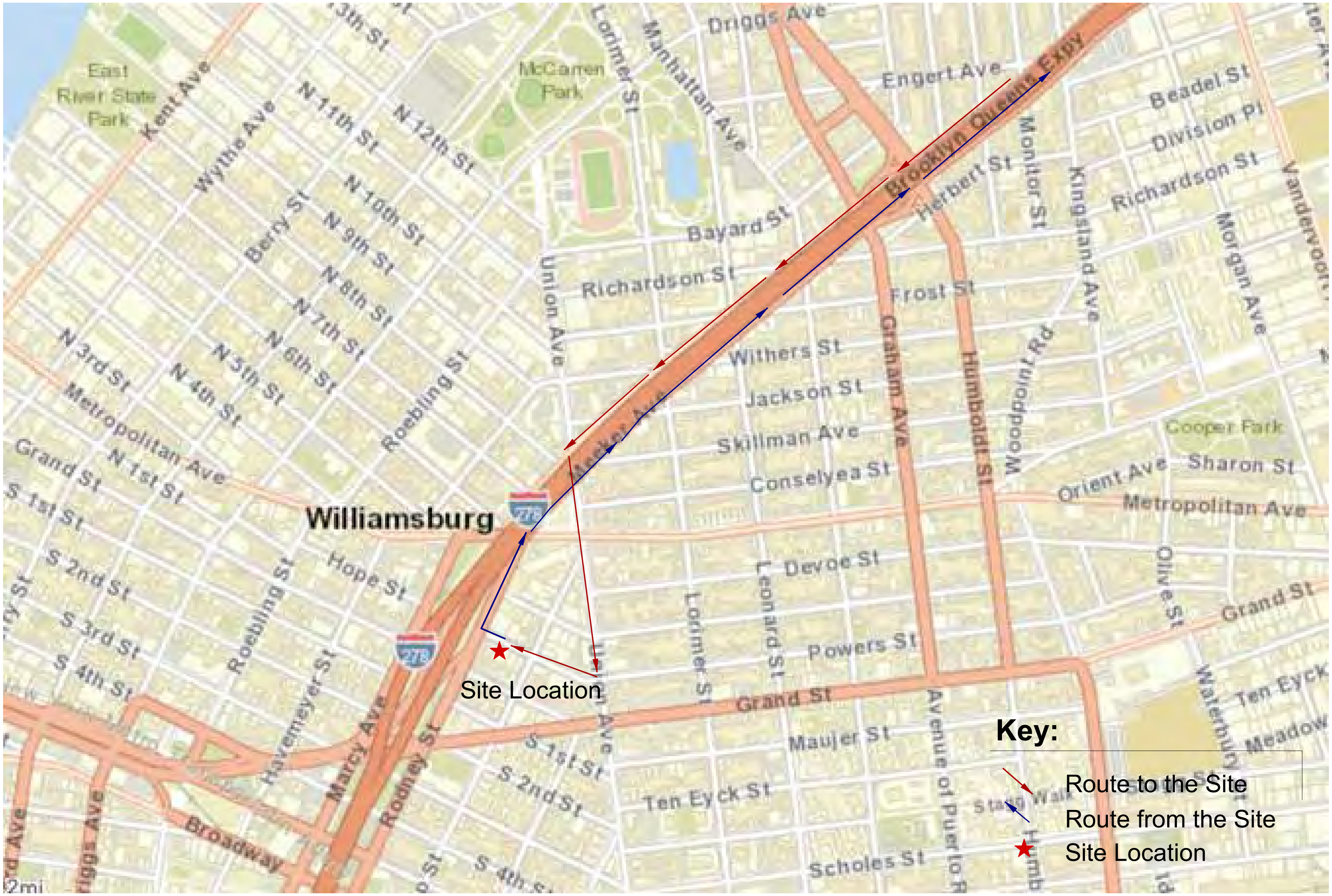
Figure No.
8b

Site Name: HOPE STREET PROJECT
Site Address: 108-134 HOPE STREET, BROOKLYN, NY
Drawing Title: SOIL GAS DETECTION MAP



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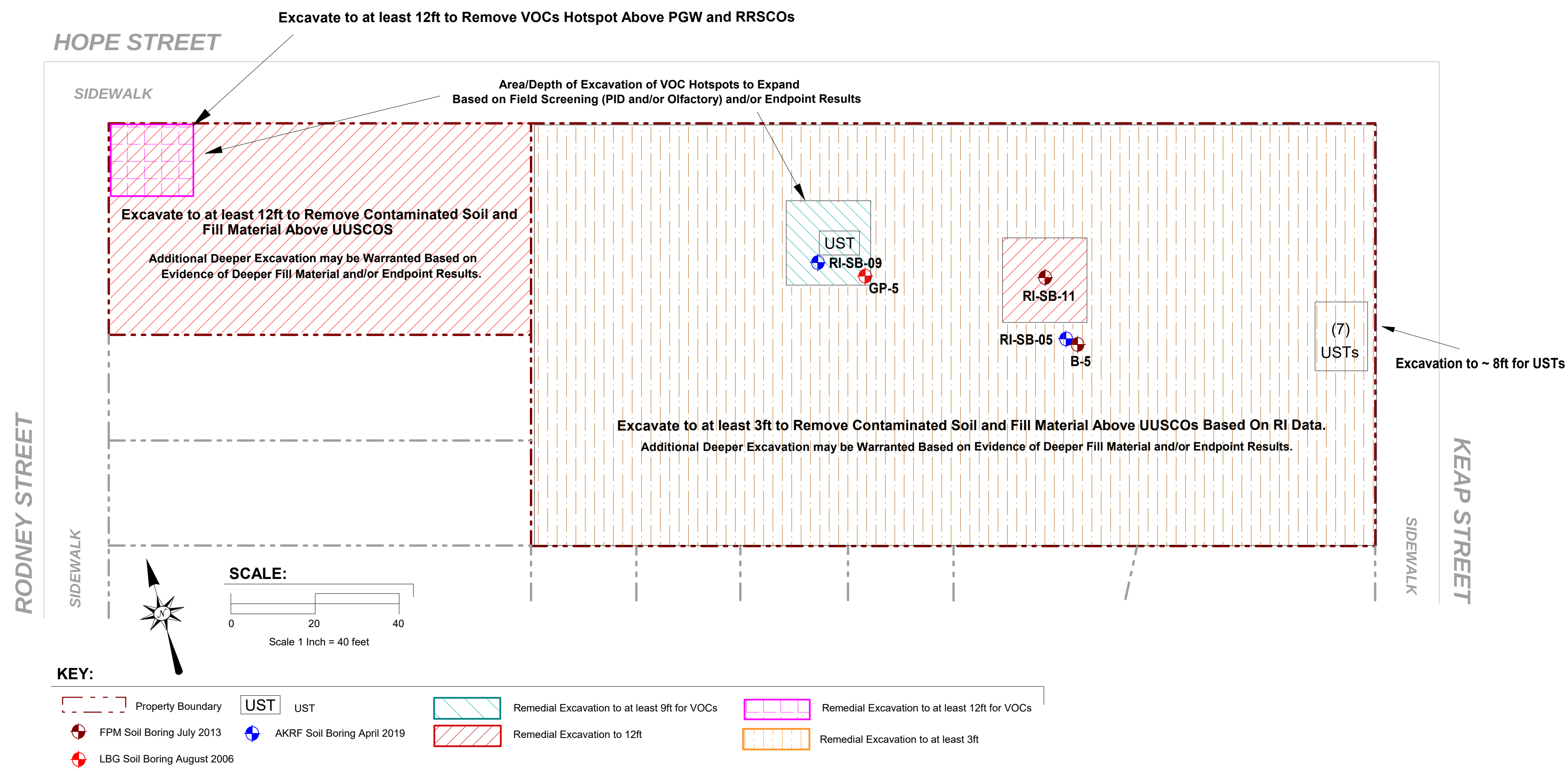
Fax 631. 924 .2870

Figure No.
9

Site Name: HOPE STREET PROJECT
Site Address: 108-134 HOPE STREET, BROOKLYN, NY
Drawing Title: TRUCK ROUTE

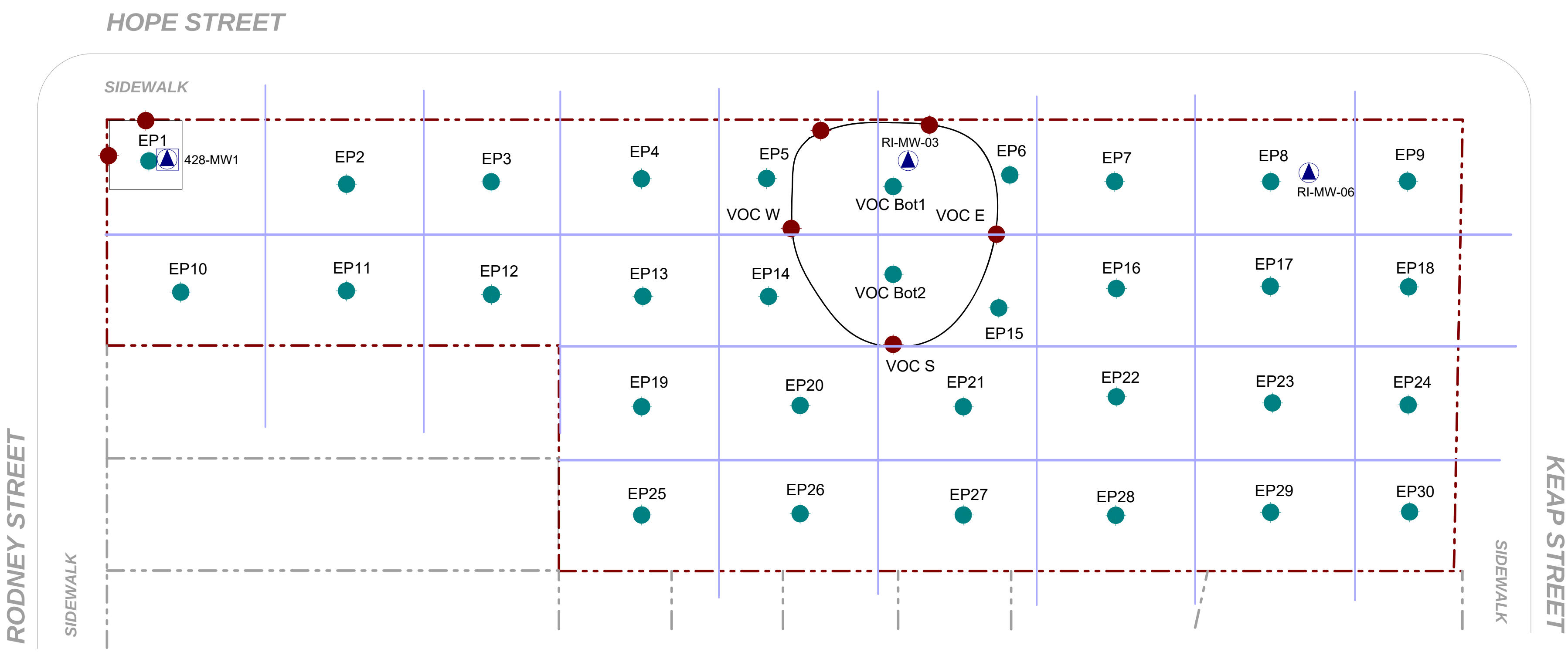


2/2/2021

AMC Engineering
1836 42nd Street
Astoria, NY 11105

Figure No. **10**

Site Name: HOPE STREET PROJECT
Site Address: 108-134 HOPE STREET, BROOKLYN, NY
Drawing Title: EXCAVATION DIAGRAM



KEY:

- Property Boundary
- Base Endpoint Soil Samples
- Sidewall Endpoint Soil Samples From Petroleum Hotspot
- Collect Post-Dewatering Groundwater Sample (VOCs)

SCALE:

0 20 40

Scale 1 Inch = 40 feet

2/22/2021

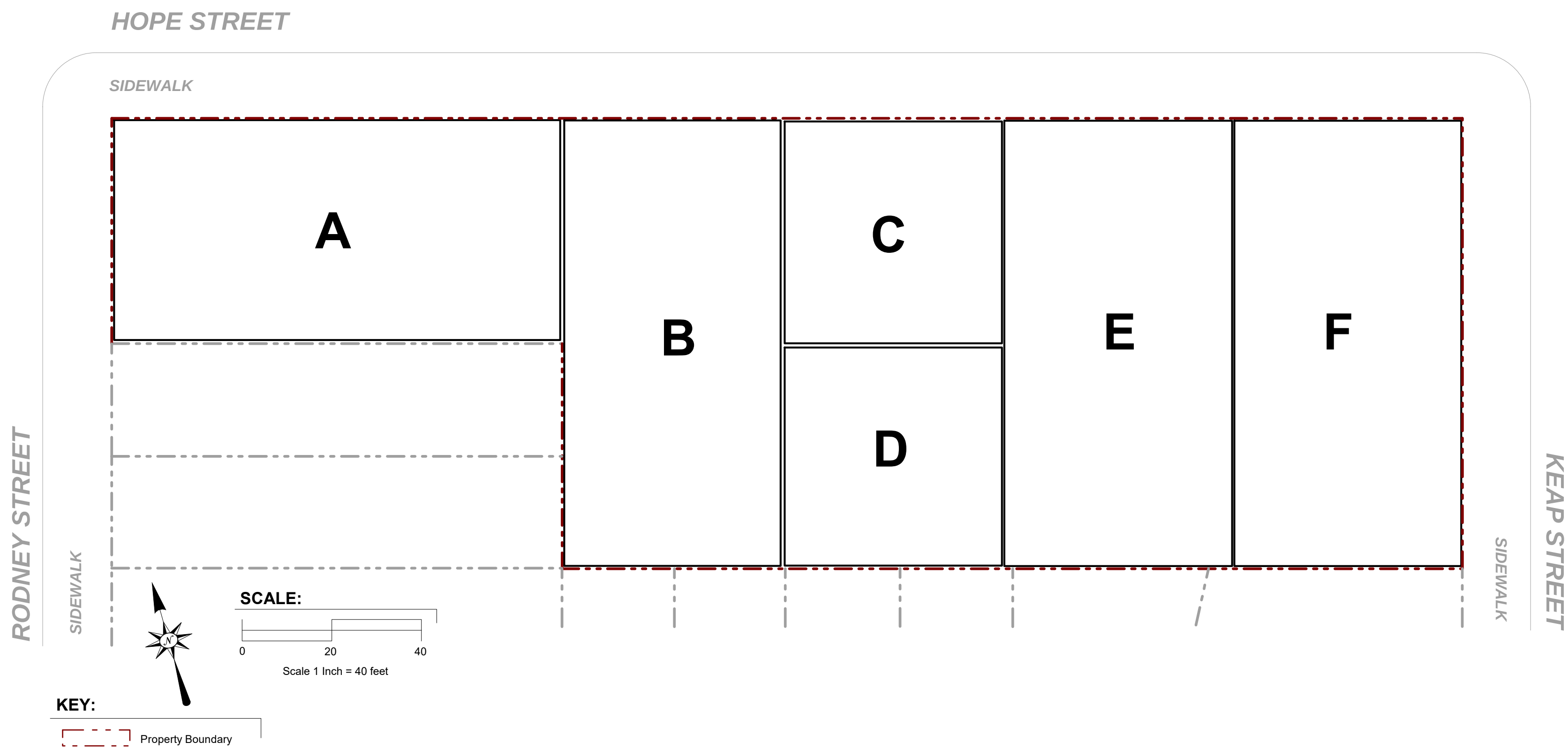
AMC Engineeting, PLLC
18-36 42nd Street
Astoria, NY 11105

Figure No.
11

Site Name: HOPE STREET PROJECT

Site Address: 108-134 HOPE STREET, BROOKLYN, NY

Drawing Title: VERIFICATION SAMPLING PLAN



AMC Engineeting, PLLC
18-36 42nd Street
Astoria, NY 11105

Figure No.
12
8/20/2020

Site Name: HOPE STREET PROJECT
Site Address: 108-134 HOPE STREET, BROOKLYN, NY
Drawing Title: GRID MAP

ATTACHMENT A
Metes and Bounds Description of Property

Schedule A Description

Parcel I:
ALL that certain plot, piece or parcel of land, situate, lying and being in the Borough of Brooklyn, County of Kings, City and State of New York, bounded and described as follows:

BEGINNING at a point on the Southerly side of Hope Street distant 100' 1 1/4" Easterly from the corner formed by the intersection of the Southerly side of Hope Street and the Easterly side of Rodney Street;

RUNNING THENCE Easterly along the Southerly side of Hope Street 100' 1 1/4";

THENCE Southerly parallel with the Easterly side of Rodney Street and part of the distance through a party wall 100' 7/8";

THENCE Westerly parallel with the Southerly side of Hope Street 100' 1 1/4";

THENCE Northerly parallel with the Easterly side of Rodney Street 100' 7/8" to the Southerly side of Hope Street at the point or place of BEGINNING.

Parcel II:
ALL that certain plot, piece or parcel of land, situate, lying and being in the Borough of Brooklyn, County of Kings, City and State of New York, bounded and described as follows:

BEGINNING at a point on the Southerly side of Hope Street, distant 200' 2 1/2" Easterly from the corner formed by the intersection of the Southerly side of Hope Street with the Easterly side of Rodney Street;

RUNNING THENCE Easterly along the Southerly side of Hope Street 52' 5/8";

THENCE Southerly parallel with the Easterly side of Rodney Street 100' 7/8";

THENCE Westerly parallel with the Southerly side of Hope Street 52' 5/8";

THENCE Northerly parallel with the Easterly side of Rodney Street 100' 7/8" to the Southerly side of Hope Street, at the point or place of BEGINNING.

Parcel III:
ALL that certain plot, piece or parcel of land, situate, lying and being in the Borough of Brooklyn, County of Kings, City and State of New York, bounded and described as follows:

BEGINNING at the corner formed by the intersection of the Southerly side of

Hope Street with the Westerly side of Keap Street;

THENCE Southerly along the Westerly side of Keap Street 100' 7/8";

THENCE Westerly parallel with Hope Street 48' 5/8";

THENCE Northerly parallel with Keap Street 100' 7/8" to the Southerly side of Hope Street; and

THENCE Easterly along the Southerly side of Hope Street 48' 5/8" to the point or place of BEGINNING.

FOR INFORMATIONAL PURPOSES ONLY:

Said premises is known as 118-138 Hope Street, Brooklyn, NY. Block 2386, Lot 7 (fka old lots 7, 12 & 14), Kings County.

Schedule A Description

ALL that certain plot, piece or parcel of land, with the buildings and improvements thereon erected, situate, lying and being in the Borough of Brooklyn, in the City of New York, County of Kings, and State of New York, bounded and described as follows:

BEGINNING at a point on the southeasterly corner of Rodney Street (formerly Ninth) and Hope Street (formerly North First);

RUNNING THENCE southerly along the line of Rodney Street, fifty (50) feet;

THENCE easterly and parallel with Hope Street One Hundred (100) feet;

THENCE northerly and parallel with Rodney Street, Fifty (50) feet to Hope Street and;

THENCE westerly along the line of Hope Street, One Hundred (100) feet to Rodney Street, to the point of place of BEGINNING.

FOR INFORMATIONAL PURPOSES ONLY:

Said premises is known as 428-430 Rodney Street a/k/a 114-116 Hope Street, Brooklyn, NY. Block 2386, Lot 4, Kings County.

ATTACHMENT B
Health and Safety Plan

HOPE STREET PROJECT
108-134 HOPE STREET
BROOKLYN, NEW YORK

NYSDEC BCP Site Number: C224281

CONSTRUCTION
HEALTH AND SAFETY PLAN

AUGUST 2020

Hope-Keap Owner LLC
199 Lee Ave #554
Brooklyn, NY 11211

Prepared by:

EBC

ENVIRONMENTAL BUSINESS CONSULTANTS
1808 Middle Country Road
Ridge, NY 11961

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STATEMENT OF COMMITMENT

This Construction Health and Safety Plan (CHASP) has been prepared to ensure that workers are not exposed to risks from hazardous materials during the remedial actions at the Hope Street Project Site.

This CHASP, which applies to persons present at the Site actually or potentially exposed to hazardous materials, describes emergency response procedures for actual and potential chemical hazards. This CHASP is also intended to inform and guide personnel entering the work area or exclusion zone. Persons are to acknowledge that they understand the potential hazards and the contents of this Health and Safety policy by signing off on receipt of their individual copy of the document. Contractors and suppliers are retained as independent contractors and are responsible for ensuring the health and safety of their own employees.

1.0 INTRODUCTION AND SITE ENTRY REQUIREMENTS

This document describes the health and safety guidelines developed by Environmental Business Consultants (EBC) for the planned Remedial Action at the Hope Street Project Brownfield Site located at 108-134 Hope Street, Brooklyn, NY to protect on-Site personnel, visitors, and the public from physical harm and exposure to hazardous materials or wastes during remedial activities. In accordance with the Occupational Safety and Health Administration (OSHA) 29 CFR Part 1910.120 Hazardous Waste Operations and Emergency Response Final rule, this CHASP, including the attachments, addresses safety and health hazards related to excavation, loading and other soil disturbance activities and is based on the best information available. The CHASP may be revised by EBC at the request of the developer and/or a regulatory agency upon receipt of new information regarding Site conditions. Changes will be documented by written amendments signed by EBC's project manager, Site Safety Officer and/or the EBC Health and Safety Consultant.

1.1 Training Requirements

Personnel entering the exclusion zone or decontamination zone are required to be certified in health and safety practices for hazardous waste Site operations as specified in the Federal OSHA Regulations CFR 1910.120e (revised 3/6/90).

Paragraph (e - 3) of the above referenced regulations requires that all on-Site management personnel directly responsible for or who supervise employees engaged in hazardous waste operations, must initially receive 8 hours of supervisor training related to managing hazardous waste work.

Paragraph (e - 8) of the above referenced regulations requires that workers and supervisors receive 8 hours of refresher training annually on the items specified in Paragraph (e-1) and/or (e-3).

Additionally, all on-Site personnel must receive adequate Site-specific training in the form of an on-Site Health and Safety briefing prior to participating in field work with emphasis on the following:

- Protection of the adjacent community from hazardous vapors and / or dust which may be released during intrusive activities.
- Identification of chemicals known or suspected to be present on-Site and the health effects and hazards of those substances.
- The need for vigilance in personnel protection, and the importance of attention to proper use, fit and care of personnel protective equipment.
- Decontamination procedures.
- Site control including work zones, access and security.
- Hazards and protection against heat or cold.
- The proper observance of daily health and safety practices, such as entry and exit of work zones and Site. Proper hygiene during lunch, break, etc.
- Emergency procedures to be followed in case of fire, explosion and sudden release of hazardous gases.

Health and Safety meetings will be conducted on a daily basis and will cover protective clothing and other equipment to be used that day, potential and chemical and physical hazards, emergency procedures, and conditions and activities from the previous day.

1.2 Medical Monitoring Requirements

Field personnel and visitors entering the exclusion zone or decontamination zone must have completed appropriate medical monitoring required under OSHA 29 CFR 1910.120(f) if respirators or other breathing related PPE is needed. Medical monitoring enables a physician to monitor each employee's health, physical condition, and his fitness to wear respiratory protective equipment and carry out on-Site tasks.

1.3 Site Safety Plan Acceptance, Acknowledgment and Amendments

The project superintendent and the Site Safety Officer are responsible for informing personnel (EBC employees and/or owner or owners representatives) entering the work area of the contents of this plan and ensuring that each person signs the safety plan acknowledging the on-Site hazards and procedures required to minimize exposure to adverse effects of these hazards. A copy of the Acknowledgement Form is included in **Appendix A**.

Site conditions may warrant an amendment to the CHASP. Amendments to the HASP are acknowledged by completing forms included in **Appendix B**.

1.4 Key Personnel - Roles and Responsibilities

Personnel responsible for implementing this Health and Safety Plan are:

Name	Title	Address	Contact Numbers
Kevin Brussee	EBC Project Manager	1808 Middle Country Rd Ridge, NY 11961	(631) 504-6000
Tom Gallo	Site Safety Officer	1808 Middle Country Rd Ridge, NY 11961	(631) 504-6000

The project manager is responsible for overall project administration and, with guidance from the Site Safety Officer, for supervising the implementation of this CHASP. The Site Safety Officer will conduct daily (tail gate or tool box) safety meetings at the project Site and oversee daily safety issues. Each subcontractor and supplier (defined as an OSHA employer) is also responsible for the health and safety of its employees. If there is any dispute about health and safety or project activities, on-Site personnel will attempt to resolve the issue. If the issue cannot be resolved at the Site, then the project manager will be consulted.

The Site Safety Officer is also responsible for coordinating health and safety activities related to hazardous material exposure on-Site. The Site Safety Officer is responsible for the following:

1. Educating personnel about information in this CHASP and other safety requirements to be observed during Site operations, including, but not limited to, decontamination

procedures, designation of work zones and levels of protection, air monitoring, fit testing, and emergency procedures dealing with fire and first aid.
2. Coordinating Site safety decisions with the project manager.
3. Designating exclusion, decontamination and support zones on a daily basis.
4. Monitoring the condition and status of known on-Site hazards and maintaining and implementing the air quality monitoring program specified in this CHASP.
5. Maintaining the work zone entry/exit log and Site entry/exit log.
6. Maintaining records of safety problems, corrective measures and documentation of chemical exposures or physical injuries (the Site Safety Officer will document these conditions in a bound notebook and maintain a copy of the notebook on-Site).

The person who observes safety concerns and potential hazards that have not been addressed in the daily safety meetings should immediately report their observations/concerns to the Site safety officer or appropriate key personnel.

2.0 SITE BACKGROUND AND SCOPE OF WORK

The street address for the Site is 118, 120, and 130 Hope Street; 138 Hope Street/429 Keap Street; and 134 Hope Street in Brooklyn, NY (Figure 1). The Site is located in the Williamsburg neighborhood of Kings County and is comprised of a two tax parcels identified as Block 2386, Lots 4 and 7 (Figure 2). Historically Lot 7 was comprised of three Lots (7, 12 and 14) which were merged on June 13, 2018 into Lot 7. Lot 4 and Lot 7 will also be merged as required for redevelopment. The total area of the Site is 25,000 square feet (0.57 acres).

The Site is bounded by Hope Street to the north followed by residential and commercial buildings; Keap Street to the east followed by residential buildings and a daycare; residential buildings followed by Grand Street to the south; and Rodney Street to the west. The Site is a vacant construction Site surrounded by a construction fence with no structures present.

2.1 Previous Investigations

A Remedial Investigation was completed at the Site by AKRF from February 8, 2019 through February 21, 2019. The investigation is summarized below. Further details are provided in the Remedial Investigation Report (AKRF, May 2019).The goals of the Remedial Investigation were to define the nature and extent of contamination in soil, groundwater and any other impacted media; to identify the source(s) of the contamination; to assess the impact of the contamination on public health and/or the environment; and to provide information to support the development of a Remedial Work Plan to address the contamination. Activities completed under the RI:

- Installed fourteen soil borings and collected twenty-two soil samples for laboratory analysis of volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), herbicides, pesticides, PCBs, and metals;
- Installed seven groundwater monitoring wells and collected seven groundwater samples for laboratory analysis of VOCs, SVOCs, pesticides, PCBs, total and dissolved metals and emerging contaminants (PFAS, 1,4-dioxane);
- Installed thirteen soil gas implants and collected samples for laboratory analysis of VOCs.

A Supplemental Remedial Investigation was performed on Lot 4 (428 Rodney Street) by EBC on July 3, 2020, and July 6, 2020. The investigation is summarized below. Further details are provided in the Supplemental Remedial Investigation Report (EBC, August 2020). Activities completed under the Supplemental RI:

- Installed four soil borings and collected eight soil samples for laboratory analysis of volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), herbicides, pesticides, PCBs, metals and PFAS compounds;
- Installed three groundwater monitoring wells and collected three groundwater samples for laboratory analysis of VOCs, SVOCs, pesticides, PCBs, total and dissolved metals and emerging contaminants (PFAS, 1,4-dioxane);
- Installed four soil gas implants and collected samples for laboratory analysis of VOCs.

The results of sampling performed during the RI and supplemental RI identified an area of petroleum-related VOCs in the north-central area of the Site in the vicinity of a historic underground gasoline storage tank. This impacted area is estimated to be approximately 1,800 sf. Elevated petroleum VOCs were also reported at a depth of 10-12 feet below the surface in the northwest corner of Lot 4.

Historic fill materials have been identified across the Site to depths 12 feet below grade extending to 15 ft and 17 feet below grade in two areas located in the northeastern and southeastern areas of the Site. The fill material contains elevated levels of metals, and SVOCs.

2.2 Redevelopment Plans

The proposed redevelopment project consists of constructing a 7-story mixed-use (commercial/residential) building, with a single basement level. The cellar will consist of 22,052.77 ft2 of parking, and the building's meter rooms. The first floor will consist of residential apartments, a 701 ft2 retail space along Keap Street, a 1,501.27 ft2 communal and co-working space at the corner of Hope Street and Keap Street, and the residential lobby, mail and package room, and the bicycle storage room. The 2nd through 7th floors will consist of residential apartments.

Excavation for redevelopment is expected to extend to approximately 12 feet below grade across the Site.

2.3 Description of Remedial Action

The remedy will include the following items:

- Removal of underground storage tanks;
- Excavation of soil/fill exceeding Track 1 Unrestricted Use SCOs as listed in **Table 1** to a average depth of 12 feet across the Site with additional excavation to 15 feet within the north-central petroleum impacted area and to depths of 15 feet and 17 feet in two other areas as needed to meet Track 1 Unrestricted Use SCOs;
- Screening for indications of contamination (by visual means, odor, and monitoring with PID) of all excavated soil during any intrusive Site work;
- Dewatering as needed to facilitate excavation of deeper petroleum impacted soil / historic fill areas and treatment of impacted groundwater before discharging to the NYC sewer system under a NYCDEP sewer discharge permit;
- Collection and analysis of end-point samples to evaluate the performance of the remedy with respect to attainment of Track 1 Unrestricted Use SCOs;
- Appropriate off-Site disposal of all material removed from the Site in accordance with all Federal, State and local rules and regulations for handling, transport, and disposal;
- Import of materials to be used for backfill and cover in compliance with: (1) chemical limits and other specifications included in **Table 1**, (2) all Federal, State and local rules and regulations for handling and transport of material;

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3.0 HAZARD ASSESSMENT

This section identifies the hazards associated with the proposed scope of work, general physical hazards that can be expected at most Sites; and presents a summary of documented or potential chemical hazards at the Site. Every effort must be made to reduce or eliminate these hazards. Those that cannot be eliminated must be guarded against using engineering controls and/or personal protective equipment.

3.1 Physical Hazards

3.1.1 Tripping Hazards
An area of risk associated with on-Site activities are presented by uneven ground, concrete, curbstones or equipment which may be present at the Site thereby creating a potential tripping hazard. During intrusive work, care should be taken to mark or remove any obstacles within the exclusion zone.

3.1.2 Climbing Hazards
During Site activities, workers may have to work on excavating equipment by climbing. The excavating contractor will conform with any applicable NIOSH and OSHA requirements or climbing activities.

3.1.3 Cuts and Lacerations
Field activities that involve excavating activities usually involve contact with various types of machinery. A first aid kit approved by the American Red Cross will be available during all intrusive activities.

3.1.4 Lifting Hazards
Improper lifting by workers is one of the leading causes of industrial injuries. Field workers in the excavation program may be required to lift heavy objects. Therefore, all members of the field crew should be trained in the proper methods of lifting heavy objects. All workers should be cautioned against lifting objects too heavy for one person.

3.1.5 Utility Hazards
Before conducting any excavation, the excavation contractor will be responsible for locating and verifying all existing utilities at each excavation.

3.1.6 Traffic Hazards
All traffic, vehicular and pedestrian, shall be maintained and protected at all times consistent with local, state and federal agency regulations regarding such traffic and in accordance with NYCDOT guidelines. The excavation contractor shall carry on his operations without undue interference or delays to traffic. The excavation contractor shall furnish all labor, materials, guards, barricades, signs, lights, and anything else necessary to maintain traffic and to protect his work and the public, during operations.

3.2 Work in Extreme Temperatures

Work under extremely hot or cold weather conditions requires special protocols to minimize the chance that employees will be affected by heat or cold stress.

3.2.1 Heat Stress

The combination of high ambient temperature, high humidity, physical exertion, and personal protective apparel, which limits the dissipation of body heat and moisture, can cause heat stress.

The following prevention, recognition and treatment strategies will be implemented to protect personnel from heat stress. Personnel will be trained to recognize the symptoms of heat stress and to apply the appropriate treatment.

1. Prevention
    a. Provide plenty of fluids. Available in the support zone will be a 50% solution of fruit punch and water or plain water.
    b. Work in Pairs. Individuals should avoid undertaking any activity alone.
    c. Provide cooling devices. A spray hose and a source of water will be provided to reduce body temperature, cool protective clothing and/or act as a quick-drench shower in case of an exposure incident.
    d. Adjustment of the work schedule. As is practical, the most labor-intensive tasks should be carried out during the coolest part of the day.

2. Recognition and Treatment
    a Heat Rash (or prickly heat):
    Cause: Continuous exposure to hot and humid air, aggravated by chafing clothing.
    Symptoms: Eruption of red pimples around sweat ducts accompanied by intense itching and tingling.
    Treatment: Remove source or irritation and cool skin with water or wet cloths.

    b. Heat Cramps (or heat prostration)
    Cause: Profuse perspiration accompanied by inadequate replenishment of body water and electrolytes.
    Symptoms: Muscular weakness, staggering gait, nausea, dizziness, shallow breathing, pale and clammy skin, approximately normal body temperature.
    Treatment: Perform the following while making arrangement for transport to a medical facility. Remove the worker to a contamination reduction zone. Remove protective clothing. Lie worker down on back in a cool place and raise feet 6 to 12 inches. Keep warm, but loosen all clothing. If conscious, provide sips of salt-water solution, using one teaspoon of salt in 12 ounces of water. Transport to a medical facility.
    c. Heat Stroke
    Cause: Same as heat exhaustion. This is also an extremely serious condition.

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Symptoms: Dry hot skin, dry mouth, dizziness, nausea, headache, rapid pulse.
Treatment: Cool worker immediately by immersing or spraying with cool water or sponge bare skin after removing protective clothing. Transport to hospital.

3.2.2 Cold Exposure

Exposure to cold weather, wet conditions and extreme wind-chill factors may result in excessive loss of body heat (hypothermia) and /or frostbite. To guard against cold exposure and to prevent cold injuries, appropriate warm clothing should be worn, warm shelter must be readily available, rest periods should be adjusted as needed, and the physical conditions of on-Site field personnel should be closely monitored. Personnel and supervisors working on-Site will be made aware of the signs and symptoms of frost bite and hypothermia such as shivering, reduced blood pressure, reduced coordination, drowsiness, impaired judgment, fatigue, pupils dilated but reactive to light and numbing of the toes and fingers.

3.3 Chemical Hazards

"Historic fill" materials, present throughout the New York City area typically contain elevated levels of semi-volatile organic compounds and metals. These "contaminants" are not related to a chemical release occurring on the Site, but are inherent in the reworked fill material in the area which contains ash and bits of tar and asphalt. Considering the previous sampling results and the past and present use of the Site, the following compounds are considered for the Site as potential contaminants:

Volatile organic compounds reported to be present at elevated concentrations in soil and /or groundwater at the Site include the following:

xylenes	toluene	ethylbenzene	124/135-trimethylbenzene	Acetone
napthalene	n-propylbenzene			

Semi-Volatile organic compounds reported to be present at elevated concentrations in soil at the Site include the following:

Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(k)fluoranthene
Dibenzo(a,h)anthracene	Indeno(1,2,3-cd)pyrene	Chrysene	

Metals reported to be present at elevated concentrations in soil at the Site include the following:

Barium	Chromium	Cadmium	Copper	Lead	Mercury
Nickel	Zinc				

Pesticides reported to be present at elevated concentrations in soil at the Site include the following:

4,4-DDD	4,4-DDE	4,4-DDT	a-chlordane	Aldrin	PCB-1254

The primary routes of exposure to these contaminants are inhalation, ingestion and absorption.

3.3.1 Respirable Dust

Dust may be generated from vehicular traffic and/or excavation activities. If visible observation detects elevated levels of dust, a program of wetting will be employed by the Site Safety Officer. If elevated dust levels persist, the Site Safety Officer will employ dust monitoring using a particulate monitor (Minirae or equivalent). If monitoring detects concentrations greater than 150 µg/m3 over daily background, the Site Safety Officer will take corrective actions as defined herein, including the use of water for dust suppression and if this is not effective, requiring workers to wear APRs with efficiency particulate air (HEPA) cartridges.

Absorption pathways for dust and direct contact with soils or groundwater will be mitigated with the implementation of latex gloves, hand washing and decontamination exercises when necessary.

3.3.2 Dust Control and Monitoring During Earthwork

Dust generated during excavation activities or other earthwork may contain contaminants identified in soils at the Site. Dust will be controlled by wetting the working surface with water. Calcium chloride may be used if the problem cannot be controlled with water. Air monitoring and dust control techniques are specified in a Site-specific Dust Control Plan (if applicable). Site workers will not be required to wear APR's unless dust concentrations are consistently over 150 $\mu g/m^3$ over Site-specific background in the breathing zone as measured by a dust monitor unless the Site Safety Officer directs workers to wear APRs. The Site Safety Officer will use visible dust as an indicator to implement the dust control plan.

3.3.3 Organic Vapors

Elevated levels of VOCs were detected in both soil and soil vapor samples collected during previous investigations at the Site. Therefore, excavation activities may cause the release of organic vapors to the atmosphere. The Site Safety Officer will periodically monitor organic vapors with a Photoionization Detector (PID) during excavation activities to determine whether organic vapor concentrations exceed action levels shown in Section 5 and/or the Community Air Monitoring Plan.

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4.0 PERSONAL PROTECTIVE EQUIPMENT

Personal protective equipment (PPE) shall be selected in accordance with the Site air monitoring program, OSHA 29 CFR 1910.120(c), (g), and 1910.132. Protective equipment shall be NIOSH approved and respiratory protection shall conform to OSHA 29 CFR Part 1910.133 and 1910.134 specifications; head protection shall conform to 1910.135; eye and face protection shall conform to 1910.133; and foot protection shall conform to 1910.136. The only true difference among the levels of protection from D thru B is the addition of the type of respiratory protection. **It is anticipated that work will be performed in Level D PPE.**

4.1 Level D

Level D PPE shall be donned when the atmosphere contains no known hazards and work functions preclude splashes, immersion, or the potential for inhalation of, or contact with, hazardous concentrations of harmful chemicals. Level D PPE consists of:

- standard work uniform, coveralls, or tyvek, as needed;
- steel toe and steel shank work boots;
- hard hat;
- gloves, as needed;
- safety glasses;
- hearing protection;
- equipment replacements are available as needed.

4.2 Level C

Level C PPE shall be donned when the concentrations of measured total organic vapors in the breathing zone exceed background concentrations (using a portable OVA, or equivalent), but are less than 5 ppm. The specifications on the APR filters used must be appropriate for contaminants identified or expected to be encountered. Level C PPE shall be donned when the identified contaminants have adequate warning properties and criteria for using APR have been met. Level C PPE consists of:

- chemical resistant or coated tyvek coveralls;
- steel-toe and steel-shank workboots;
- chemical resistant overboots or disposable boot covers;
- disposable inner gloves (surgical gloves);
- disposable outer gloves;
- full face APR fitted with organic vapor/dust and mist filters or filters appropriate for the identified or expected contaminants;
- hard hat;
- splash shield, as needed; and,
- ankles/wrists taped with duct tape.

The Site Safety Officer will verify if Level C is appropriate by checking organic vapor concentrations using compound and/or class-specific detector tubes.

- chemical resistant coveralls;
- steel-toe and steel-shank workboots;
- chemical resistant overboots or disposable boot covers;
- disposable inner gloves;
- disposable outer gloves;
- hard hat; and,
- ankles/wrists taped.

The exact PPE ensemble is decided on a Site-by-Site basis by the Site Safety Officer with the intent to provide the most protective and efficient worker PPE.

4.3 Activity-Specific Levels of Personal Protection

The required level of PPE is activity-specific and is based on air monitoring results (Section 4.0) and properties of identified or expected contaminants. **It is expected that Site work will be performed in Level D.** If air monitoring results indicate the necessity to upgrade the level of protection engineering controls (i.e. Facing equipment away from the wind and placing Site personnel upwind of drilling locations, active venting, etc.) will be implemented before requiring the use of respiratory protection.

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5.0 AIR MONITORING AND ACTION LEVELS

29 CFR 1910.120(h) specifies that monitoring shall be performed where there may be a question of employee exposure to hazardous concentrations of hazardous substances in order to assure proper selection of engineering controls, work practices and personal protective equipment so that employees are not exposed to levels which exceed permissible exposure limits, or published exposure levels if there are no permissible exposure limits, for hazardous substances.

5.1 Air Monitoring Requirements

If excavation work is performed, air will be monitored for VOCs with a portable ION Science 3000EX photoionization detector, or the equivalent. If necessary, Lower Explosive Limit (LEL) and oxygen will be monitored with a Combustible Gas Indicator (CGI). If appropriate, fugitive dust will be monitored using a MiniRam Model PDM-3 aerosol monitor. Air will be monitored when any of the following conditions apply:

- initial Site entry;
- during any work where a potential IDLH condition or flammable atmosphere could develop;
- excavation work begins on another portion of the Site;
- contaminants, other than those previously identified, have been discovered;
- each time a different task or activity is initiated;
- during trenching and/or excavation work.

The designated Site Safety Officer will record air monitoring data and ensure that air monitoring instruments are calibrated and maintained in accordance with manufacturer's specifications. Instruments will be zeroed daily and checked for accuracy. Monitoring results will be recorded in a field notebook and will be transferred to instrument reading logs.

5.2 Work Stoppage Responses

The following responses will be initiated whenever one or more of the action levels necessitating a work stoppage are exceeded:

1 The SSO will be consulted immediately
2 All personnel (except as necessary for continued monitoring and contaminant migration, if applicable) will be cleared from the work area (eg from the exclusion zone).
3 Monitoring will be continued until intrusive work resumes.

5.3 Action Levels During Excavation Activities

Instrument readings will be taken in the breathing zone above the excavation pit unless otherwise noted. Each action level is independent of all other action levels in determining responses.

Organic Vapors (PID)	LEL %	Responses
0-1 ppm above background	0%	• Continue excavating • Level D protection • Continue monitoring every 10 minutes
1-5 ppm Above Background, Sustained Reading	1-10%	• Continue excavating • Go to Level C protection or employ engineering controls • Continue monitoring every 10 minutes
5-25 ppm Above Background, Sustained Reading	10-20%	• Discontinue excavating, unless PID is only action level exceeded. • Level C protection or employ engineering controls • Continue monitoring for organic vapors 200 ft downwind • Continuous monitoring for LEL at excavation pit
>25 ppm Above Background, Sustained Reading	>20%	• Discontinue excavating • Withdraw from area, shut off all engine ignition sources. • Allow pit to vent • Continuous monitoring for organic vapors 200 ft downwind.

Notes: Air monitoring will occur in the breathing zone 30 inches above the excavation pit. Readings may also be taken in the excavation pit but will not be used for action levels.

If action levels for any one of the monitoring parameters are exceeded, the appropriate responses listed in the right hand column should be taken. If instrument readings do not return to acceptable levels after the excavation pit has been vented for a period of greater than one-half hour, a decision will then be made whether or not to seal the pit with suppressant foam.

If, during excavation activities, downwind monitoring PID readings are greater than 5 ppm above background for more than one-half hour, excavation will stop until sustained levels are less then 5 ppm (see Community Air Monitoring Plan).

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6.0 SITE CONTROL

6.1 Work Zones

The primary purpose of Site controls is to establish the perimeter of a hazardous area, to reduce the migration of contaminants into clean areas, and to prevent access or exposure to hazardous materials by unauthorized persons. When operations are to take place involving hazardous materials, the Site Safety Officer will establish an exclusion zone, a decontamination zone, and a support zone. These zones "float" (move around the Site) depending on the tasks being performed on any given day. The Site Safety Officer will outline these locations before work begins and when zones change. The Site Safety Officer records this information in the Site log book.

Due to the dimensions of the Site and the work area, it is expected that an exclusion zone will include the entire fenced area with the exception of the construction entrance area, which will serve as the decontamination zone. A support zone if needed will be located outside of the fenced area. All onSite workers engaged in the excavation of hazardous or contaminated materials must provide evidence of OSHA 24 or 40-hour Hazardous Waste Operations and Emergency Response Operations training to conduct work within the exclusion zone established by the Site Safety Officer. Gross decontamination (as determined by the Site Health and Safety Officer) is conducted in the exclusion zone; all other decontamination is performed in the decontamination zone or trailer.

Protective equipment is removed in the decontamination zone. Disposable protective equipment is stored in receptacles staged in the decontamination zone, and non-disposable equipment is decontaminated. All personnel and equipment exit the exclusion zone through the decontamination zone. If a decontamination trailer is provided the first aid equipment, an eye wash unit, and drinking water are kept in the decontamination trailer.

The support zone is used for vehicle parking, daily safety meetings, and supply storage. Eating, drinking, and smoking are permitted only in the support zone. When a decontamination trailer is not provided, the eye wash unit, first aid equipment, and drinking water are kept at a central location designated by the Site Safety Officer.

7.0 CONTINGENCY PLAN/EMERGENCY RESPONSE PLAN

Site personnel must be prepared in the event of an emergency. Emergencies can take many forms: illnesses, injuries, chemical exposure, fires, explosions, spills, leaks, releases of harmful contaminants, or sudden changes in the weather.

Emergency telephone numbers and a map to the hospital will be posted in the command post. Site personnel should be familiar with the emergency procedures, and the locations of Site safety, first aid, and communication equipment.

7.1 Emergency Equipment On-Site

Private telephones:	Site personnel.
Two-way radios:	Site personnel where necessary.
Emergency Alarms:	On-Site vehicle horns*.
First aid kits:	On-Site, in vehicles or office.
Fire extinguisher:	On-Site, in office or on equipment.

* Horns: Air horns will be supplied to personnel at the discretion of the project superintendent or Site Safety Officer.

7.2 Emergency Telephone Numbers

General Emergencies	911
New York City Police	911
Woodhull Medical Center	(718) 963-8000
NYSDEC Spills Division	1-800-457-7362
NYSDEC Hazardous Waste Division	1-718-482-4994
NYCDEP	1-718-699-9811
NYC Department of Health	1-212-788-4711
NYC Fire Department	911
National Response Center	1-800-424-8802
Poison Control	1-212-340-4494
Site Safety Officer	1-631-504-6000
Alternate Site Safety Officer	1-631-504-6000

7.3 Personnel Responsibilities During an Emergency

The project manager is primarily responsible for responding to and correcting any emergency situations. However, in the absence of the project manager, the Site Safety Officer shall act as the project manager's on-Site designee and perform the following tasks:

- Take appropriate measures to protect personnel including: withdrawal from the exclusion zone, evacuate and secure the Site, or upgrade/downgrade the level of protective clothing and respiratory protection;

- Ensure that appropriate federal, state, and local agencies are informed and emergency response plans are coordinated. In the event of fire or explosion, the local fire department should be summoned immediately. If toxic materials are released to the air, the local authorities should be informed in order to assess the need for evacuation;

- Ensure appropriate decontamination, treatment, or testing for exposed or injured personnel;

- Determine the cause of incidents and make recommendations to prevent recurrence; and,

- Ensure that all required reports have been prepared.

The following key personnel are planned for this project:

- Project Manager — Kevin Brussee (631) 504-6000
- Construction Health and Safety Manager — Marty Binik (718) 887-9840
- Remedial Action Site Safety Officer — Tom Gallo (631) 504-6000

7.4 Medical Emergencies

A person who becomes ill or injured in the exclusion zone will be decontaminated to the maximum extent possible. If the injury or illness is minor, full decontamination will be completed and first aid administered prior to transport. First aid will be administered while waiting for an ambulance or paramedics. A Field Accident Report (**Appendix D**) must be filled out for any injury.

A person transporting an injured/exposed person to a clinic or hospital for treatment will take the directions to the hospital (**Appendix D**).and information on the chemical(s) to which they may have been exposed (**Appendix C**).

7.5 Fire or Explosion

In the event of a fire or explosion, the local fire department will be summoned immediately. The Site Safety Officer or his designated alternate will advise the fire commander of the location, nature and identification of the hazardous materials on-Site. If it is safe to do so, Site personnel may:

- use fire fighting equipment available on Site; or,
- remove or isolate flammable or other hazardous materials that may contribute to the fire.

7.6 Evacuation Routes

Evacuation routes established by work area locations for each Site will be reviewed prior to commencing Site operations. As the work areas change, the evacuation routes will be altered accordingly, and the new route will be reviewed.

Under extreme emergency conditions, evacuation is to be immediate without regard for equipment. The evacuation signal will be a continuous blast of a vehicle horn, if possible, and/or by verbal/radio communication. When evacuating the Site, personnel will follow these instructions:

- Keep upwind of smoke, vapors, or spill location.

- Exit through the decontamination corridor if possible.

- If evacuation through the decontamination corridor is not possible, personnel should remove contaminated clothing once they are in a safe location and leave it near the exclusion zone or in a safe place.

- The Site Safety Officer will conduct a head count to ensure that all personnel have been evacuated safely. The head count will be correlated to the Site and/or exclusion zone entry/exit log.

- If emergency Site evacuation is necessary, all personnel are to escape the emergency situation and decontaminate to the maximum extent practical.

7.7 Spill Control Procedures

Spills associated with Site activities may be attributed to project equipment and include gasoline, diesel and hydraulic oil. In the event of a leak or a release, Site personnel will inform their supervisor immediately, locate the source of spillage and stop the flow if it can be done safely. A spill containment kit including absorbent pads, booms and/or granulated speedy dry absorbent material will be available to Site personnel to facilitate the immediate recovery of the spilled material. Daily inspections of Site equipment components including hydraulic lines, fuel tanks, etc. will be performed by their respective operators as a preventative measure for equipment leaks and to ensure equipment soundness. In the event of a spill, Site personnel will immediately notify the NYSDEC (1-800-457-7362), and a spill number will be generated.

7.8 Vapor Release Plan

If work zone organic vapor (excluding methane) exceeds 5 ppm, then a downwind reading will be made either 200 feet from the work zone or at the property line, whichever is closer. If readings at this location exceed 5 ppm over background, the work will be stopped.

If 5 ppm of VOCs are recorded over background on a PID at the property line, then an off-Site reading will be taken within 20 feet of the nearest residential or commercial property, whichever is closer. If efforts to mitigate the emission source are unsuccessful for 30 minutes, then the designated Site Safety Officer will:

- Contact the local police;
- Continue to monitor air every 30 minutes, 20 feet from the closest off-Site property. If two successive readings are below 5 ppm (non-methane), off-Site air monitoring will be halted; and
- All property line and off-Site air monitoring locations and results associated with vapor releases will be recorded in the Site safety log book.

APPENDIX A

SITE SAFETY ACKNOWLEDGEMENT FORM

DAILY BREIFING SIGN-IN SHEET

Date:______________________________ Person Conducting Briefing:______________________

Project Name and Location:____

1. AWARENESS (topics discussed, special safety concerns, recent incidents, etc…):

____

____

____

____

2. OTHER ISSUES (HASP changes, attendee comments, etc…):

____

____

____

3. ATTENDEES (Print Name):

1.	11.
2.	12.
3.	13.
4.	14.
5.	15.
6.	16.
7.	17.
8.	18.
9.	19.
10.	20.

APPENDIX B

SITE SAFETY PLAN AMENDMENTS

SITE SAFETY PLAN AMENDMENT FORM

Site Safety Plan Amendment #:____

Site Name: ____

Reason for Amendment:____

____

____

____

Alternative Procedures:____

____

____

____

Required Changes in PPE:____

____

____

____

______________________________	____________________
Project Superintendent (signature)	**Date**
______________________________	____________________
Health and Safety Consultant (signature)	**Date**
______________________________	____________________
Site Safety Officer (signature)	**Date**

APPENDIX C

CHEMICAL HAZARDS

CHEMICAL HAZARDS

The attached International Chemical Safety Cards are provided for contaminants of concern that have been identified in soils and/or groundwater at the site.

International Chemical Safety Cards

1,2,4-TRIMETHYLBENZENE

ICSC: 1433

Pseudocumene

C_9H_{12}

Molecular mass: 120,2

ICSC # 1433
CAS # 95-63-6
RTECS # DC3325000
UN # 1993
EC # 601-043-00-3
March 06, 2002 Peer reviewed

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Flammable.	NO open flames, NO sparks, and NO smoking.	Alcohol-resistant foam, dry powder, carbon dioxide.
EXPLOSION	Above 44°C explosive vapour/air mixtures may be formed.	Above 44°C use a closed system, ventilation, and explosion-proof electrical equipment. Prevent build-up of electrostatic charges (e.g., by grounding).	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		PREVENT GENERATION OF MISTS!	
•INHALATION	Confusion. Cough. Dizziness. Drowsiness. Headache. Sore throat. Vomiting.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
•SKIN	Redness. Dry skin.	Protective gloves.	Rinse skin with plenty of water or shower.
•EYES	Redness. Pain.	Safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	(See Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT wash away into sewer. Do NOT let this chemical enter the environment. Personal protection: filter respirator for organic gases and vapours.	Fireproof. Separated from strong oxidants. Well closed. Keep in a well-ventilated room.	Xn symbol N symbol R: 10-20-36/37/38-51/53 S: 2-26-61 UN Hazard Class: 3 UN Packing Group: III

SEE IMPORTANT INFORMATION ON BACK

International Chemical Safety Cards

1,2,4-TRIMETHYLBENZENE

ICSC: 1433

IMPORTANT DATA

PHYSICAL STATE; APPEARANCE:
COLOURLESS LIQUID , WITH CHARACTERISTIC ODOUR.

PHYSICAL DANGERS:

CHEMICAL DANGERS:
The substance decomposes on burning producing toxic and irritating fumes Reacts violently with strong oxidants causing fire and explosion hazard.

OCCUPATIONAL EXPOSURE LIMITS:
TLV: (as mixed isomers) 25 ppm as TWA (ACGIH 2004).
MAK: (as mixed isomers) 20 ppm 100 mg/m³
Peak limitation category: II(2) Pregnancy risk group: C (DFG 2004).
OSHA PEL†: none
NIOSH REL: TWA 25 ppm (125 mg/m^3)
NIOSH IDLH: N.D. See: IDLH INDEX

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation.

INHALATION RISK:
A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C; on spraying or dispersing, however, much faster.

EFFECTS OF SHORT-TERM EXPOSURE:
The substance is irritating to the eyes the skin and the respiratory tract If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. The substance may cause effects on the central nervous system

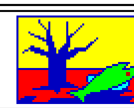
EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
The liquid defats the skin. Lungs may be affected by repeated or prolonged exposure , resulting in chronic bronchitis The substance may have effects on the central nervous system blood See Notes.

PHYSICAL PROPERTIES

Boiling point: 169°C
Melting point: -44°C
Relative density (water = 1): 0.88
Solubility in water:
very poor
Relative vapour density (air = 1): 4.1
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.01
Flash point: 44°C c.c.
Auto-ignition temperature: 500°C
Explosive limits, vol% in air: 0.9-6.4
Octanol/water partition coefficient as log Pow: 3.8

ENVIRONMENTAL DATA

The substance is toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish.



N O T E S

Use of alcoholic beverages enhances the harmful effect. Depending on the degree of exposure, periodic medical examination is suggested. See also ICSC 1155 1,3,5-Trimethylbenzene (Mesitylene), ICSC 1362 1,2,3-Trimethylbenzene (Hemimellitene), ICSC 1389 Trimethyl benzene (mixed isomers). 1,3,5-Trimethylbenzene (Mesitylene) is classified as a marine pollutant.

Transport Emergency Card: TEC (R)-30GF1-III
NFPA Code: H0; F2; R0;

ADDITIONAL INFORMATION

ICSC: 1433 **1,2,4-TRIMETHYLBENZENE**

International Chemical Safety Cards

1,3,5-TRIMETHYLBENZENE

ICSC: 1155

Mesitylene
C_9H_{12}
Molecular mass: 120.2

ICSC # 1155
CAS # 108-67-8
RTECS # OX6825000
UN # 2325
EC # 601-025-00-5
March 06, 2002 Peer reviewed

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Flammable.	NO open flames, NO sparks, and NO smoking.	Alcohol-resistant foam, dry powder, carbon dioxide.
EXPLOSION	Above 50°C explosive vapour/air mixtures may be formed.	Above 50°C use a closed system, ventilation, and explosion-proof electrical equipment. Prevent build-up of electrostatic charges (e.g., by grounding).	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		PREVENT GENERATION OF MISTS!	
•INHALATION	Confusion. Cough. Dizziness. Drowsiness. Headache. Sore throat. Vomiting.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
•SKIN	Redness. Dry skin.	Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
•EYES	Redness. Pain.	Safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	(See Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT wash away into sewer. Do NOT let this chemical enter the environment. (Extra personal protection: filter respirator for organic gases and vapours.)	Fireproof. Separated from strong oxidants. Well closed. Keep in a well-ventilated room.	Marine pollutant. Xi symbol N symbol R: 10-37-51/53 S: 2-61 UN Hazard Class: 3 UN Packing Group: III

SEE IMPORTANT INFORMATION ON BACK

International Chemical Safety Cards

1,3,5-TRIMETHYLBENZENE

ICSC: 1155

IMPORTANT DATA

PHYSICAL STATE; APPEARANCE:
COLOURLESS LIQUID , WITH CHARACTERISTIC ODOUR.

PHYSICAL DANGERS:

CHEMICAL DANGERS:
The substance decomposes on burning producing toxic and irritating fumes. Reacts violently with strong oxidants causing fire and explosion hazard.

OCCUPATIONAL EXPOSURE LIMITS:
TLV (as mixed isomers): 25 ppm; (ACGIH 2001).
MAK (all isomers): 20 ppm; 100 mg/m^3; class II 1 © (2001)
OSHA PEL†: none
NIOSH REL: TWA 25 ppm (125 mg/m^3)
NIOSH IDLH: N.D. See: IDLH INDEX

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation.

INHALATION RISK:
A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C; on spraying or dispersing, however, much faster.

EFFECTS OF SHORT-TERM EXPOSURE:
The substance is irritating to the eyes the skin and the respiratory tract If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. The substance may cause effects on the central nervous system.

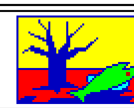
EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
The liquid defats the skin. Lungs may be affected by repeated or prolonged exposure, resulting in chronic bronchitis. The substance may have effects on the central nervous system blood See Notes.

PHYSICAL PROPERTIES

Boiling point: 165°C
Melting point: -45°C
Relative density (water = 1): 0.86
Solubility in water:
very poor
Vapour pressure, kPa at 20°C: 0.25
Relative vapour density (air = 1): 4.1
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.01
Flash point: 50°C (c.c.)
Auto-ignition temperature: 550°C
Octanol/water partition coefficient as log Pow: 3.42

ENVIRONMENTAL DATA

The substance is harmful to aquatic organisms. Bioaccumulation of this chemical may occur in fish.



NOTES

Use of alcoholic beverages enhances the harmful effect. Depending on the degree of exposure, periodic medical examination is indicated. See ICSC 1433 1,2,4-Trimethylbenzene (Pseudocumene), ICSC 1362 1,2,3-Trimethylbenzene (Hemimellitene), ICSC 1389 Trimethyl benzene (mixed isomers).

Transport Emergency Card: TEC (R)-30S2325
NFPA Code: H0; F2; R0

ADDITIONAL INFORMATION

ICSC: 1155 **1,3,5-TRIMETHYLBENZENE**

IMPORTANT LEGAL NOTICE:

International Chemical Safety Cards

ACETONE

ICSC: 0087

2-Propanone
Dimethyl ketone
Methyl ketone
C_3H_6O / CH_3COCH_3
Molecular mass: 58.1

ICSC # 0087
CAS # 67-64-1
RTECS # AL3150000
UN # 1090
EC # 606-001-00-8
April 22, 1994 Validated
Fi, review at IHE: 10/09/89

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Highly flammable.	NO open flames, NO sparks, and NO smoking.	Powder, alcohol-resistant foam, water in large amounts, carbon dioxide.
EXPLOSION	Vapour/air mixtures are explosive.	Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT use compressed air for filling, discharging, or handling.	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE			
•INHALATION	Sore throat. Cough. Confusion. Headache. Dizziness. Drowsiness. Unconsciousness.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
•SKIN	Dry skin.	Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
•EYES	Redness. Pain. Blurred vision. Possible corneal damage.	Safety spectacles or face shield . Contact lenses should not be worn.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Nausea. Vomiting. (Further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Personal protection: self-contained breathing apparatus. Ventilation. Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT wash away into sewer. Then wash away with plenty of water.	Fireproof. Separated from strong oxidants. Store in an area without drain or sewer access.	F symbol Xi symbol R: 11-36-66-67 S: 2-9-16-26 UN Hazard Class: 3 UN Packing Group: II

SEE IMPORTANT INFORMATION ON BACK

International Chemical Safety Cards

ACETONE

ICSC: 0087

I M P O R T A N T D A T A	**PHYSICAL STATE; APPEARANCE:** COLOURLESS LIQUID , WITH CHARACTERISTIC ODOUR. **PHYSICAL DANGERS:** The vapour is heavier than air and may travel along the ground; distant ignition possible. **CHEMICAL DANGERS:** The substance can form explosive peroxides on contact with strong oxidants such as acetic acid, nitric acid, hydrogen peroxide. Reacts with chloroform and bromoform under basic conditions, causing fire and explosion hazard. Attacks plastic. **OCCUPATIONAL EXPOSURE LIMITS:** TLV: 500 ppm as TWA, 750 ppm as STEL; A4 (not classifiable as a human carcinogen); BEI issued; (ACGIH 2004). MAK: 500 ppm 1200 mg/m³ Peak limitation category: I(2); Pregnancy risk group: D; (DFG 2006). OSHA PEL†: TWA 1000 ppm (2400 mg/m^3) NIOSH REL: TWA 250 ppm (590 mg/m^3) NIOSH IDLH: 2500 ppm 10%LEL See: 67641	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation and through the skin. **INHALATION RISK:** A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C; on spraying or dispersing, however, much faster. **EFFECTS OF SHORT-TERM EXPOSURE:** The vapour irritates the eyes and the respiratory tract. The substance may cause effects on the central nervous system , liver , kidneys and gastrointestinal tract . **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the blood and bone marrow .
PHYSICAL PROPERTIES	Boiling point: 56°C Melting point: -95°C Relative density (water = 1): 0.8 Solubility in water: miscible Vapour pressure, kPa at 20°C: 24	Relative vapour density (air = 1): 2.0 Relative density of the vapour/air-mixture at 20°C (air = 1): 1.2 Flash point: -18°C c.c. Auto-ignition temperature: 465°C Explosive limits, vol% in air: 2.2-13 Octanol/water partition coefficient as log Pow: -0.24
ENVIRONMENTAL DATA		

NOTES

Use of alcoholic beverages enhances the harmful effect.

Transport Emergency Card: TEC (R)-30S1090

NFPA Code: H 1; F 3; R 0;
Card has been partially updated in July 2007: see Occupational Exposure Limits.
Card has been partially updated in January 2008: see Storage.

ADDITIONAL INFORMATION

ICSC: 0087 ACETONE

International Chemical Safety Cards

ETHYLBENZENE

ICSC: 0268

Ethylbenzol
Phenylethane
EB
C_8H_{10} / $C_6H_5C_2H_5$
Molecular mass: 106.2

ICSC # 0268
CAS # 100-41-4
RTECS # DA0700000
UN # 1175
EC # 601-023-00-4
March 13, 1995 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Highly flammable.	NO open flames, NO sparks, and NO smoking.	Powder, AFFF, foam, carbon dioxide.
EXPLOSION	Vapour/air mixtures are explosive.	Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT use compressed air for filling, discharging, or handling.	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		PREVENT GENERATION OF MISTS!	
•INHALATION	Cough. Dizziness. Drowsiness. Headache.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
•SKIN	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES	Redness. Pain. Blurred vision.	Face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	(Further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Give a slurry of activated charcoal in water to drink. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Ventilation. Collect leaking liquid in covered containers. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT wash away into sewer. Personal protection: A filter respirator for organic gases and vapours.	Fireproof. Separated from strong oxidants.	F symbol Xn symbol R: 11-20 S: 2-16-24/25-29 UN Hazard Class: 3 UN Packing Group: II

SEE IMPORTANT INFORMATION ON BACK

International Chemical Safety Cards

ETHYLBENZENE

ICSC: 0268

IMPORTANT DATA

PHYSICAL STATE; APPEARANCE:
COLOURLESS LIQUID , WITH AROMATIC ODOUR.

PHYSICAL DANGERS:
The vapour mixes well with air, explosive mixtures are easily formed.

CHEMICAL DANGERS:
Reacts with strong oxidants. Attacks plastic and rubber.

OCCUPATIONAL EXPOSURE LIMITS:
TLV: 100 ppm as TWA 125 ppm as STEL A3 (confirmed animal carcinogen with unknown relevance to humans); BEI issued (ACGIH 2005).
MAK: skin absorption (H);
Carcinogen category: 3A;
(DFG 2004).
OSHA PEL†: TWA 100 ppm (435 mg/m^3)
NIOSH REL: TWA 100 ppm (435 mg/m^3) ST 125 ppm (545 mg/m^3)
NIOSH IDLH: 800 ppm 10%LEL See: 100414

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation of its vapour, through the skin and by ingestion.

INHALATION RISK:
A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

EFFECTS OF SHORT-TERM EXPOSURE:
The substance is irritating to the eyes the skin and the respiratory tract Swallowing the liquid may cause aspiration into the lungs with the risk of chemical pneumonitis. The substance may cause effects on the central nervous system Exposure far above the OEL could cause lowering of consciousness.

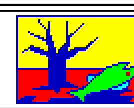
EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
Repeated or prolonged contact with skin may cause dermatitis.

PHYSICAL PROPERTIES

Boiling point: 136°C
Melting point: -95°C
Relative density (water = 1): 0.9
Solubility in water, g/100 ml at 20°C: 0.015
Vapour pressure, kPa at 20°C: 0.9
Relative vapour density (air = 1): 3.7
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.02
Flash point: 18°C c.c.
Auto-ignition temperature: 432°C
Explosive limits, vol% in air: 1.0-6.7
Octanol/water partition coefficient as log Pow: 3.2

ENVIRONMENTAL DATA

The substance is harmful to aquatic organisms.



NOTES

The odour warning when the exposure limit value is exceeded is insufficient.

Transport Emergency Card: TEC (R)-30S1175 or 30GF1-I+II
NFPA Code: H2; F3; R0

ADDITIONAL INFORMATION

ICSC: 0268 **ETHYLBENZENE**

Material Safety Data Sheet

Version 4.0
Revision Date 07/28/2010
Print Date 12/07/2011

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Propylbenzene
Product Number	:	P52407
Brand	:	Aldrich
Company	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052
Emergency Phone #	:	(314) 776-6555

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Combustible Liquid

Target Organs

Lungs, Eyes, Kidney

GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)

H226	Flammable liquid and vapour.
H304	May be fatal if swallowed and enters airways.
H335	May cause respiratory irritation.
H401	Toxic to aquatic life.

Precautionary statement(s)

P261	Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P301 + P310	IF SWALLOWED: Immediately call a POISON CENTER or doctor/ physician.
P331	Do NOT induce vomiting.

HMIS Classification

Health hazard:	0
Chronic Health Hazard:	*
Flammability:	2
Physical hazards:	0

NFPA Rating

Health hazard:	1
Fire:	2
Reactivity Hazard:	0

Potential Health Effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Skin	May be harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.

Ingestion Aspiration hazard if swallowed - can enter lungs and cause damage. May be harmful if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms : 1-Phenylpropane

Formula : C_9H_{12}
Molecular Weight : 120.19 g/mol

CAS-No.	EC-No.	Index-No.	Concentration
Propylbenzene			
103-65-1	203-132-9	601-024-00-X	-

4. FIRST AID MEASURES

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing give artificial respiration Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media
For small (incipient) fires, use media such as "alcohol" foam, dry chemical, or carbon dioxide. For large fires, apply water from as far as possible. Use very large quantities (flooding) of water applied as a mist or spray; solid streams of water may be ineffective. Cool all affected containers with flooding quantities of water.

Special protective equipment for fire-fighters
Wear self contained breathing apparatus for fire fighting if necessary.

Further information
Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Use personal protective equipment. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

Methods and materials for containment and cleaning up
Contain spillage, and then collect with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local / national regulations (see section 13). Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling
Avoid inhalation of vapour or mist.

Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

Conditions for safe storage
Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Store in cool place.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Contains no substances with occupational exposure limit values.

Personal protective equipment

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection
For prolonged or repeated contact use protective gloves.

Eye protection
Face shield and safety glasses

Skin and body protection
Choose body protection according to the amount and concentration of the dangerous substance at the work place.

Hygiene measures
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	liquid, clear
Colour	colourless

Safety data

pH	no data available
Melting point	-99 °C (-146 °F) - lit.
Boiling point	159 °C (318 °F) - lit.
Flash point	42.0 °C (107.6 °F) - closed cup
Ignition temperature	450 °C (842 °F)
Lower explosion limit	0.8 %(V)
Upper explosion limit	6 %(V)
Density	0.862 g/cm3 at 25 °C (77 °F)
Water solubility	slightly soluble

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Possibility of hazardous reactions
Vapours may form explosive mixture with air.

Conditions to avoid
Heat, flames and sparks.

Materials to avoid
Strong oxidizing agents

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides

11. TOXICOLOGICAL INFORMATION

Acute toxicity
LD50 Oral - rat - 6,040 mg/kg
Remarks: Behavioral:Somnolence (general depressed activity).

LC50 Inhalation - rat - 2 h - 65000 ppm

Skin corrosion/irritation
no data available

Serious eye damage/eye irritation
no data available

Respiratory or skin sensitization
no data available

Germ cell mutagenicity
no data available

Carcinogenicity

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity
no data available

Specific target organ toxicity - single exposure (Globally Harmonized System)
May cause respiratory irritation.

Specific target organ toxicity - repeated exposure (Globally Harmonized System)
no data available

Aspiration hazard
May be fatal if swallowed and enters airways.

Potential health effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Ingestion	Aspiration hazard if swallowed - can enter lungs and cause damage. May be harmful if swallowed.
Skin	May be harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.

Signs and Symptoms of Exposure
Damage to the lungs., To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Additional Information
RTECS: DA8750000

12. ECOLOGICAL INFORMATION

Toxicity

Toxicity to fish   LC50 - Oncorhynchus mykiss (rainbow trout) - 1.55 mg/l - 96.0 h

Toxicity to daphnia and other aquatic invertebrates.	Immobilization EC50 - Daphnia magna (Water flea) - 2 mg/l - 24 h

Persistence and degradability
no data available

Bioaccumulative potential
no data available

Mobility in soil
no data available

PBT and vPvB assessment
no data available

Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Avoid release to the environment.

13. DISPOSAL CONSIDERATIONS

Product
This combustible material may be burned in a chemical incinerator equipped with an afterburner and scrubber. Observe all federal, state, and local environmental regulations. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN-Number: 2364 Class: 3 Packing group: III
Proper shipping name: n-Propyl benzene
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
UN-Number: 2364 Class: 3 Packing group: III EMS-No: F-E, S-D
Proper shipping name: PROPYLBENZENE
Marine pollutant: No

IATA
UN-Number: 2364 Class: 3 Packing group: III
Proper shipping name: n-Propylbenzene

15. REGULATORY INFORMATION

OSHA Hazards
Combustible Liquid

DSL Status
All components of this product are on the Canadian DSL list.

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
SARA 313: This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
Fire Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Propylbenzene	103-65-1	2007-03-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Propylbenzene	103-65-1	2007-03-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Propylbenzene	103-65-1	2007-03-01

California Prop. 65 Components

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Co., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

International Chemical Safety Cards

o-XYLENE

ICSC: 0084

National Institute for Occupational Safety and Health

UNEP

ortho-Xylene
1,2-Dimethylbenzene
o-Xylol
$C_6H_4(CH_3)_2$ / C_8H_{10}
Molecular mass: 106.2

ICSC # 0084
CAS # 95-47-6
RTECS # ZE2450000
UN # 1307
EC # 601-022-00-9
August 03, 2002 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Flammable.	NO open flames, NO sparks, and NO smoking.	Powder, water spray, foam, carbon dioxide.
EXPLOSION	Above 32°C explosive vapour/air mixtures may be formed.	Above 32°C use a closed system, ventilation, and explosion-proof electrical equipment. Prevent build-up of electrostatic charges (e.g., by grounding).	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		STRICT HYGIENE! AVOID EXPOSURE OF (PREGNANT) WOMEN!	
•INHALATION	Dizziness. Drowsiness. Headache. Nausea.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
•SKIN	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES	Redness. Pain.	Safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Burning sensation. Abdominal pain. (Further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Ventilation. Remove all ignition sources. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT let this chemical enter the environment. (Extra personal protection: filter respirator for organic gases and vapours.)	Fireproof. Separated from strong oxidants and strong acids .	Note: C Xn symbol R: 10-20/21-38 S: 2-25 UN Hazard Class: 3 UN Packing Group: III

SEE IMPORTANT INFORMATION ON BACK

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the

ICSC: 0084

International Chemical Safety Cards

o-XYLENE

ICSC: 0084

IMPORTANT DATA

PHYSICAL STATE; APPEARANCE:
COLOURLESS LIQUID , WITH CHARACTERISTIC ODOUR.

PHYSICAL DANGERS:
As a result of flow, agitation, etc., electrostatic charges can be generated.

CHEMICAL DANGERS:
Reacts with strong acids and strong oxidants .

OCCUPATIONAL EXPOSURE LIMITS:
TLV: 100 ppm as TWA; 150 ppm as STEL A4 (ACGIH 2001). BEI specified by (ACGIH 2001).
EU OEL: 50 ppm as TWA; 100 ppm as STEL
(skin)
(EU 2000).
OSHA PEL†: TWA 100 ppm (435 mg/m^3)
NIOSH REL: TWA 100 ppm (435 mg/m^3) ST 150 ppm (655 mg/m^3)
NIOSH IDLH: 900 ppm See: 95476

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

INHALATION RISK:
A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

EFFECTS OF SHORT-TERM EXPOSURE:
The substance is irritating to the eyes and the skin . The substance may cause effects on the central nervous system . If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis.

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
The liquid defats the skin. The substance may have effects on the central nervous system. Exposure to the substance may enhance hearing damage caused by exposure to noise. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

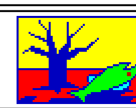
PHYSICAL PROPERTIES

Boiling point: 144°C
Melting point: -25°C
Relative density (water = 1): 0.88
Solubility in water:
none
Vapour pressure, kPa at 20°C: 0.7

Relative vapour density (air = 1): 3.7
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.02
Flash point: 32°C c.c.
Auto-ignition temperature: 463°C
Explosive limits, vol% in air: 0.9-6.7
Octanol/water partition coefficient as log Pow: 3.12

ENVIRONMENTAL DATA

The substance is toxic to aquatic organisms.



NOTES

Depending on the degree of exposure, periodic medical examination is indicated. The recommendations on this Card also apply to technical xylene. See ICSC 0086 p-Xylene and 0085 m-Xylene.

Transport Emergency Card: TEC (R)-30S1307-III

NFPA Code: H 2; F 3; R 0;
Card has been partially updated in January 2008: see Occupational Exposure Limits.

ADDITIONAL INFORMATION

ICSC: 0084 **o-XYLENE**

IMPORTANT LEGAL

Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only

International Chemical Safety Cards

p-XYLENE

ICSC: 0086

para-Xylene
1,4-Dimethylbenzene
p-Xylol
$C_6H_4(CH_3)_2$ / C_8H_{10}
Molecular mass: 106.2

ICSC # 0086
CAS # 106-42-3
RTECS # ZE2625000
UN # 1307
EC # 601-022-00-9
August 03, 2002 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Flammable.	NO open flames, NO sparks, and NO smoking.	Powder, water spray, foam, carbon dioxide.
EXPLOSION	Above 27°C explosive vapour/air mixtures may be formed.	Above 27°C use a closed system, ventilation, and explosion-proof electrical equipment. Prevent build-up of electrostatic charges (e.g., by grounding).	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		STRICT HYGIENE! AVOID EXPOSURE OF (PREGNANT) WOMEN!	
•INHALATION	Dizziness. Drowsiness. Headache. Nausea.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
•SKIN	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES	Redness. Pain.	Safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Burning sensation. Abdominal pain. (Further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Ventilation. Remove all ignition sources. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT let this chemical enter the environment. (Extra personal protection: filter respirator for organic gases and vapours.)	Fireproof. Separated from strong oxidants, strong acids	Note: C Xn symbol R: 10-20/21-38 S: 2-25 UN Hazard Class: 3 UN Packing Group: III

SEE IMPORTANT INFORMATION ON BACK

International Chemical Safety Cards

p-XYLENE

ICSC: 0086

IMPORTANT DATA

PHYSICAL STATE; APPEARANCE:
COLOURLESS LIQUID , WITH CHARACTERISTIC ODOUR.

PHYSICAL DANGERS:
As a result of flow, agitation, etc., electrostatic charges can be generated.

CHEMICAL DANGERS:
Reacts with strong acids strong oxidants

OCCUPATIONAL EXPOSURE LIMITS:
TLV: 100 ppm as TWA 150 ppm as STEL A4 (ACGIH 2001). BEI (ACGIH 2001).
MAK: 100 ppm 440 mg/m³
Peak limitation category: II(2)
skin absorption (H);
Pregnancy risk group: D
(DFG 2005).
EU OEL: 50 ppm as TWA 100 ppm as STEL (skin) (EU 2000).
OSHA PEL†: TWA 100 ppm (435 mg/m^3)
NIOSH REL: TWA 100 ppm (435 mg/m^3) ST 150 ppm (655 mg/m^3)
NIOSH IDLH: 900 ppm See: 95476

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

INHALATION RISK:
A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

EFFECTS OF SHORT-TERM EXPOSURE:
The substance is irritating to the eyes and the skin The substance may cause effects on the central nervous system If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis.

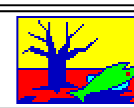
EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
The liquid defats the skin. The substance may have effects on the central nervous system. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

PHYSICAL PROPERTIES

Boiling point: 138°C
Melting point: 13°C
Relative density (water = 1): 0.86
Solubility in water:
none
Vapour pressure, kPa at 20°C: 0.9
Relative vapour density (air = 1): 3.7
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.02
Flash point: 27°C c.c.
Auto-ignition temperature: 528°C
Explosive limits, vol% in air: 1.1-7.0
Octanol/water partition coefficient as log Pow: 3.15

ENVIRONMENTAL DATA

The substance is toxic to aquatic organisms.



NOTES

Depending on the degree of exposure, periodic medical examination is indicated. The recommendations on this Card also apply to technical xylene. See ICSC 0084 o-Xylene and 0085 m-Xylene.

Transport Emergency Card: TEC (R)-30S1307-III
NFPA Code: H 2; F 3; R 0;

ADDITIONAL INFORMATION

ICSC: 0086 **p-XYLENE**

International Chemical Safety Cards

m-XYLENE

ICSC: 0085

meta-Xylene
1,3-Dimethylbenzene
m-Xylol
$C_6H_4(CH_3)_2$ / C_8H_{10}
Molecular mass: 106.2

ICSC # 0085
CAS # 108-38-3
RTECS # ZE2275000
UN # 1307
EC # 601-022-00-9
August 03, 2002 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Flammable.	NO open flames, NO sparks, and NO smoking.	Powder, water spray, foam, carbon dioxide.
EXPLOSION	Above 27°C explosive vapour/air mixtures may be formed.	Above 27°C use a closed system, ventilation, and explosion-proof electrical equipment. Prevent build-up of electrostatic charges (e.g., by grounding).	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		STRICT HYGIENE!	
•INHALATION	Dizziness. Drowsiness. Headache. Nausea.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
•SKIN	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES	Redness. Pain.	Safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Burning sensation. Abdominal pain. (Further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Ventilation. Remove all ignition sources. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT let this chemical enter the environment. (Extra personal protection: filter respirator for organic gases and vapours.)	Fireproof. Separated from strong oxidants strong acids	Note: C Xn symbol R: 10-20/21-38 S: 2-25 UN Hazard Class: 3 UN Packing Group: III

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0085

International Chemical Safety Cards

m-XYLENE

ICSC: 0085

IMPORTANT DATA

PHYSICAL STATE; APPEARANCE:
COLOURLESS LIQUID , WITH CHARACTERISTIC ODOUR.

PHYSICAL DANGERS:
As a result of flow, agitation, etc., electrostatic charges can be generated.

CHEMICAL DANGERS:
Reacts with strong acids strong oxidants

OCCUPATIONAL EXPOSURE LIMITS:
TLV: 100 ppm as TWA 150 ppm as STEL A4 (ACGIH 2001). BEI (ACGIH 2001).
MAK: 100 ppm 440 mg/m^3
Peak limitation category: II(2)
skin absorption (H);
Pregnancy risk group: D
(DFG 2005).
EU OEL: 50 ppm as TWA 100 ppm as STEL (skin) (EU 2000).
OSHA PEL†: TWA 100 ppm (435 mg/m^3)
NIOSH REL: TWA 100 ppm (435 mg/m^3) ST 150 ppm (655 mg/m^3)
NIOSH IDLH: 900 ppm See: 95476

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

INHALATION RISK:
A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

EFFECTS OF SHORT-TERM EXPOSURE:
The substance is irritating to the eyes and the skin The substance may cause effects on the central nervous system If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis.

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
The liquid defats the skin. The substance may have effects on the central nervous system Animal tests show that this substance possibly causes toxicity to human reproduction or development.

PHYSICAL PROPERTIES

Boiling point: 139°C
Melting point: -48°C
Relative density (water = 1): 0.86
Solubility in water:
none
Vapour pressure, kPa at 20°C: 0.8
Relative vapour density (air = 1): 3.7
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.02
Flash point: 27°C c.c.
Auto-ignition temperature: 527°C
Explosive limits, vol% in air: 1.1-7.0
Octanol/water partition coefficient as log Pow: 3.20

ENVIRONMENTAL DATA

The substance is toxic to aquatic organisms.

NOTES

Depending on the degree of exposure, periodic medical examination is indicated. The recommendations on this Card also apply to technical xylene. See ICSC 0084 o-Xylene and 0086 p-Xylene.

NFPA Code: H 2; F 3; R 0;
Transport Emergency Card: TEC (R)-30S1307-III

ADDITIONAL INFORMATION

ICSC: 0085 **m-XYLENE**

BENZ(a)ANTHRACENE

ICSC: 0385

1,2-Benzoanthracene
Benzo(a)anthracene
2,3-Benzphenanthrene
Naphthanthracene
$C_{18}H_{12}$
Molecular mass: 228.3

ICSC # 0385
CAS # 56-55-3
RTECS # CV9275000
EC # 601-033-00-9
October 23, 1995 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible.		Water spray, powder. In case of fire in the surroundings: use appropriate extinguishing media.
EXPLOSION	Finely dispersed particles form explosive mixtures in air.	Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.	
EXPOSURE		AVOID ALL CONTACT!	
•INHALATION		Local exhaust or breathing protection.	Fresh air, rest.
•SKIN		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES		Safety goggles face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION		Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into sealable containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place. Personal protection: complete protective clothing including self-contained breathing apparatus.	Well closed.	T symbol N symbol R: 45-50/53 S: 53-45-60-61

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0385

International Chemical Safety Cards

ICSC: 0385

BENZ(a)ANTHRACENE

IMPORTANT DATA		
I M P O R T A N T D A T A	**PHYSICAL STATE; APPEARANCE:** COLOURLESS TO YELLOW BROWN FLUORESCENT FLAKES OR POWDER. **PHYSICAL DANGERS:** Dust explosion possible if in powder or granular form, mixed with air. **CHEMICAL DANGERS:** **OCCUPATIONAL EXPOSURE LIMITS:** TLV: A2 (suspected human carcinogen); (ACGIH 2004). MAK: Carcinogen category: 2 (as pyrolysis product of organic materials) (DFG 2005).	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation, through the skin and by ingestion. **INHALATION RISK:** Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly. **EFFECTS OF SHORT-TERM EXPOSURE:** **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** This substance is probably carcinogenic to humans.
PHYSICAL PROPERTIES	Sublimation point: 435°C Melting point: 162°C Relative density (water = 1): 1.274 Solubility in water: none	Vapour pressure, Pa at 20°C: 292 Octanol/water partition coefficient as log Pow: 5.61
ENVIRONMENTAL DATA	Bioaccumulation of this chemical may occur in seafood.	

N O T E S

This substance is one of many polycyclic aromatic hydrocarbons - standards are usually established for them as mixtures, e.g., coal tar pitch volatiles. However, it may be encountered as a laboratory chemical in its pure form. Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken. Do NOT take working clothes home. Tetraphene is a common name. Card has been partly updated in October 2005 and August 2006: see sections Occupational Exposure Limits, EU classification.

ADDITIONAL INFORMATION

ICSC: 0385 **BENZ(a)ANTHRACENE**

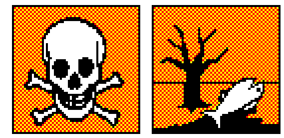
BENZO(a)PYRENE

ICSC: 0104

National Institute for Occupational Safety and Health

Benz(a)pyrene
3,4-Benzopyrene
Benzo(d,e,f)chrysene
$C_{20}H_{12}$
Molecular mass: 252.3

ICSC # 0104
CAS # 50-32-8
RTECS # DJ3675000
EC # 601-032-00-3
October 17, 2005 Peer reviewed



TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible.	NO open flames.	Water spray, foam, powder, carbon dioxide.
EXPLOSION			
EXPOSURE	See EFFECTS OF LONG-TERM OR REPEATED EXPOSURE.	AVOID ALL CONTACT! AVOID EXPOSURE OF (PREGNANT) WOMEN!	
•INHALATION		Local exhaust or breathing protection.	Fresh air, rest.
•SKIN	MAY BE ABSORBED!	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES		Safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION		Do not eat, drink, or smoke during work.	Induce vomiting (ONLY IN CONSCIOUS PERSONS!). Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Evacuate danger area! Personal protection: complete protective clothing including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Sweep spilled substance into sealable containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place.	Separated from strong oxidants.	T symbol N symbol R: 45-46-60-61-43-50/53 S: 53-45-60-61

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0104

BENZO(a)PYRENE

ICSC: 0104

IMPORTANT DATA

PHYSICAL STATE; APPEARANCE:
PALE-YELLOW CRYSTALS

PHYSICAL DANGERS:

CHEMICAL DANGERS:
Reacts with strong oxidants causing fire and explosion hazard.

OCCUPATIONAL EXPOSURE LIMITS:
TLV: Exposure by all routes should be carefully controlled to levels as low as possible A2 (suspected human carcinogen); (ACGIH 2005).
MAK:
Carcinogen category: 2; Germ cell mutagen group: 2; (DFG 2005).

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation of its aerosol, through the skin and by ingestion.

INHALATION RISK:
Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed.

EFFECTS OF SHORT-TERM EXPOSURE:

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
This substance is carcinogenic to humans. May cause heritable genetic damage to human germ cells. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

PHYSICAL PROPERTIES

Boiling point: 496°C
Melting point: 178.1°C
Density: 1.4 g/cm³
Solubility in water: none (<0.1 g/100 ml)
Vapour pressure : negligible
Octanol/water partition coefficient as log Pow: 6.04

ENVIRONMENTAL DATA

The substance is very toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish, in plants and in molluscs. The substance may cause long-term effects in the aquatic environment.

N O T E S

Do NOT take working clothes home. Benzo(a)pyrene is present as a component of polycyclic aromatic hydrocarbons (PAHs) in the environment, usually resulting from the incomplete combustion or pyrolysis of organic matters, especially fossil fuels and tobacco.

ADDITIONAL INFORMATION

International Chemical Safety Cards

BENZO(b)FLUORANTHENE

ICSC: 0720

Benz(e)acephenanthrylene
2,3-Benzofluoroanthene
Benzo(e)fluoranthene
3,4-Benzofluoranthene
$C_{20}H_{12}$
Molecular mass: 252.3

ICSC # 0720
CAS # 205-99-2
RTECS # CU1400000
EC # 601-034-00-4
March 25, 1999 Peer reviewed

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE			In case of fire in the surroundings: use appropriate extinguishing media.
EXPLOSION			
EXPOSURE		AVOID ALL CONTACT!	
•INHALATION		Local exhaust or breathing protection.	Fresh air, rest.
•SKIN		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES		Safety spectacles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION		Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into covered containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place. Do NOT let this chemical enter the environment.	Provision to contain effluent from fire extinguishing. Well closed.	T symbol N symbol R: 45-50/53 S: 53-45-60-61

SEE IMPORTANT INFORMATION ON BACK

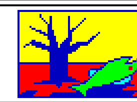
ICSC: 0720

International Chemical Safety Cards

BENZO(b)FLUORANTHENE

ICSC: 0720

I	PHYSICAL STATE; APPEARANCE:	ROUTES OF EXPOSURE:
	COLOURLESS CRYSTALS	The substance can be absorbed into the body by inhalation

M P O R T A N T D A T A	**PHYSICAL DANGERS:** **CHEMICAL DANGERS:** Upon heating, toxic fumes are formed. **OCCUPATIONAL EXPOSURE LIMITS:** TLV: A2 (suspected human carcinogen); (ACGIH 2004). MAK: Carcinogen category: 2; (DFG 2004).	of its aerosol and through the skin. **INHALATION RISK:** Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly. **EFFECTS OF SHORT-TERM EXPOSURE:** **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** This substance is possibly carcinogenic to humans. May cause genetic damage in humans.
PHYSICAL PROPERTIES	Boiling point: 481°C Melting point: 168°C Solubility in water: none	Octanol/water partition coefficient as log Pow: 6.12
ENVIRONMENTAL DATA	This substance may be hazardous to the environment; special attention should be given to air quality and water quality.	

N O T E S

Benzo(b)fluoranthene is present as a component of polycyclic aromatic hydrocarbons (PAH) content in the environment usually resulting from the incomplete combustion or pyrolysis of organic matters, especially fossil fuels and tobacco.ACGIH recommends environment containing benzo(b)fluoranthene should be evaluated in terms of the TLV-TWA for coal tar pitch volatile, as benzene soluble 0.2 mg/m^3. Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken.

ADDITIONAL INFORMATION

ICSC: 0720 **BENZO(b)FLUORANTHENE**

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International Chemical Safety Cards

BENZO(k)FLUORANTHENE

ICSC: 0721

Dibenzo(b,jk)fluorene
8,9-Benzofluoranthene
11,12-Benzofluoranthene
$C_{20}H_{12}$
Molecular mass: 252.3

ICSC # 0721
CAS # 207-08-9
RTECS # DF6350000
EC # 601-036-00-5
March 25, 1999 Peer reviewed

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE			In case of fire in the surroundings: use appropriate extinguishing media.
EXPLOSION			
EXPOSURE		AVOID ALL CONTACT!	
•INHALATION		Local exhaust or breathing protection.	Fresh air, rest.
•SKIN		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES		Safety spectacles or eye protection in combination with breathing protection if powder.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION		Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into covered containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place. Do NOT let this chemical enter the environment.	Provision to contain effluent from fire extinguishing. Well closed.	T symbol N symbol R: 45-50/53 S: 53-45-60-61

SEE IMPORTANT INFORMATION ON BACK

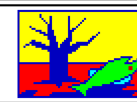
ICSC: 0721

International Chemical Safety Cards

BENZO(k)FLUORANTHENE

ICSC: 0721

I M	**PHYSICAL STATE; APPEARANCE:** YELLOW CRYSTALS	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation of its aerosol and through the skin.

IMPORTANT DATA	**PHYSICAL DANGERS:** **CHEMICAL DANGERS:** Upon heating, toxic fumes are formed. **OCCUPATIONAL EXPOSURE LIMITS:** TLV not established. MAK: Carcinogen category: 2; (DFG 2004). **INHALATION RISK:** Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly. **EFFECTS OF SHORT-TERM EXPOSURE:** **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** This substance is possibly carcinogenic to humans.
PHYSICAL PROPERTIES	Boiling point: 480°C Melting point: 217°C Solubility in water: none Octanol/water partition coefficient as log Pow: 6.84
ENVIRONMENTAL DATA	This substance may be hazardous to the environment; special attention should be given to air quality and water quality. Bioaccumulation of this chemical may occur in crustacea and in fish. 

N O T E S

Benzo(k)fluoranthene is present as a component of polycyclic aromatic hydrocarbons (PAH) content in the environment usually resulting from the incomplete combustion or pyrolysis of organic matters, especially fossil fuels and tobacco.ACGIH recommends environment containing benzo(k)fluoranthene should be evaluated in terms of the TLV-TWA for coal tar pitch volatile, as benzene soluble 0.2 mg/m^3. Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken.

ADDITIONAL INFORMATION

ICSC: 0721 **BENZO(k)FLUORANTHENE**

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International Chemical Safety Cards

CHRYSENE

ICSC: 1672

Benzoaphenanthrene
1,2-Benzophenanthrene
1,2,5,6-Dibenzonaphthalene
$C_{18}H_{12}$
Molecular mass: 228.3

ICSC # 1672
CAS # 218-01-9
RTECS # GC0700000
UN # 3077
EC # 601-048-00-0
October 12, 2006 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible.	NO open flames.	Water spray. Dry powder. Foam. Carbon dioxide.
EXPLOSION	Finely dispersed particles form explosive mixtures in air.	Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.	
EXPOSURE	See EFFECTS OF LONG-TERM OR REPEATED EXPOSURE.	AVOID ALL CONTACT!	
•INHALATION		Local exhaust or breathing protection.	Fresh air, rest.
•SKIN		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES		Safety goggles	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION		Do not eat, drink, or smoke during work.	Rinse mouth.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Personal protection: P3 filter respirator for toxic particles. Do NOT let this chemical enter the environment. Sweep spilled substance into sealable containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place.	Separated from strong oxidants, Provision to contain effluent from fire extinguishing. Store in an area without drain or sewer access.	T symbol N symbol R: 45-68-50/53 S: 53-45-60-61 UN Hazard Class: 9 UN Packing Group: III Signal: Warning Aqua-Cancer Suspected of causing cancer Very toxic to aquatic life with long lasting effects Very toxic to aquatic life

SEE IMPORTANT INFORMATION ON BACK

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European

International Chemical Safety Cards

CHRYSENE

ICSC: 1672

IMPORTANT DATA

PHYSICAL STATE; APPEARANCE:
COLOURLESS TO BEIGE CRYSTALS OR POWDER

PHYSICAL DANGERS:
Dust explosion possible if in powder or granular form, mixed with air.

CHEMICAL DANGERS:
The substance decomposes on burning producing toxic fumes Reacts violently with strong oxidants

OCCUPATIONAL EXPOSURE LIMITS:
TLV: A3 (confirmed animal carcinogen with unknown relevance to humans); (ACGIH 2006).
MAK not established.

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation of its aerosol, through the skin and by ingestion.

INHALATION RISK:
A harmful concentration of airborne particles can be reached quickly when dispersed

EFFECTS OF SHORT-TERM EXPOSURE:

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
This substance is possibly carcinogenic to humans.

PHYSICAL PROPERTIES

Boiling point: 448°C
Melting point: 254 - 256°C
Density: 1.3
g/cm³

Solubility in water:
very poor
Octanol/water partition coefficient as log Pow: 5.9

ENVIRONMENTAL DATA

The substance is very toxic to aquatic organisms. Bioaccumulation of this chemical may occur in seafood. It is strongly advised that this substance does not enter the environment.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested. Do NOT take working clothes home. This substance does not usually occur as a pure substance but as a component of polyaromatic hydrocarbon (PAH) mixtures. Human population studies have associated PAH's exposure with cancer and cardiovascular diseases.

Transport Emergency Card: TEC (R)-90GM7-III

ADDITIONAL INFORMATION

ICSC: 1672 CHRYSENE

IMPORTANT LEGAL NOTICE:

International Chemical Safety Cards

INDENO(1,2,3-cd)PYRENE

ICSC: 0730

o-Phenylenepyrene
2,3-Phenylenepyrene
$C_{22}H_{12}$
Molecular mass: 276.3

ICSC # 0730
CAS # 193-39-5
RTECS # NK9300000
March 25, 1999 Peer reviewed

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE			In case of fire in the surroundings: use appropriate extinguishing media.
EXPLOSION			
EXPOSURE		AVOID ALL CONTACT!	
•INHALATION		Local exhaust or breathing protection.	Fresh air, rest.
•SKIN		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES		Safety spectacles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION		Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into covered containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place. Do NOT let this chemical enter the environment.	Provision to contain effluent from fire extinguishing. Well closed.	R: S:

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0730

International Chemical Safety Cards

INDENO(1,2,3-cd)PYRENE

ICSC: 0730

I M P	**PHYSICAL STATE; APPEARANCE:** YELLOW CRYSTALS **PHYSICAL DANGERS:**	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation of its aerosol and through the skin. **INHALATION RISK:**

O R T A N T D A T A	**CHEMICAL DANGERS:** Upon heating, toxic fumes are formed. **OCCUPATIONAL EXPOSURE LIMITS:** TLV not established. MAK: Carcinogen category: 2; (DFG 2004).	Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly. **EFFECTS OF SHORT-TERM EXPOSURE:** **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** This substance is possibly carcinogenic to humans.
PHYSICAL PROPERTIES	Boiling point: 536°C Melting point: 164°C Solubility in water: none	Octanol/water partition coefficient as log Pow: 6.58
ENVIRONMENTAL DATA	This substance may be hazardous to the environment; special attention should be given to air quality and water quality. Bioaccumulation of this chemical may occur in fish.	

N O T E S

Indeno(1,2,3-cd)pyrene is present as a component of polycyclic aromatic hydrocarbons (PAH) content in the environment usually resulting from the incomplete combustion or pyrolysis of organic matters, especially fossil fuels and tobacco.ACGIH recommends environment containing Indeno(1,2,3-c,d)pyrene should be evaluated in terms of the TLV-TWA for coal tar pitch volatile, as benzene soluble 0.2 mg/m^3. Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken.

ADDITIONAL INFORMATION

ICSC: 0730 **INDENO(1,2,3-cd)PYRENE**

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International Chemical Safety Cards

ARSENIC

ICSC: 0013

Grey arsenic
As
Atomic mass: 74.9

ICSC # 0013
CAS # 7440-38-2
RTECS # CG0525000
UN # 1558
EC # 033-001-00-X
October 18, 1999 Peer reviewed

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames. NO contact with strong oxidizers. NO contact with hot surfaces.	Powder, water spray, foam, carbon dioxide.
EXPLOSION	Risk of fire and explosion is slight when exposed to hot surfaces or flames in the form of fine powder or dust.	Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.	
EXPOSURE		PREVENT DISPERSION OF DUST! AVOID ALL CONTACT! AVOID EXPOSURE OF (PREGNANT) WOMEN!	IN ALL CASES CONSULT A DOCTOR!
•INHALATION	Cough. Sore throat. Shortness of breath. Weakness. See Ingestion.	Closed system and ventilation.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
•SKIN	Redness.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
•EYES	Redness.	Face shield or eye protection in combination with breathing protection if powder.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Abdominal pain. Diarrhoea. Nausea. Vomiting. Burning sensation in the throat and chest. Shock or collapse. Unconsciousness.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Induce vomiting (ONLY IN CONSCIOUS PERSONS!). Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Evacuate danger area! Sweep spilled substance into sealable containers. Carefully collect remainder, then remove to safe place. Chemical protection suit including self-contained breathing apparatus. Do NOT let this chemical enter the environment.	Separated from strong oxidants, acids, halogens, food and feedstuffs. Well closed.	Do not transport with food and feedstuffs. Marine pollutant. T symbol N symbol R: 23/25-50/53 S: 1/2-20/21-28-45-60-61 UN Hazard Class: 6.1 UN Packing Group: II

SEE IMPORTANT INFORMATION ON BACK

International Chemical Safety Cards

ARSENIC

ICSC: 0013

IMPORTANT DATA

PHYSICAL STATE; APPEARANCE:
ODOURLESS, BRITTLE, GREY, METALLIC-LOOKING CRYSTALS.

PHYSICAL DANGERS:

CHEMICAL DANGERS:
Upon heating, toxic fumes are formed. Reacts violently with strong oxidants and halogens, causing fire and explosion hazard. Reacts with acids to produce

OCCUPATIONAL EXPOSURE LIMITS:
TLV: 0.01 mg/m³ as TWA A1 (confirmed human carcinogen); BEI issued (ACGIH 2004).
MAK:
Carcinogen category: 1; Germ cell mutagen group: 3A; (DFG 2004).
OSHA PEL: 1910.1018 TWA 0.010 mg/m^3
NIOSH REL: Ca C 0.002 mg/m^3 15-minute See Appendix A
NIOSH IDLH: Ca 5 mg/m^3 (as As) See: 7440382

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation of its aerosol and by ingestion.

INHALATION RISK:
Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly, when dispersed.

EFFECTS OF SHORT-TERM EXPOSURE:
The substance is irritating to the eyes the skin and the respiratory tract. The substance may cause effects on the gastrointestinal tract cardiovascular system central nervous system kidneys , resulting in severe gastroenteritis, loss of fluid, and electrolytes, cardiac disorders shock convulsions and kidney impairment Exposure above the OEL may result in death. The effects may be delayed. Medical observation is indicated.

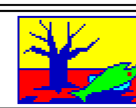
EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the mucous membranes, skin, peripheral nervous system liver bone marrow , resulting in pigmentation disorders, hyperkeratosis, perforation of nasal septum, neuropathy, liver impairment anaemia This substance is carcinogenic to humans. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

PHYSICAL PROPERTIES

Sublimation point: 613°C
Density: 5.7 g/cm³
Solubility in water: none

ENVIRONMENTAL DATA

The substance is toxic to aquatic organisms. It is strongly advised that this substance does not enter the environment.



N O T E S

The substance is combustible but no flash point is available in literature. Depending on the degree of exposure, periodic medical examination is suggested. Do NOT take working clothes home. Refer also to cards for specific arsenic compounds, e.g., Arsenic pentoxide (ICSC 0377), Arsenic trichloride (ICSC 0221), Arsenic trioxide (ICSC 0378), Arsine (ICSC 0222).

Transport Emergency Card: TEC (R)-61GT5-II

ADDITIONAL INFORMATION

ICSC: 0013 **ARSENIC**

International Chemical Safety Cards

BARIUM SULFATE

ICSC: 0827

Barium sulphate
Blanc fixe
Artificial barite
$BaSO_4$
Molecular mass: 233.43

ICSC # 0827
CAS # 7727-43-7
RTECS # CR0600000
October 20, 1999 Peer reviewed

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Not combustible. Gives off irritating or toxic fumes (or gases) in a fire.		In case of fire in the surroundings: use appropriate extinguishing media.
EXPLOSION			
EXPOSURE		PREVENT DISPERSION OF DUST!	
•INHALATION		Local exhaust or breathing protection.	Fresh air, rest.
•SKIN		Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
•EYES		Safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION		Do not eat, drink, or smoke during work.	Rinse mouth.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into containers; if appropriate, moisten first to prevent dusting. Personal protection: P1 filter respirator for inert particles.		R: S:

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0827

International Chemical Safety Cards

BARIUM SULFATE

ICSC: 0827

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<tr><td>I
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A</td><td>PHYSICAL STATE; APPEARANCE:
ODOURLESS TASTELESS, WHITE OR YELLOWISH CRYSTALS OR POWDER.

PHYSICAL DANGERS:

CHEMICAL DANGERS:
Reacts violently with aluminium powder.

OCCUPATIONAL EXPOSURE LIMITS:
TLV: 10 mg/m³ as TWA; (ACGIH 2004).
MAK: (Inhalable fraction) 4 mg/m³; (Respirable fraction) 1.5 mg/m³; (DFG 2004).
OSHA PEL†: TWA 15 mg/m^3 (total) TWA 5 mg/m^3 (resp)
NIOSH REL: TWA 10 mg/m^3 (total) TWA 5 mg/m^3 (resp)
NIOSH IDLH: N.D. See: IDLH INDEX</td><td>ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation of its aerosol.

INHALATION RISK:
Evaporation at 20°C is negligible; a nuisance-causing concentration of airborne particles can, however, be reached quickly.

EFFECTS OF SHORT-TERM EXPOSURE:

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
Lungs may be affected by repeated or prolonged exposure to dust particles , resulting in baritosis (a form of benign pneumoconiosis).</td></tr>
<tr><td>PHYSICAL PROPERTIES</td><td>Melting point (decomposes): 1600°C
Density: 4.5
g/cm³</td><td>Solubility in water: none</td></tr>
<tr><td>ENVIRONMENTAL DATA</td><td colspan="2"></td></tr>
<tr><td colspan="3">N O T E S</td></tr>
<tr><td colspan="3">Occurs in nature as the mineral barite; also as barytes, heavy spar. Card has been partly updated in October 2005. See section Occupational Exposure Limits.</td></tr>
</table>

<table>
<tr><td colspan="2">ADDITIONAL INFORMATION</td></tr>
<tr><td></td><td></td></tr>
<tr><td>ICSC: 0827</td><td>BARIUM SULFATE</td></tr>
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International Chemical Safety Cards

CADMIUM

ICSC: 0020

Cd
Atomic mass: 112.4

ICSC # 0020
CAS # 7440-43-9
RTECS # EU9800000
UN # 2570
EC # 048-002-00-0
April 22, 2005 Peer reviewed

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Flammable in powder form and spontaneously combustible in pyrophoric form. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames, NO sparks, and NO smoking. NO contact with heat or acid(s).	Dry sand. Special powder. NO other agents.
EXPLOSION	Finely dispersed particles form explosive mixtures in air.	Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.	
EXPOSURE		PREVENT DISPERSION OF DUST! AVOID ALL CONTACT!	IN ALL CASES CONSULT A DOCTOR!
•INHALATION	Cough. Sore throat.	Local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
•SKIN		Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES	Redness. Pain.	Safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Abdominal pain. Diarrhoea. Headache. Nausea. Vomiting.	Do not eat, drink, or smoke during work.	Rest. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Evacuate danger area! Personal protection: chemical protection suit including self-contained breathing apparatus. Remove all ignition sources. Sweep spilled substance into containers. Carefully collect remainder, then remove to safe place.	Fireproof. Dry. Keep under inert gas. Separated from igntion sources, oxidants acids, food and feedstuffs	Airtight. Unbreakable packaging; put breakable packaging into closed unbreakable container. Do not transport with food and feedstuffs. Note: E T+ symbol N symbol R: 45-26-48/23/25-62-63-68-50/53 S: 53-45-60-61 UN Hazard Class: 6.1

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0020

International Chemical Safety Cards

CADMIUM

ICSC: 0020

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** SOFT BLUE-WHITE METAL LUMPS OR GREY POWDER. MALLEABLE. TURNS BRITTLE ON EXPOSURE TO 80°C AND TARNISHES ON EXPOSURE TO MOIST AIR. **PHYSICAL DANGERS:** Dust explosion possible if in powder or granular form, mixed with air. **CHEMICAL DANGERS:** Reacts with acids forming flammable/explosive gas (hydrogen - see ICSC0001.) Dust reacts with oxidants, hydrogen azide, zinc, selenium or tellurium , causing fire and explosion hazard. **OCCUPATIONAL EXPOSURE LIMITS:** TLV: (Total dust) 0.01 mg/m^3 (Respirable fraction) 0.002 mg/m^3 as TWA A2 (suspected human carcinogen); BEI issued (ACGIH 2005). MAK: skin absorption (H); Carcinogen category: 1; Germ cell mutagen group: 3A; (DFG 2004). OSHA PEL*: 1910.1027 TWA 0.005 mg/m^3 *Note: The PEL applies to all Cadmium compounds (as Cd). NIOSH REL*: Ca See Appendix A *Note: The REL applies to all Cadmium compounds (as Cd). NIOSH IDLH: Ca 9 mg/m^3 (as Cd) See: IDLH INDEX	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation of its aerosol and by ingestion. **INHALATION RISK:** A harmful concentration of airborne particles can be reached quickly when dispersed, especially if powdered. **EFFECTS OF SHORT-TERM EXPOSURE:** The fume is irritating to the respiratory tract Inhalation of fume may cause lung oedema (see Notes). Inhalation of fumes may cause metal fume fever. The effects may be delayed. Medical observation is indicated. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** Lungs may be affected by repeated or prolonged exposure to dust particles. The substance may have effects on the kidneys , resulting in kidney impairment This substance is carcinogenic to humans.
PHYSICAL PROPERTIES	Boiling point: 765°C Melting point: 321°C Density: 8.6 g/cm3	Solubility in water: none Auto-ignition temperature: (cadmium metal dust) 250°C
ENVIRONMENTAL DATA		

NOTES

Reacts violently with fire extinguishing agents such as water,foam,carbon dioxideand halons. Depending on the degree of exposure, periodic medical examination is indicated. The symptoms of lung oedema often do not become manifest until a few hours have passed and they are aggravated by physical effort. Rest and medical observation are therefore essential. Do NOT take working clothes home. Cadmium also exists in a pyrophoric form (EC No. 048-011-00-X), which bears the additional EU labelling symbol F, R phrase 17, and S phrases 7/8 and 43. UN numbers and packing group will vary according to the physical form of the substance.

ADDITIONAL INFORMATION

ICSC: 0020 **CADMIUM**

IMPORTANT LEGAL NOTICE:	Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

CHROMIUM

ICSC: 0029

Chrome
Cr
Atomic mass: 52.0
(powder)

ICSC # 0029
CAS # 7440-47-3
RTECS # GB4200000
October 27, 2004 Peer reviewed

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible under specific conditions.	No open flames if in powder form.	In case of fire in the surroundings: use appropriate extinguishing media.
EXPLOSION		Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.	
EXPOSURE		PREVENT DISPERSION OF DUST!	
•INHALATION	Cough.	Local exhaust or breathing protection.	Fresh air, rest.
•SKIN		Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
•EYES	Redness.	Safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION		Do not eat, drink, or smoke during work.	Rinse mouth.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into containers; if appropriate, moisten first to prevent dusting. Personal protection: P2 filter respirator for harmful particles.		R: S:

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0029

International Chemical Safety Cards

CHROMIUM

ICSC: 0029

I
M
P

PHYSICAL STATE; APPEARANCE:
GREY POWDER

PHYSICAL DANGERS:
Dust explosion possible if in powder or granular form, mixed with air.

ROUTES OF EXPOSURE:

INHALATION RISK:
A harmful concentration of airborne particles can be reached quickly when dispersed.

O R T A N T D A T A	**CHEMICAL DANGERS:** Chromium is a catalytic substance and may cause reaction in contact with many organic and inorganic substances , causing fire and explosion hazard. **OCCUPATIONAL EXPOSURE LIMITS:** TLV: (as Cr metal, Cr(III) compounds) 0.5 mg/m³ as TWA A4 (ACGIH 2004). MAK not established. OSHA PEL*: TWA 1 mg/m^3 See Appendix C *Note: The PEL also applies to insoluble chromium salts. NIOSH REL: TWA 0.5 mg/m^3 See Appendix C NIOSH IDLH: 250 mg/m^3 (as Cr) See: 7440473	**EFFECTS OF SHORT-TERM EXPOSURE:** May cause mechanical irritation tothe eyesandthe respiratory tract. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:**
PHYSICAL PROPERTIES	Boiling point: 2642°C Melting point: 1900°C Density: 7.15 g/cm³	Solubility in water: none
ENVIRONMENTAL DATA		

N O T E S

The surface of the chromium particles is oxidized to chromium(III)oxide in air. See ICSC 1531 Chromium(III) oxide.

ADDITIONAL INFORMATION

ICSC: 0029 **CHROMIUM**

IMPORTANT LEGAL NOTICE:	Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

COPPER

ICSC: 0240

Cu
(powder)

ICSC # 0240
CAS # 7440-50-8
RTECS # GL5325000
September 24, 1993 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible.	NO open flames.	Special powder, dry sand, NO other agents.
EXPLOSION			
EXPOSURE		PREVENT DISPERSION OF DUST!	
•INHALATION	Cough. Headache. Shortness of breath. Sore throat.	Local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
•SKIN	Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES	Redness. Pain.	Safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Abdominal pain. Nausea. Vomiting.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into containers. Carefully collect remainder. Then remove to safe place. (Extra personal protection: P2 filter respirator for harmful particles).	Separated from - See Chemical Dangers.	R: S:

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0240

International Chemical Safety Cards

COPPER

ICSC: 0240

I

M

P

PHYSICAL STATE; APPEARANCE:
RED POWDER, TURNS GREEN ON EXPOSURE TO MOIST AIR.

PHYSICAL DANGERS:

CHEMICAL DANGERS:

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation and by ingestion.

INHALATION RISK:
Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed.

<table>
<tr><td>O
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A</td><td>Shock-sensitive compounds are formed with acetylenic compounds, ethylene oxides and azides. Reacts with strong oxidants like chlorates, bromates and iodates, causing explosion hazard.

OCCUPATIONAL EXPOSURE LIMITS:
TLV: 0.2 mg/m^3 fume (ACGIH 1992-1993).
TLV (as Cu, dusts & mists): 1 mg/m^3 (ACGIH 1992-1993).
Intended change 0.1 mg/m^3
Inhal.,
A4 (not classifiable as a human carcinogen);
MAK: 0.1 mg/m^3 (Inhalable fraction)
Peak limitation category: II(2) Pregnancy risk group: D (DFG 2005).
OSHA PEL*: TWA 1 mg/m^3 *Note: The PEL also applies to other copper compounds (as Cu) except copper fume.
NIOSH REL*: TWA 1 mg/m^3 *Note: The REL also applies to other copper compounds (as Cu) except Copper fume.
NIOSH IDLH: 100 mg/m^3 (as Cu) See: 7440508</td><td>EFFECTS OF SHORT-TERM EXPOSURE:
Inhalation of fumes may cause metal fume fever. See Notes.

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
Repeated or prolonged contact may cause skin sensitization.</td></tr>
<tr><td>PHYSICAL PROPERTIES</td><td>Boiling point: 2595°C
Melting point: 1083°C
Relative density (water = 1): 8.9</td><td>Solubility in water:
none</td></tr>
<tr><td>ENVIRONMENTAL DATA</td><td></td><td></td></tr>
</table>

N O T E S

The symptoms of metal fume fever do not become manifest until several hours.

ADDITIONAL INFORMATION

ICSC: 0240 **COPPER**

LEAD

ICSC: 0052

Lead metal
Plumbum
Pb
Atomic mass: 207.2
(powder)

ICSC # 0052
CAS # 7439-92-1
RTECS # OF7525000
October 08, 2002 Peer reviewed

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Not combustible. Gives off irritating or toxic fumes (or gases) in a fire.		In case of fire in the surroundings: use appropriate extinguishing media.
EXPLOSION	Finely dispersed particles form explosive mixtures in air.	Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.	
EXPOSURE	See EFFECTS OF LONG-TERM OR REPEATED EXPOSURE.	PREVENT DISPERSION OF DUST! AVOID EXPOSURE OF (PREGNANT) WOMEN!	
•INHALATION		Local exhaust or breathing protection.	Fresh air, rest.
•SKIN		Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES		Safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Abdominal pain. Nausea. Vomiting.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Give plenty of water to drink. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place. Do NOT let this chemical enter the environment. Personal protection: P3 filter respirator for toxic particles.	Separated from food and feedstuffs incompatible materials See Chemical Dangers.	R: S:

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0052

LEAD

ICSC: 0052

IMPORTANT DATA

PHYSICAL STATE; APPEARANCE:
BLUISH-WHITE OR SILVERY-GREY SOLID IN VARIOUS FORMS. TURNS TARNISHED ON EXPOSURE TO AIR.

PHYSICAL DANGERS:
Dust explosion possible if in powder or granular form, mixed with air.

CHEMICAL DANGERS:
On heating, toxic fumes are formed. Reacts with oxidants. Reacts with hot concentrated nitric acid, boiling concentrated hydrochloric acid and sulfuric acid. Attacked by pure water and by weak organic acids in the presence of oxygen.

OCCUPATIONAL EXPOSURE LIMITS:
TLV: 0.05 mg/m³ A3 (confirmed animal carcinogen with unknown relevance to humans); BEI issued (ACGIH 2004).
MAK:
Carcinogen category: 3B; Germ cell mutagen group: 3A; (DFG 2004).
EU OEL: as TWA 0.15 mg/m³ (EU 2002).
OSHA PEL*: 1910.1025 TWA 0.050 mg/m^3 See Appendix C *Note: The PEL also applies to other lead compounds (as Pb) -- see Appendix C.
NIOSH REL*: TWA 0.050 mg/m^3 See Appendix C *Note: The REL also applies to other lead compounds (as Pb) -- see Appendix C.
NIOSH IDLH: 100 mg/m^3 (as Pb) See: 7439921

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation and by ingestion.

INHALATION RISK:
A harmful concentration of airborne particles can be reached quickly when dispersed, especially if powdered.

EFFECTS OF SHORT-TERM EXPOSURE:

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
The substance may have effects on the blood bone marrow central nervous system peripheral nervous system kidneys , resulting in anaemia, encephalopathy (e.g., convulsions), peripheral nerve disease, abdominal cramps and kidney impairment. Causes toxicity to human reproduction or development.

PHYSICAL PROPERTIES

Boiling point: 1740°C
Melting point: 327.5°C
Density: 11.34 g/cm3
Solubility in water: none

ENVIRONMENTAL DATA

Bioaccumulation of this chemical may occur in plants and in mammals. It is strongly advised that this substance does not enter the environment.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested. Do NOT take working clothes home.

Transport Emergency Card: TEC (R)-51S1872

ADDITIONAL INFORMATION

ICSC: 0052 **LEAD**

International Chemical Safety Cards

MERCURY

ICSC: 0056

Quicksilver
Liquid silver
Hg
Atomic mass: 200.6

ICSC # 0056
CAS # 7439-97-6
RTECS # OV4550000
UN # 2809
EC # 080-001-00-0
April 22, 2004 Peer reviewed

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Not combustible. Gives off irritating or toxic fumes (or gases) in a fire.		In case of fire in the surroundings: use appropriate extinguishing media.
EXPLOSION	Risk of fire and explosion.		In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		STRICT HYGIENE! AVOID EXPOSURE OF (PREGNANT) WOMEN! AVOID EXPOSURE OF ADOLESCENTS AND CHILDREN!	IN ALL CASES CONSULT A DOCTOR!
•INHALATION	Abdominal pain. Cough. Diarrhoea. Shortness of breath. Vomiting. Fever or elevated body temperature.	Local exhaust or breathing protection.	Fresh air, rest. Artificial respiration if indicated. Refer for medical attention.
•SKIN	MAY BE ABSORBED! Redness.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention.
•EYES		Face shield, or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION		Do not eat, drink, or smoke during work. Wash hands before eating.	Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Evacuate danger area in case of a large spill! Consult an expert! Ventilation. Collect leaking and spilled liquid in sealable non-metallic containers as far as possible. Do NOT wash away into sewer. Do NOT let this chemical enter the environment. Chemical protection suit including self-contained breathing apparatus.	Provision to contain effluent from fire extinguishing. Separated from food and feedstuffs Well closed.	Special material. Do not transport with food and feedstuffs. T symbol N symbol R: 23-33-50/53 S: 1/2-7-45-60-61 UN Hazard Class: 8 UN Packing Group: III

SEE IMPORTANT INFORMATION ON BACK

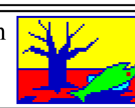
ICSC: 0056

International Chemical Safety Cards

MERCURY

ICSC: 0056

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** ODOURLESS, HEAVY AND MOBILE SILVERY LIQUID METAL. **PHYSICAL DANGERS:** **CHEMICAL DANGERS:** Upon heating, toxic fumes are formed. Reacts violently with ammonia and halogens causing fire and explosion hazard. Attacks aluminium and many other metals forming amalgams. **OCCUPATIONAL EXPOSURE LIMITS:** TLV: 0.025 mg/m³ as TWA (skin) A4 BEI issued (ACGIH 2004). MAK: 0.1 mg/m³ Sh Peak limitation category: II(8) Carcinogen category: 3B (DFG 2003). OSHA PEL†: C 0.1 mg/m^3 NIOSH REL: Hg Vapor: TWA 0.05 mg/m^3 skin Other: C 0.1 mg/m^3 skin NIOSH IDLH: 10 mg/m^3 (as Hg) See: 7439976	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation of its vapour and through the skin , also as a vapour! **INHALATION RISK:** A harmful contamination of the air can be reached very quickly on evaporation of this substance at 20°C. **EFFECTS OF SHORT-TERM EXPOSURE:** The substance is irritating to the skin. Inhalation of the vapours may cause pneumonitis. The substance may cause effects on the central nervous systemandkidneys. The effects may be delayed. Medical observation is indicated. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** The substance may have effects on the central nervous system kidneys , resulting in irritability, emotional instability, tremor, mental and memory disturbances, speech disorders. Danger of cumulative effects. Animal tests show that this substance possibly causes toxic effects upon human reproduction.
PHYSICAL PROPERTIES	Boiling point: 357°C Melting point: -39°C Relative density (water = 1): 13.5 Solubility in water: none	Vapour pressure, Pa at 20°C: 0.26 Relative vapour density (air = 1): 6.93 Relative density of the vapour/air-mixture at 20°C (air = 1): 1.009
ENVIRONMENTAL DATA	The substance is very toxic to aquatic organisms. In the food chain important to humans, bioaccumulation takes place, specifically in fish.	



N O T E S

Depending on the degree of exposure, periodic medical examination is indicated. No odour warning if toxic concentrations are present. Do NOT take working clothes home.

Transport Emergency Card: TEC (R)-80GC9-II+III

ADDITIONAL INFORMATION

ICSC: 0056 **MERCURY**

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International Chemical Safety Cards

NICKEL

ICSC: 0062

Ni
Atomic mass: 58.7
(powder)

ICSC # 0062
CAS # 7440-02-0
RTECS # QR5950000
EC # 028-002-00-7
October 17, 2001 Peer reviewed

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Flammable as dust. Toxic fumes may be released in a fire.		Dry sand. NO carbon dioxide. NO water.
EXPLOSION	Finely dispersed particles form explosive mixtures in air.	Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.	
EXPOSURE		PREVENT DISPERSION OF DUST! AVOID ALL CONTACT!	
•INHALATION	Cough. Shortness of breath.	Local exhaust or breathing protection.	Fresh air, rest.
•SKIN		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES		Safety spectacles, or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION		Do not eat, drink, or smoke during work.	Rinse mouth.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Vacuum spilled material. Carefully collect remainder, then remove to safe place. Personal protection: P2 filter respirator for harmful particles.	Separated from strong acids.	Xn symbol R: 40-43 S: 2-22-36

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0062

International Chemical Safety Cards

NICKEL

ICSC: 0062

I

PHYSICAL STATE; APPEARANCE:
SILVERY METALLIC SOLID IN VARIOUS FORMS.

PHYSICAL DANGERS:

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation of the dust.

M P O R T A N T D A T A	Dust explosion possible if in powder or granular form, mixed with air. **CHEMICAL DANGERS:** Reacts violently, in powder form, with titanium powder and potassium perchlorate, and oxidants such as ammonium nitrate, causing fire and explosion hazard. Reacts slowly with non-oxidizing acids and more rapidly with oxidizing acids. Toxic gases and vapours (such as nickel carbonyl) may be released in a fire involving nickel. **OCCUPATIONAL EXPOSURE LIMITS:** TLV: (Inhalable fraction) 1.5 mg/m³ as TWA A5 (not suspected as a human carcinogen); (ACGIH 2004). MAK: (Inhalable fraction) sensitization of respiratory tract and skin (Sah); Carcinogen category: 1; (DFG 2004). OSHA PEL*†: TWA 1 mg/m^3 *Note: The PEL does not apply to Nickel carbonyl. NIOSH REL*: Ca TWA 0.015 mg/m^3 See Appendix A *Note: The REL does not apply to Nickel carbonyl. NIOSH IDLH: Ca 10 mg/m^3 (as Ni) See: 7440020	**INHALATION RISK:** Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed. **EFFECTS OF SHORT-TERM EXPOSURE:** May cause mechanical irritation. Inhalation of fumes may cause pneumonitis. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** Repeated or prolonged contact may cause skin sensitization. Repeated or prolonged inhalation exposure may cause asthma. Lungs may be affected by repeated or prolonged exposure. This substance is possibly carcinogenic to humans.
PHYSICAL PROPERTIES	Boiling point: 2730°C Melting point: 1455°C Density: 8.9 g/cm3	Solubility in water: none
ENVIRONMENTAL DATA		

N O T E S

At high temperatures, nickel oxide fumes will be formed. Depending on the degree of exposure, periodic medical examination is suggested. The symptoms of asthma often do not become manifest until a few hours have passed and they are aggravated by physical effort. Rest and medical observation are therefore essential. Anyone who has shown symptoms of asthma due to this substance should avoid all further contact with this substance.

ADDITIONAL INFORMATION

ICSC: 0062	NICKEL

International Chemical Safety Cards

SILVER

ICSC: 0810

Argentium
C.I. 77820
Ag

ICSC # 0810
CAS # 7440-22-4
RTECS # VW3500000
September 10, 1997 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Not combustible, except as powder.		
EXPLOSION			
EXPOSURE		PREVENT DISPERSION OF DUST!	
•INHALATION		Local exhaust or breathing protection.	Fresh air, rest.
•SKIN		Protective gloves.	Rinse skin with plenty of water or shower.
•EYES		Safety spectacles, or eye protection in combination with breathing protection if powder.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION		Do not eat, drink, or smoke during work.	

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place. Do NOT let this chemical enter the environment.	Separated from ammonia, strong hydrogen peroxide solutions, strong acids.	

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0810

International Chemical Safety Cards

SILVER

ICSC: 0810

I M P O R

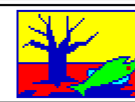
PHYSICAL STATE; APPEARANCE:
WHITE METAL, TURNS DARK ON EXPOSURE TO OZONE, HYDROGEN SULFIDE OR SULFUR.

PHYSICAL DANGERS:

CHEMICAL DANGERS:
Shock-sensitive compounds are formed with acetylene.

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation and by ingestion.

INHALATION RISK:
Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed.

T A N T D A T A	Reacts with acids causing fire hazard. Contact with strong hydrogen peroxide solution will cause violent decomposition to oxygen gas. Contact with ammonia may cause formation of compounds that are explosive when dry. **OCCUPATIONAL EXPOSURE LIMITS:** TLV (metal): 0.1 mg/m³ (ACGIH 1997). EU OEL: 0.1 mg/m³ as TWA (EU 2000). OSHA PEL: TWA 0.01 mg/m^3 NIOSH REL: TWA 0.01 mg/m^3 NIOSH IDLH: 10 mg/m^3 (as Ag) See: IDLH INDEX	**EFFECTS OF SHORT-TERM EXPOSURE:** Inhalation of high amounts of metallic silver vapours may cause lung damage with pulmonary oedema. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** The substance may cause a grey-blue discoloration of the eyes, nose, throat and skin (argyria/argyrosis).
PHYSICAL PROPERTIES	Boiling point: 2212°C Melting point: 962°C	Relative density (water = 1): 10.5 Solubility in water: none
ENVIRONMENTAL DATA	This substance may be hazardous to the environment; special attention should be given to aquatic organisms.	

N O T E S

Card has been partially updated in March 2008: see Occupational Exposure Limits.

ADDITIONAL INFORMATION

ICSC: 0810 **SILVER**

IMPORTANT LEGAL NOTICE:	Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

ZINC POWDER

ICSC: 1205

Blue powder
Merrillite
Zn
Atomic mass: 65.4
(powder)

ICSC # 1205
CAS # 7440-66-6
RTECS # ZG8600000
UN # 1436 (zinc powder or dust)
EC # 030-001-00-1
October 24, 1994 Peer reviewed

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Highly flammable. Many reactions may cause fire or explosion. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames, NO sparks, and NO smoking. NO contact with acid(s), base (s) and incompatible substances (see Chemical Dangers).	Special powder, dry sand, NO other agents. NO water.
EXPLOSION	Risk of fire and explosion on contact with acid(s), base(s), water and incompatible substances.	Closed system, ventilation, explosion-proof electrical equipment and lighting. Prevent build-up of electrostatic charges (e.g., by grounding). Prevent deposition of dust.	In case of fire: cool drums, etc., by spraying with water but avoid contact of the substance with water.
EXPOSURE		PREVENT DISPERSION OF DUST! STRICT HYGIENE!	
•INHALATION	Metallic taste and metal fume fever. Symptoms may be delayed (see Notes).	Local exhaust.	Fresh air, rest. Refer for medical attention.
•SKIN	Dry skin.	Protective gloves.	Rinse and then wash skin with water and soap.
•EYES		Safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Abdominal pain. Nausea. Vomiting.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Extinguish or remove all ignition sources. Do NOT wash away into sewer. Sweep spilled substance into containers. then remove to safe place. Personal protection: self-contained breathing apparatus.	Fireproof. Separated from acids, bases oxidants Dry.	Airtight. F symbol N symbol R: 15-17-50/53 S: 2-7/8-43-46-60-61 UN Hazard Class: 4.3 UN Subsidiary Risks: 4.2

SEE IMPORTANT INFORMATION ON BACK

International Chemical Safety Cards

ZINC POWDER

ICSC: 1205

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** ODOURLESS GREY TO BLUE POWDER. **PHYSICAL DANGERS:** Dust explosion possible if in powder or granular form, mixed with air. If dry, it can be charged electrostatically by swirling, pneumatic transport, pouring, etc. **CHEMICAL DANGERS:** Upon heating, toxic fumes are formed. The substance is a strong reducing agent and reacts violently with oxidants. Reacts with water and reacts violently with acids and bases forming flammable/explosive gas (hydrogen - see ICSC0001) Reacts violently with sulfur, halogenated hydrocarbons and many other substances causing fire and explosion hazard. **OCCUPATIONAL EXPOSURE LIMITS:** TLV not established.	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation and by ingestion. **INHALATION RISK:** Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed. **EFFECTS OF SHORT-TERM EXPOSURE:** Inhalation of fumes may cause metal fume fever. The effects may be delayed. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** Repeated or prolonged contact with skin may cause dermatitis.
PHYSICAL PROPERTIES	Boiling point: 907°C Melting point: 419°C Relative density (water = 1): 7.14	Solubility in water: reaction Vapour pressure, kPa at 487°C: 0.1 Auto-ignition temperature: 460°C
ENVIRONMENTAL DATA		

N O T E S

Zinc may contain trace amounts of arsenic, when forming hydrogen, may also form toxic gas arsine (see ICSC 0001 and ICSC 0222). Reacts violently with fire extinguishing agents such as water, halons, foam and carbon dioxide. The symptoms of metal fume fever do not become manifest until several hours later. Rinse contaminated clothes (fire hazard) with plenty of water.

Transport Emergency Card: TEC (R)-43GWS-II+III
NFPA Code: H0; F1; R1;

ADDITIONAL INFORMATION

ICSC: 1205 ZINC POWDER

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Material Safety Data Sheet

Version 4.0
Revision Date 03/12/2010
Print Date 12/09/2011

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	4,4'-DDD PESTANAL,250 MG (2,2-BIS(4-CHL&
Product Number	:	35486
Brand	:	Fluka
Company	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052
Emergency Phone #	:	(314) 776-6555

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Toxic by ingestion, Harmful by skin absorption., Possible carcinogen.

GHS Label elements, including precautionary statements

Pictogram

Signal word: Danger

Hazard statement(s)

H301	Toxic if swallowed.
H312	Harmful in contact with skin.
H351	Suspected of causing cancer.
H400	Very toxic to aquatic life.
H413	May cause long lasting harmful effects to aquatic life.

Precautionary statement(s)

P273	Avoid release to the environment.
P280	Wear protective gloves/protective clothing.
P301 + P310	IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.

HMIS Classification

Health hazard: 2
Chronic Health Hazard: *
Flammability: 0
Physical hazards: 0

NFPA Rating

Health hazard: 2
Fire: 0
Reactivity Hazard: 0

Potential Health Effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Skin	Harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.
Ingestion	Toxic if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms	:	1,1-Dichloro-2,2-bis(4-chlorophenyl)ethane 4,4′-DDD TDE
Formula	:	$C_{14}H_{10}Cl_4$
Molecular Weight	:	320.04 g/mol

CAS-No.	EC-No.	Index-No.	Concentration
2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane			
72-54-8	200-783-0	-	-

4. FIRST AID MEASURES

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing give artificial respiration Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Special protective equipment for fire-fighters
Wear self contained breathing apparatus for fire fighting if necessary.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Use personal protective equipment. Avoid dust formation. Avoid breathing dust. Ensure adequate ventilation. Evacuate personnel to safe areas.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

Methods and materials for containment and cleaning up
Pick up and arrange disposal without creating dust. Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling
Avoid contact with skin and eyes. Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed. Normal measures for preventive fire protection.

Conditions for safe storage
Keep container tightly closed in a dry and well-ventilated place.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Contains no substances with occupational exposure limit values.

Personal protective equipment

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection
Handle with gloves.

Eye protection
Face shield and safety glasses

Skin and body protection
Choose body protection according to the amount and concentration of the dangerous substance at the work place.

Hygiene measures
Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	solid

Safety data

pH	no data available
Melting point	94.0 - 96.0 °C (201.2 - 204.8 °F)
Boiling point	193.0 °C (379.4 °F) at 1.3 hPa (1.0 mmHg)
Flash point	no data available
Ignition temperature	no data available
Lower explosion limit	no data available
Upper explosion limit	no data available
Vapour pressure	< 0.00001 hPa (< 0.00001 mmHg) at 25.0 °C (77.0 °F)
Density	1.38 g/cm3
Water solubility	no data available
Partition coefficient: n-octanol/water	log Pow: 6.02

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Conditions to avoid
no data available

Materials to avoid
Strong oxidizing agents

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas
Hazardous decomposition products formed under fire conditions. - Nature of decomposition products not known.

11. TOXICOLOGICAL INFORMATION

Acute toxicity
LD50 Oral - Hamster - > 5,000 mg/kg

TDLo Oral - Human - 428.5 mg/kg
Remarks: Endocrine:Adrenal cortex hypoplasia.

TDLo Oral - rat - 6,000 mg/kg
Remarks: Cardiac:Other changes. Gastrointestinal:Other changes. Kidney, Ureter, Bladder:Changes in both tubules and glomeruli.

TDLo Oral - rat - 14 mg/kg
Remarks: Liver:Changes in liver weight. Endocrine:Estrogenic. Musculoskeletal:Other changes.

TDLo Oral - rat - 2,100 mg/kg
Remarks: Behavioral:Altered sleep time (including change in righting reflex).

LD50 Dermal - rabbit - 1,200 mg/kg
Remarks: Behavioral:Excitement. Behavioral:Convulsions or effect on seizure threshold. Skin irritation

Skin corrosion/irritation
no data available

Serious eye damage/eye irritation
no data available

Respiratory or skin sensitization
no data available

Germ cell mutagenicity

no data available

Carcinogenicity

This product is or contains a component that has been reported to be possibly carcinogenic based on its IARC, ACGIH, NTP, or EPA classification.

Limited evidence of carcinogenicity in animal studies

IARC:	No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
ACGIH:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
NTP:	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

no data available

Specific target organ toxicity - single exposure (GHS)
no data available

Specific target organ toxicity - repeated exposure (GHS)
no data available

Aspiration hazard
no data available

Potential health effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Ingestion	Toxic if swallowed.
Skin	Harmful if absorbed through skin. May cause skin irritation.

Eyes	May cause eye irritation.

Signs and Symptoms of Exposure
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Additional Information
RTECS: KI0700000

12. ECOLOGICAL INFORMATION

Toxicity

Toxicity to fish	LC50 - other fish - 1.18 - 9 mg/l - 96.0 h
	LC50 - Lepomis macrochirus (Bluegill) - 0.04 - 0.05 mg/l - 96.0 h
	LC50 - Oncorhynchus mykiss (rainbow trout) - 0.06 - 0.09 mg/l - 96.0 h
	LC50 - Pimephales promelas (fathead minnow) - 3.47 - 5.58 mg/l - 96.0 h
Toxicity to daphnia and other aquatic invertebrates.	EC50 - Daphnia pulex (Water flea) - 0.01 mg/l - 48 h

Persistence and degradability
no data available

Bioaccumulative potential
Indication of bioaccumulation.

Mobility in soil
no data available

PBT and vPvB assessment
no data available

Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

13. DISPOSAL CONSIDERATIONS

Product
Observe all federal, state, and local environmental regulations. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN-Number: 2811 Class: 6.1 Packing group: III
Proper shipping name: Toxic solids, organic, n.o.s. (2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane)
Reportable Quantity (RQ): 1 lbs
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
UN-Number: 2811 Class: 6.1 Packing group: III EMS-No: F-A, S-A
Proper shipping name: TOXIC SOLID, ORGANIC, N.O.S. (2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane)
Marine pollutant: No

IATA
UN-Number: 2811 Class: 6.1 Packing group: III
Proper shipping name: Toxic solid, organic, n.o.s. (2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane)

15. REGULATORY INFORMATION

OSHA Hazards
Toxic by ingestion, Harmful by skin absorption., Possible carcinogen.

DSL Status
This product contains the following components that are not on the Canadian DSL nor NDSL lists.

	CAS-No.
2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane	72-54-8

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
SARA 313: This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
Acute Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane	72-54-8	

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane	72-54-8	

New Jersey Right To Know Components

	CAS-No.	Revision Date
2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane	72-54-8	

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. 2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane	72-54-8	

16. OTHER INFORMATION

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Co., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

MSDS : 2,2-Bis-(4-chlorophenyl)-1,1-dichloroethylene, 99%
CAS : 72-55-9
SYNONYMS : p,p'-DDE ; ethylene,1,1-dichloro-2,2-bis-(p-chlorophenyl)- ; DDT dehydrochloride ; DDE; 1-1'-(Dichloroethenylidene)bis(4-chlorobenzene)

Catalog of Chemical Suppliers, Buyers, Custom Synthesis Companies And Equipment Manufacturers
[2,2-Bis-(4-chlorophenyl)-1,1-dichloroethylene, 99% 72-55-9]

Suppliers:

Not Available

Buyers:

Not Available

**** SECTION 2 - COMPOSITION, INFORMATION ON INGREDIENTS ****

CAS#	Chemical Name	%	EINECS#
72-55-9	2,2-Bis-(4-chlorophenyl)-1,1-dichloroethylene	99	200-784-6

Hazard Symbols: XN
Risk Phrases: 22 33

**** SECTION 3 - HAZARDS IDENTIFICATION ****

EMERGENCY OVERVIEW
Harmful if swallowed. Danger of cumulative effects.Cancer suspect agent.Possible risks of irreversible effects.

Potential Health Effects
Eye:
May cause eye irritation.
Skin:
May cause skin irritation.
Ingestion:
May cause irritation of the digestive tract. May be harmful if swallowed. Ingestion of large amounts may cause liver and/or kidney damage.
Inhalation:
May cause respiratory tract irritation.
Chronic:
May cause cancer according to animal studies. Adverse reproductive effects have been reported in animals. Laboratory experiments have resulted in mutagenic effects.

**** SECTION 4 - FIRST AID MEASURES ****

Eyes:
Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.
Skin:
Get medical aid. Flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse.
Ingestion:
If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately.
Inhalation:
Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician:
Treat symptomatically and supportively.

**** SECTION 5 - FIRE FIGHTING MEASURES ****

General Information:

As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Water runoff can cause environmental damage. Dike and collect water used to fight fire. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Will burn if involved in a fire.
Extinguishing Media:
For large fires, use water spray, fog or regular foam. For small fires, use dry chemical, carbon dioxide, water spray or regular foam. Cool containers with flooding quantities of water until well after fire is out.

**** SECTION 6 - ACCIDENTAL RELEASE MEASURES ****

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks:
Avoid runoff into storm sewers and ditches which lead to waterways. Clean up spills immediately, observing precautions in the Protective Equipment section. Sweep up, then place into a suitable container for disposal. Avoid generating dusty conditions. Provide ventilation.

**** SECTION 7 - HANDLING and STORAGE ****

Handling:
Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Minimize dust generation and accumulation. Avoid contact with eyes, skin, and clothing. Do not ingest or inhale. Use with adequate ventilation.
Storage:
Keep container closed when not in use. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances.

**** SECTION 8 - EXPOSURE CONTROLS, PERSONAL PROTECTION ****

Engineering Controls:
Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate ventilation to keep airborne concentrations low.
Exposure Limits
CAS# 72-55-9:

Personal Protective Equipment

Eyes:
Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin:
Wear appropriate protective gloves to prevent skin exposure.
Clothing:
Wear appropriate protective clothing to prevent skin exposure.
Respirators:
A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant respirator use.

**** SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES ****

Physical State: Crystals
Color: white
Odor: None reported.
pH: Not available.
Vapor Pressure: 6.5106 mm Hg @ 20 C
Viscosity: Not available.
Boiling Point: 336 deg C
Freezing/Melting Point: 88.00 - 90.00 deg C
Autoignition Temperature: Not available.
Flash Point: Not available.
Explosion Limits, lower: Not available.
Explosion Limits, upper: Not available.
Decomposition Temperature:
Solubility in water: 0.010 ppm
Specific Gravity/Density:
Molecular Formula: $C_{14}H_8Cl_4$
Molecular Weight: 318.02

**** SECTION 10 - STABILITY AND REACTIVITY ****

Chemical Stability:
Stable under normal temperatures and pressures.
Conditions to Avoid:
Incompatible materials, dust generation, strong oxidants.
Incompatibilities with Other Materials:
Strong oxidizing agents - strong bases.
Hazardous Decomposition Products:
Hydrogen chloride, carbon monoxide, carbon dioxide.
Hazardous Polymerization: Has not been reported.

**** SECTION 11 - TOXICOLOGICAL INFORMATION ****

RTECS#:
CAS# 72-55-9: KV9450000
LD50/LC50:
CAS# 72-55-9: Oral, mouse: LD50 = 700 mg/kg; Oral, rat: LD50 = 880 mg/kg.
Carcinogenicity:
2,2-Bis-(4-chlorophenyl)-1,1-dichloroethylene -
California: carcinogen, initial date 1/1/89

Other:
See actual entry in RTECS for complete information.

**** SECTION 12 - ECOLOGICAL INFORMATION ****

Ecotoxicity:
Estimated BCF value = 8,300 based on water solubility. Estimated Koc value = 8,300. There was no movement of DDE reported in soil column mobility experiments.

**** SECTION 13 - DISPOSAL CONSIDERATIONS ****

Dispose of in a manner consistent with federal, state, and local regulations.

**** SECTION 14 - TRANSPORT INFORMATION ****

IATA
Not regulated as a hazardous material.
IMO
Not regulated as a hazardous material.
RID/ADR
Not regulated as a hazardous material.
USA RQ: CAS# 72-55-9: 1 lb final RQ; 0.454 kg final RQ

**** SECTION 15 - REGULATORY INFORMATION ****

European/International Regulations
European Labeling in Accordance with EC Directives
Hazard Symbols: XN
Risk Phrases:
R 22 Harmful if swallowed.
R 33 Danger of cumulative effects.
Safety Phrases:
S 24/25 Avoid contact with skin and eyes.
WGK (Water Danger/Protection)
CAS# 72-55-9: 3
Canada
None of the chemicals in this product are listed on the DSL/NDSL list.
CAS# 72-55-9 is listed on Canada's Ingredient Disclosure List.
US FEDERAL
TSCA
CAS# 72-55-9 is not listed on the TSCA inventory.
It is for research and development use only.

**** SECTION 16 - ADDITIONAL INFORMATION ****

MSDS Creation Date: 9/28/1998 Revision #3 Date: 3/18/2003

Search More 72-55-9 msds GO

ALL MSDS PAGES IN THIS GROUP

NAME	CAS
M-Benzyloxybenzyl Alcohol , 97%	1700-30-7
Octaphenylcyclotetrasiloxane, 98%	546-56-5
Cetylpyridinium chloride	123-03-5
3,4-Difluorophenol, 99%	2713-33-9
1-Benzyl-4-Hydroxypiperidine, 97%	4727-72-4
4-tert-Butylbenzoyl chloride	1710-98-1
Borane-morpholine complex, 97%	4856-95-5
Benzyl Ether, 99%	103-50-4
5-Amino-1-Naphtol (Pract)	83-55-6
Pyridinium-P-Toluenesulfonate 98%	24057-28-1
Pyrogallol Red, 98% (Titr.)	32638-88-3
Amberlite ira 416	9002-26-0
3-Methoxybenzonitrile, 98%	1527-89-5
1-Adamantanemethanol, 99%	770-71-8
Inosine, 99%	58-63-9
Pentafluoropropionic Acid	422-64-0
Pyruvic Acid	127-17-3
Potassium hydrogen fluoride, 99+%	7789-29-9
Aluminum Nitride, 98% Particle Size <10 Micron	24304-00-5
Nickel(II) hydroxide, c.p., 60-61% Ni	12054-48-7
1-Adamantanamine sulfate, 99%	31377-23-8
S-(Thiobenzoyl)-Thioglycolic Acid, 97%	942-91-6
N,N-Dimethyl-P-Nitroaniline	100-23-2
Benzofuroxan	480-96-6
cis-2-Aminomethyl-1-cyclohexanol hydrochloride, 99%	24947-68-0
Silver Phosphate, 98% (Titr.)	7784-09-0

International Chemical Safety Cards

DDT

ICSC: 0034

Dichlorodiphenyltrichloroethane
1,1,1-Trichloro-2,2-bis(p-chlorophenyl)ethane
2,2-bis(p-Chlorophenyl)-1,1,1-trichloroethane
1,1'-(2,2,2-Trichloroethylidene)bis(4-chlorobenzene)
p,p'-DDT
$C_{14}H_9Cl_5$
Molecular mass: 354.5

ICSC # 0034
CAS # 50-29-3
RTECS # KJ3325000
UN # 2761
EC # 602-045-00-7
April 20, 2004 Peer reviewed

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible. Liquid formulations containing organic solvents may be flammable. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames.	Powder, water spray, foam, carbon dioxide.
EXPLOSION			
EXPOSURE		PREVENT DISPERSION OF DUST! STRICT HYGIENE! AVOID EXPOSURE OF (PREGNANT) WOMEN!	
•INHALATION	Cough.	Local exhaust or breathing protection.	Fresh air, rest.
•SKIN		Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES	Redness.	Safety goggles, or eye protection in combination with breathing protection if powder.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Tremors. Diarrhoea. Dizziness. Headache. Vomiting. Numbness. Paresthesias. Hyperexcitability. Convulsions.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Give a slurry of activated charcoal in water to drink. Rest. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Do NOT let this chemical enter the environment. Sweep spilled substance into sealable non-metallic containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place. Personal protection: P3 filter respirator for toxic particles.	Provision to contain effluent from fire extinguishing. Separated from iron, aluminum and its salts, food and feedstuffs See Chemical Dangers.	Do not transport with food and feedstuffs. Severe marine pollutant. T symbol N symbol R: 25-40-48/25-50/53 S: 1/2-22-36/37-45-60-61 UN Hazard Class: 6.1 UN Packing Group: III

SEE IMPORTANT INFORMATION ON BACK

International Chemical Safety Cards

DDT

ICSC: 0034

IMPORTANT DATA

PHYSICAL STATE; APPEARANCE:
COLOURLESS CRYSTALS WHITE POWDER.
TECHNICAL PRODUCT IS WAXY SOLID.

PHYSICAL DANGERS:

CHEMICAL DANGERS:
On combustion, forms toxic and corrosive fumesincludinghydrogen chloride. Reacts with aluminium and iron.

OCCUPATIONAL EXPOSURE LIMITS:
TLV: 1 mg/m³ as TWA A3 (ACGIH 2004).
MAK: 1 mg/m³ H
Peak limitation category: II(8)
(DFG 2003).
OSHA PEL: TWA 1 mg/m^3 skin
NIOSH REL: Ca TWA 0.5 mg/m^3 See Appendix A
NIOSH IDLH: Ca 500 mg/m^3 See: 50293

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by ingestion.

INHALATION RISK:
Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly especially if powdered.

EFFECTS OF SHORT-TERM EXPOSURE:
May cause mechanical irritation. The substance may cause effects on the central nervous system , resulting in convulsions and respiratory depression Exposure at high levels may result in death. Medical observation is indicated.

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
The substance may have effects on the central nervous system and liver. This substance is possibly carcinogenic to humans. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

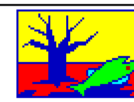
PHYSICAL PROPERTIES

Boiling point: 260°C
Melting point: 109°C
Density: 1.6
g/cm3

Solubility in water: poor
Octanol/water partition coefficient as log Pow: 6.36

ENVIRONMENTAL DATA

The substance is very toxic to aquatic organisms. This substance may be hazardous to the environment; special attention should be given to birds. Bioaccumulation of this chemical may occur along the food chain, for example in milk and aquatic organisms. This substance does enter the environment under normal use. Great care, however, should be given to avoid any additional release, e.g. through inappropriate disposal.



N O T E S

Depending on the degree of exposure, periodic medical examination is indicated. Carrier solvents used in commercial formulations may change physical and toxicological properties. Do NOT take working clothes home. Consult national legislation. Agritan, Azotox, Anofex, Ixodex, Gesapon, Gesarex, Gesarol, Guesapon, Clofenotane, Zeidane, Dicophane, Neocid are trade names.

Transport Emergency Card: TEC (R)-61GT7-III

ADDITIONAL INFORMATION

ICSC: 0034 **DDT**

SIGMA-ALDRICH

sigma-aldrich.com

Material Safety Data Sheet

Version 4.2
Revision Date 07/07/2011
Print Date 12/09/2011

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Aroclor 1262
Product Number	:	442463
Brand	:	Supelco
Supplier	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052
Emergency Phone # (For both supplier and manufacturer)	:	(314) 776-6555
Preparation Information	:	Sigma-Aldrich Corporation Product Safety - Americas Region 1-800-521-8956

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Carcinogen

GHS Classification
Carcinogenicity (Category 1B)
Specific target organ toxicity - repeated exposure (Category 2)
Acute aquatic toxicity (Category 3)
Chronic aquatic toxicity (Category 3)

GHS Label elements, including precautionary statements

Pictogram

Signal word	Danger

Hazard statement(s)

H350	May cause cancer.
H373	May cause damage to organs through prolonged or repeated exposure.
H412	Harmful to aquatic life with long lasting effects.

Precautionary statement(s)

P201	Obtain special instructions before use.
P273	Avoid release to the environment.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.

HMIS Classification

Health hazard:	0
Chronic Health Hazard:	*
Flammability:	0
Physical hazards:	0

NFPA Rating

Health hazard:	0
Fire:	0

Reactivity Hazard:	0

Potential Health Effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Skin	May be harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.
Ingestion	May be harmful if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

CAS-No.	EC-No.	Index-No.	Concentration
PCB - Aroclor 1262			
37324-23-5	-	602-039-00-4	-

4. FIRST AID MEASURES

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIRE-FIGHTING MEASURES

Conditions of flammability
Not flammable or combustible.

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Special protective equipment for fire-fighters
Wear self contained breathing apparatus for fire fighting if necessary.

Hazardous combustion products
Hazardous decomposition products formed under fire conditions. - Nature of decomposition products not known.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Use personal protective equipment. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

Methods and materials for containment and cleaning up
Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.

Conditions for safe storage
Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Contains no substances with occupational exposure limit values.

Personal protective equipment

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Eye protection
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin and body protection
Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Hygiene measures
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	liquid
Colour	no data available

Safety data

pH	no data available
Melting point/freezing point	no data available
Boiling point	no data available
Flash point	no data available
Ignition temperature	no data available
Autoignition temperature	no data available
Lower explosion limit	no data available
Upper explosion limit	no data available
Vapour pressure	no data available
Density	no data available
Water solubility	no data available
Partition coefficient: n-octanol/water	no data available
Relative vapour density	no data available

Odour	no data available
Odour Threshold	no data available
Evaporation rate	no data available

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Possibility of hazardous reactions
no data available

Conditions to avoid
no data available

Materials to avoid
Strong oxidizing agents

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Nature of decomposition products not known.
Other decomposition products - no data available

11. TOXICOLOGICAL INFORMATION

Acute toxicity

Oral LD50
LD50 Oral - rat - 11,300 mg/kg

Inhalation LC50
no data available

Dermal LD50
Other information on acute toxicity
no data available

Skin corrosion/irritation
no data available

Serious eye damage/eye irritation
no data available

Respiratory or skin sensitization
no data available

Germ cell mutagenicity

no data available

Carcinogenicity

Carcinogen

Possible human carcinogen

IARC:	No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
ACGIH:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
NTP:	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

no data available

Teratogenicity

no data available

Specific target organ toxicity - single exposure (Globally Harmonized System)
no data available

Specific target organ toxicity - repeated exposure (Globally Harmonized System)
May cause damage to organs through prolonged or repeated exposure.
no data available

Aspiration hazard
no data available

Potential health effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Ingestion	May be harmful if swallowed.
Skin	May be harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.

Signs and Symptoms of Exposure
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Synergistic effects
no data available

Additional Information
RTECS: TQ1364000

12. ECOLOGICAL INFORMATION

Toxicity

Toxicity to fish LC50 - Oncorhynchus clarki - 50 mg/l - 96 h

Persistence and degradability

Biodegradability Result: - According to the results of tests of biodegradability this product is not readily biodegradable.
Remarks: no data available

Bioaccumulative potential
no data available

Mobility in soil
no data available

PBT and vPvB assessment
no data available

Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Harmful to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 2315 Class: 9 Packing group: II
Proper shipping name: Polychlorinated biphenyls, liquid
Reportable Quantity (RQ):
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG

UN number: 2315 Class: 9 Packing group: II EMS-No: F-A, S-A
Proper shipping name: POLYCHLORINATED BIPHENYLS, LIQUID
Marine pollutant: No

IATA

UN number: 2315 Class: 9 Packing group: II
Proper shipping name: Polychlorinated biphenyls, liquid

15. REGULATORY INFORMATION

OSHA Hazards

Carcinogen

SARA 302 Components

SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components

SARA 313: This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards

Chronic Health Hazard

Massachusetts Right To Know Components

No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
PCB - Aroclor 1262	37324-23-5	1989-08-11

New Jersey Right To Know Components

	CAS-No.	Revision Date
PCB - Aroclor 1262	37324-23-5	1989-08-11

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. PCB - Aroclor 1262	37324-23-5	2008-08-01

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause birth defects or other reproductive harm. PCB - Aroclor 1262	37324-23-5	2008-08-01

16. OTHER INFORMATION

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Co., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

APPENDIX D

HOSPITAL INFORMATION AND MAP

FIELD ACCIDENT REPORT

FIELD ACCIDENT REPORT

This report is to be filled out by the designated Site Safety Officer after EVERY accident.

PROJECT NAME ________________________________ PROJECT. NO.______________

Date of Accident ____________________ Time ________ Report By _________________

Type of Accident (Check One):

( ) Vehicular ( ) Personal ( ) Property

Name of Injured ____ DOB or Age ________

How Long Employed ____

Names of Witnesses ____

____

Description of Accident ____

____

____

Action Taken ____

____

____

Did the Injured Lose Any Time? _______ How Much (Days/Hrs.)? ___________________

Was Safety Equipment in Use at the Time of the Accident (Hard Hat, Safety Glasses, Gloves, Safety Shoes, etc.)? ____

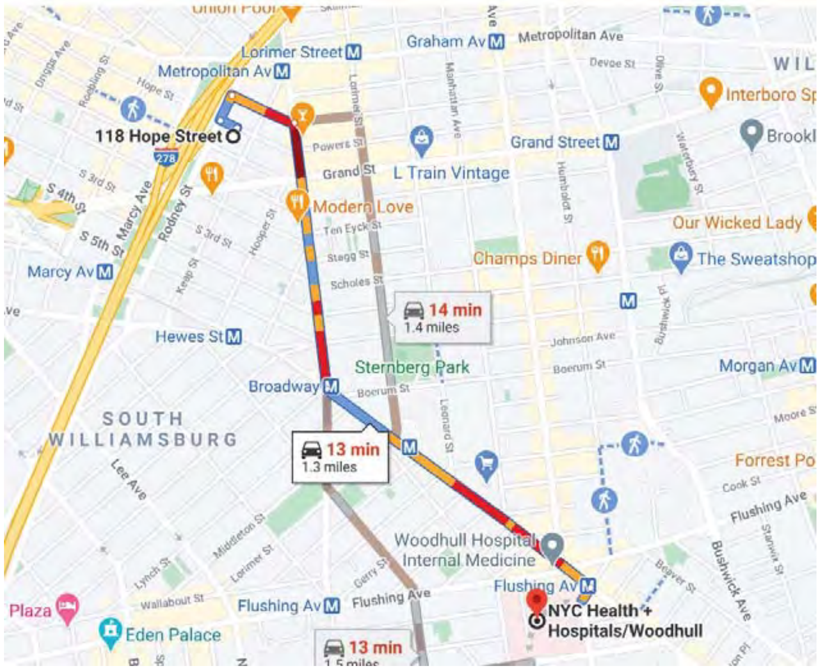
____

(If not, it is the EMPLOYEE'S sole responsibility to process his/her claim through his/her Health and Welfare Fund.)

INDICATE STREET NAMES, DESCRIPTION OF VEHICLES, AND NORTH ARROW

HOSPITAL INFORMATION AND MAP

The hospital nearest the site is:
Woodhull Medical Center- Emergency Room
760 Broadway
Brooklyn, NY 11206
(718) 963-8000



Directions

118 Hope St
Brooklyn, NY 11211

1. Head northwest on Hope St toward Rodney St
   177 ft
2. Turn right onto Rodney St
   259 ft
3. Turn right onto Ainslie St
   0.1 mi
4. Turn right onto Union Ave
   Pass by Subway (on the left in 0.4 mi)
   0.5 mi
5. Turn left onto Broadway
   Pass by McDonald's (on the right in 0.5 mi)
   0.6 mi
6. Turn right onto Marcus Garvey Blvd
   148 ft

NYC Health + Hospitals/Woodhull
760 Broadway, Brooklyn, NY 11206

ATTACHMENT C
Quality Assurance Project Plan

QUALITY ASSURANCE PROJECT PLAN
Hope Street Project

108-134 Hope Street, Brooklyn, NY

Prepared on behalf of:

Hope-Keap Owner LLC
199 Lee Avenue, #554
Brooklyn, NY 11211

AUGUST 2020

Prepared by:

EBC
ENVIRONMENTAL BUSINESS CONSULTANTS
RIDGE, NY 11961

TABLE OF CONTENTS

QUALITY ASSURANCE PROJECT PLAN

Hope Street Project
108-134 Hope Street, Brooklyn, NY

1.0 INTRODUCTION

This Quality Assurance Project Plan (QAPP) has been prepared in accordance with DER-10 to detail procedures to be followed during the course of the sampling and analytical portion of the project, as required by the approved work plan.

To ensure the successful completion of the project each individual responsible for a given component of the project must be aware of the quality assurance objectives of his / her particular work and of the overall project. The Project Director will be responsible for overseeing all technical and administrative aspects of the project and for directing QA/QC activities. Chawinie Reilly will be directly responsible for the overall quality assurance/quality control (QA/QC) for the project. Ms. Chawinie Reilly will serve as the Quality Assurance Officer (QAO) and in this role may conduct:

- conduct periodic field and sampling audits;
- interface with the analytical laboratory to resolve problems; and
- interface with the data validator and/or the preparer of the DUSR to resolve problems.

Charles Sosik will serve as the Project Manager and will be responsible for implementation of the Remedial Action Work Plan and coordination with field sampling crews and subcontractors. Reporting directly to the Project Manager will be the Field Operations Officer, Tom Gallo; who will serve as the on-Site qualified environmental professional who will record observations, and be responsible for the collection and handling of all samples.

1.1 Organization

QC for specific tasks will be the responsibility of the individuals and organizations listed below, under the direction and coordination of the Project Manager.

GENERAL RESPONSIBILITY	SCOPE OF WORK	RESPONSIBILITY OF QUALITY CONTROL
Field Operations	Supervision of Field Crew, sample collection and handling	Thomas Gallo, EBC
Project Manager	Implementation of the RAWP	Charles Sosik, EBC
Quality Assurance Officer	Interface with laboratory, validator and field crew to identify / resolve data quality issues.	C. Reilly, EBC
Laboratory Analysis	Analysis of soil and groundwater samples for VOCs, SVOCs, Pesticides, PCBs, metals, and/or 1,4-dioxane by NYSDEC ASP methods Laboratory	Phoenix Environmental Laboratories, Inc.
Laboratory Analysis	Analysis of soil samples for PFAS by NYSDEC ASP methods Laboratory	Alpha Analytical Inc. PFAS
Data review	Review for completeness and compliance	3rd party validation – Koman Government Solutions, LLC – Sherri Pullar

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Environmental Business Consultants
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Ridge, NY 11961
Phone 631.504.6000
Fax 631.924.2870

2.0 QUALITY ASSURANCE PROJECT PLAN OBJECTIVES

2.1 Overview

Overall project goals are defined through the development of Data Quality Objectives (DQOs), which are qualitative and quantitative Statements that specify the quality of the data required to support decisions; DQOs, as described in this section, are based on the end uses of the data as described in the work plan.

In this plan, Quality Assurance and Quality Control are defined as follows:

- Quality Assurance - The overall integrated program for assuring reliability of monitoring and measurement data.

- Quality Control - The routine application of procedures for obtaining prescribed standards of performance in the monitoring and measurement process.

2.2 QA / QC Requirements for Analytical Laboratory

Samples will be analyzed by a New York State Department of Health (NYSDOH) certified laboratory that is certified in the appropriate categories. Data generated from the laboratory will be used to evaluate contaminants such as PCBs, pesticides, metals, semi-volatile organic compounds (SVOCs), volatile organic compounds (VOCs), and 1,4-dioxane and PFAS in soil, and VOCs and SVOCs in groundwater. The QA requirements for all subcontracted analytical laboratory work performed on this project are described below. QA elements to be evaluated include accuracy, precision, sensitivity, representativeness, and completeness. The data generated by the analytical laboratory for this project are required to be sensitive enough to achieve required quantification limits as specified in NYSDEC Analytical Services Protocol (NYSDEC ASP, 07/2005) and useful for comparison with clean-up objectives. The analytical results meeting the required quantification limits will provide data sensitive enough to meet the data quality objectives of this remedial program as described in the work plan. Reporting of the data must be clear, concise, and comprehensive. The QC elements that are important to this project are completeness of field data, sample custody, sample holding times, sample preservation, sample storage, instrument calibration and blank contamination.

2.2.1 Instrument Calibration

Calibration curves will be developed for each of the compounds to be analyzed. Standard concentrations and a blank will be used to produce the initial curves. The development of calibration curves and initial calibration response factors must be consistent with method requirements presented in the most recent version of NYSDEC ASP 07/2005).

2.2.2 Continuing Instrument Calibration

The initial calibration curve will be verified every 12 hrs by analyzing one calibration standard. The standard concentration will be the midpoint concentration of the initial calibration curve. The calibration check compound must come within 25% relative percent difference (RPD) of the average response factor obtained during initial calibration. If the RPD is greater than 25%, then corrective action must be taken as provided in the specific methodology.

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2.2.3 Method Blanks

Method blank or preparation blank is prepared from an analyte·free matrix which includes the same reagents, internal standards and surrogate standards as me related samples. It is carried through the entire sample preparation and analytical procedure. A method blank analysis will be performed once for each 12 hr period during the analysis of samples for volatiles. An acceptable method blank will contain less than two (2) times the CRQL of methylene chloride, acetone and 2-butanone. For all other target compounds, the method blank must contain less than or equal to the CRQL of any single target compound. For non-target peaks in the method blank, the peak area must be less than 10 percent of the nearest internal standard. The method blank will be used to demonstrate the level of laboratory background and reagent contamination that might result from the analytical process itself.

2.2.4 Rinsate Blanks / Trip Blanks.

Equipment/materials rinsate blanks are samples which are obtained by running PFAS free water through or over decontaminated sampling equipment or materials including pump tubing, scoops, augers etc. (bailer, pump, auger, etc.). These samples are used to determine if decontamination procedures are adequate. Equipment/materials rinsate banks will be collected for 1,4-dioxane and PFAS soil and groundwater water samples at a minimum frequency of 1 per day per matrix.

Trip blanks consist of a single set of sample containers filled at the laboratory with deionized. laboratory-grade water. The water used will be from the same source as that used for the laboratory method blank. The containers will be carried into the field and handled and transported in the same way as the samples collected that day. Analysis of the trip blank for VOCs is used to identify contamination from the air, shipping containers, or from other items coming in contact with the sample bottles. (The bottles holding the trip blanks will be not opened during this procedure). A complete set of trip blanks will be provided with each shipment of samples to the certified laboratory.

2.2.5 Surrogate Spike Analysis

For organic analyses, all samples and blanks will be spiked with surrogate compounds before purging or extraction in order to monitor preparation and analyses of samples. Surrogate spike recoveries shall fall within the advisory limits in accordance with the NY5DEC ASP protocols for samples falling within the quantification limits without dilution.

2.2.6 Matrix Spike / Matrix Spike Duplicate / Matrix Spike Blank (MS/MSDIMSB) Analysis

MS, MSD and MSB analyses will be performed to evaluate the matrix effect of the sample upon the analytical methodology along with the precision of the instrument by measuring recoveries. The MS / MSD / MSB samples will be analyzed for each group of samples of a similar matrix at a rate of one for every 20 field samples. The RPD will be calculated from the difference between the MS and MSD. Matrix spike blank analysis will be performed to indicate the appropriateness of the spiking solution(s) used for the MS/MSD.

2.2.7 Sampling Procedures PFAs

Field Sampling Guidelines for PFAS are included in **Attachment A** and are described below:

The following sample container procedures will be followed:

- All PFA samples will be collected first on site.
- Groundwater samples will be collected from the monitoring wells using dedicated HPDE tubing, which will be replaced with new tubing between each monitoring well.

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- All sample containers made of HDPE or polypropylene.
- Caps are unlined and made of HDPE or polypropylene (no Teflon® -lined caps).

The following field clothing and PPE procedures will be followed:

- No clothing or boots containing Gore-Tex®.
- All safety boots made from polyurethane and PVC.
- No materials containing Tyvek®.
- Do not use fabric softener on clothing to be worn in field.
- Do not used cosmetics, moisturizers, hand cream, or other related products the morning of sampling.
- Do not use unauthorized sunscreen or insect repellant.
- Wet weather gear made of polyurethane and PVC only.
- Sampler must use powderless nitrile gloves.

The following field equipment procedures will be followed:

- Must not contain Teflon® (aka PTFE) or LDPE materials.
- All sampling materials must be made from stainless steel, HDPE, acetate, silicon, or polypropylene.
- No waterproof field books can be used.
- No plastic clipboards, binders, or spiral hard cover notebooks can be used.
- No adhesives (i.e. Post-It® Notes) can be used.
- Sharpies and permanent markers not allowed; regular ball point pens are acceptable.
- Aluminum foil must not be used.
- Keep PFC samples in separate cooler, away from sampling containers that may contain PFAS.
- Coolers filled with regular ice only - Do not use chemical (blue) ice packs or freezer packs.

2.2.8 Sampling Procedures Soil

Site-wide endpoint soil samples EP1 through EP19 will be collected across the Site following excavation for the new building, and four bottom soil samples and six sidewall endpoint soil samples will be collected from the SB-8 petroleum hotspot area.

Soil samples will be collected in accordance with procedures described below:

- Wear a new pair of powderless nitrile gloves when collecting each discrete soil sample.
- Perform soil field screening or logging activities (e.g., PID screening, soil type identification and description) using a representative portion of the soil sample that is not needed for fixed-base laboratory analysis.
- Screening and logging activities may be performed before or after laboratory containers have been filled.
- A grab soil sample for PFAS analysis should be collected using powderless nitrile gloves in two laboratory supplied 250mL plastic containers. PFAS samples are to be immediately placed in a plastic bag in a cooler with water/ice separate from other samples.
- Soil samples for VOC analysis should be collected immediately following PFAS sample collection. Collect the soil samples for VOC analysis utilizing the Terra Core sampling device to add the approximately 5 g and 10 g of soil to the 40 mL VOC Vials.
    - Remove cap from soil vial and place in an area where soil will not come in contact with the cap and find its way into the threads.

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  - With the plunger seated in the handle, push Terra Core into freshly exposed soil until the sample chamber is filled. Use the 5 g Terra Core for the water vials and the 10 g for the methanol vial.
  - Wipe all soil and debris from the outside of the Terra Core sampler. The soil plug should be flush with the mouth of the sampler.
  - Add soil to the vial taking care to not get soil in the threads.
  - Rotate the plunger that was seated in the handle top 90° until it is aligned with the slots in the body. Place the mouth of the sampler into the appropriate 40ml VOA vial. Extrude the sample by pushing the plunger down. Be sure to remove any soil or debris from the top and/or threads of the vial, quickly place the lid back on the 40 ml VOA vial.
  - It is extremely important to add only enough soil to bring the liquid to the bottom of the "Red Reference Line.
- For non-VOC constituents, fill the laboratory containers (8 oz soil jar) with a representative portion of the soil increment.
- Immediately place the labeled and filled laboratory containers in a cooler on ice.
- Complete the chain-of-custody form and applicable boring logs, field forms, log book or log sheets.
- If gross contamination (e.g., non-aqueous phase liquids) is encountered or if the potential for cross-contamination is a concern, the sampling equipment should be decontaminated in accordance with Section 2.2.10 below.

2.2.9 Sampling Procedures Groundwater

Groundwater samples will be collected from three monitoring wells to collect post-dewatering groundwater samples for VOCs. Groundwater samples will be collected through the use of a pump with new HDPE tubing placed down the monitoring wells and any tubing connections using new silicone tubing. All pump tubing is to be replaced with new tubing between each monitoring well.

Groundwater samples will be collected in accordance with standard low-flow sampling procedures as follows:

- Record pump make & model on sampling form.
- Wear appropriate health and safety equipment as outlined in the Health and Safety Plan and PFAS sampling procedure documented above.
- Inspect each well for any damage or evidence of tampering and note condition in field logbook.
- Remove the well cap.
- Lay out plastic sheeting and place the monitoring, purging and sampling equipment on the sheeting.
- To avoid cross-contamination, do not let any downhole equipment touch the ground.
- Measure well headspace with a PID or FID and record the reading in the field logbook.
- A synoptic water level measurement round should be performed (in the shortest possible time) before any purging and sampling activities begin. Measure and record the depth to water using a water level meter or interface probe to the nearest 0.01 ft. Record the measurement in the field logbook. Do not measure the depth to the bottom of the well at this time (to avoid disturbing any sediment that may have accumulated). Obtain depth to bottom information from installation information in the field logbook or soil boring logs.
- Collect samples in order from wells with lowest contaminant concentration to highest concentration.

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- Connect the HDPE tubing to the pump and lower the pump into the well to approximately the middle of the screen. The pump should be a minimum of two feet above the bottom of the well, as this may cause mobilization of any sediment present in the bottom of the well.
- Start the pump at its lowest speed setting and slowly increase the speed until discharge occurs. Check water level. Adjust pump speed until there is little or no water level drawdown (less than 0.3 feet). If the minimal drawdown that can be achieved exceeds 0.3 feet but remains stable, continue purging until indicator field parameters stabilize.
- There should be at least one foot of water over the end of the tubing / pump so there is no risk of entrapment of air in the sample. Pumping rates should be reduced to the minimum capabilities of the pump, if needed, to avoid purging the well dry. However, if the recharge rate of the well is very low and the well is purged dry, then wait until the well has recharged to a sufficient level and collect the appropriate volume of sample.
- During well purging, monitor indicator field parameters (temperature, specific conductance and pH) every three to five minutes (or less frequently, if appropriate). Note: during the early phase of purging emphasis should be put on minimizing and stabilizing pumping stress, and recording those adjustments. Purging is considered complete and sampling may begin when all the above indicator field parameters have stabilized. Stabilization is considered to be achieved when three consecutive readings, taken at three (3) to five minute intervals, are within the following limits:
  - specific conductance (3%),
  - temperature (3%),
  - pH (± 0.1 unit)
  - If stability is not reached within a reasonable time period purging may be stopped and the sample collected. This should be noted on the sampling log.
- If groundwater samples are to be collected for PFAS analysis, collect PFAS samples first directly into laboratory supplied containers. PFAS samples are to be placed in a plastic bag and in a cooler separate from all other samples.
- If groundwater samples are to be collected for 1,4-dioxane analysis, groundwater samples for 1,4-dioxane analysis should be collected immediately following PFAS sample collection. Collect the samples using powder-less nitrile gloves in the laboratory supplied containers.
- VOC samples should be collected directly into pre-preserved sample containers. Fill all sample containers by allowing the pump discharge to flow gently down the inside of the container with minimal turbulence. Fill each container with sample to just overflowing so that no air bubbles are entrapped inside. Cap each bottle as it is filled.
- For non-VOC constituents, fill the laboratory containers to a level just below the top of the container.
- Label the samples, and record them on the chain of custody form. Place immediately into a cooler for shipment and maintain at 4ºC.
- Remove the tubing from the well. The HDPE tubing must be discarded.

2.2.10 Equipment Decontamination Procedures

Decontamination of non-dedicated sampling equipment will consist of the following:

- Gently tap or scrape to remove adhered soil.
- Rinse with PFAS free water.
- Wash with alconox® detergent solution and scrub
  (liquinox not suitable for 1,4-Dioxane sampling).
- Rinse with PFAS free water.
- Rinse with PFAS free water.

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2.3 Accuracy

Accuracy is defined as the nearness of a real or the mean (x) of a set of results to the true value. Accuracy is assessed by means of reference samples and percent recoveries. Accuracy includes both precision and recovery and is expressed as percent recovery (% REC). The MS sample is used to determine the percent recovery. The matrix spike percent recovery (% REC) is calculated by the following equation:

$$\%REC = \frac{SSR - SR}{SA} \times 100$$

Where:
SSR = spike sample results
SR = sample results
SA = spike added from spiking mix

2.4 Precision

Precision is defined as the measurement of agreement of a set of replicate results among themselves without a Precision is defined as the measurement of agreement of a set of replicate results among themselves without assumption of any prior information as to the true result. Precision is assessed by means of duplicate/replicate sample analyses.

Analytical precision is expressed in terms of RPD. The RPD is calculated using the following formula:

$$RPD = \frac{D^1 - D^2}{(D^1 + D^2)/2} \times 100$$

Where:
RPD = relative percent difference
D^1 = first sample value
D^2 = second sample value (duplicate)

2.5 Sensitivity

The sensitivity objectives for this plan require that data generated by the analytical laboratory achieve quantification levels low enough to meet the required detection limits specified by NYSDEC ASP and to meet all site-specific standards, criteria and guidance values (SGCs) established for this project.

2.6 Representativeness

Representativeness is a measure of the relationship of an individual sample taken from a particular site to the remainder of that site and the relationship of a small aliquot of the sample (i.e., the one used in the actual analysis) to the sample remaining on site. The representativeness of samples is assured by adherence to sampling procedures described in the Remedial Investigation Work Plan.

2.7 Completeness

Completeness is a measure of the quantity of data obtained from a measurement system as compared to the amount of data expected from the measurement system. Completeness is defined as the percentage of all results that are not affected by failing QC qualifiers, and should be between 70 and 100% of all analyses performed. The objective of completeness in laboratory reporting is to provide a thorough

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data support package. The laboratory data package provides documentation of sample analysis and results in the form of summaries, QC data, and raw analytical data. The laboratory will be required to submit data packages that follow NYSDEC ASP Category B reporting format which, at a minimum, will include the following components:

1. All sample chain-of-custody forms.
2. The case narrative(s) presenting a discussion of any problems and/or procedural changes required during analyses. Also presented in the case narrative are sample summary forms.
3. Documentation demonstrating the laboratory's ability to attain the contract specified detection limits for all target analytes in all required matrices.
4. Tabulated target compound results and tentatively identified compounds.
5. Surrogate spike analysis results (organics).
6. Matrix spike/matrix spike duplicate/matrix spike blank results.
7. QC check sample and standard recovery results
8. Blank results (field, trip, and method).
9. Internal standard area and RT summary.

2.8 Laboratory Custody Procedures

The following elements are important for maintaining the field custody of samples:

- Sample identification
- Sample labels
- Custody records
- Shipping records
- Packaging procedures

Sample labels will be attached to all sampling bottles before field activities begin; each label will contain an identifying number. Each number will have a suffix that identifies the site and where the sample was taken. Approximate sampling locations will be marked on a map with a description of the sample location. The number, type of sample, and sample identification will be entered into the field logbook. A chain-of-custody form, initiated at the analytical laboratory will accompany the sample bottles from the laboratory into the field. Upon receipt of the bottles and cooler, the sampler will sign and date the first received blank space. After each sample is collected and appropriately identified, entries will be made on the chain-of-custody form that will include:

- Site name and address
- Samplers' names and signatures

2.9 Sample Handling and Decontamination Procedures

Collected samples will be appropriately packaged, placed in coolers and shipped via overnight courier or delivered directly to the analytical laboratory by field personnel. Samples will be containerized in appropriate laboratory provided glassware and shipped in plastic coolers. Samples will be preserved through the use of water ice to maintain a temperature of 4ºC.

Dedicated disposable sampling materials will be used for soil samples. Field rinsate blanks will be prepared at the rate of 1 for every eight samples collected with a minimum of 1 sample per day per matrix. No field filtering will be conducted; any required filtration will be completed by the laboratory. Decontamination of non-dedicated sampling equipment will consist of the following:

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- Gently tap or scrape to remove adhered soil;
- Rinse with tap water;
- Wash with alconox® detergent solution and scrub ;
- Rinse with tap water;
- Rinse with distilled or deionized water.

Prepare field blanks by pouring distilled or deionized water over decontaminated equipment and collecting the water in laboratory provided containers. Trip blanks will accompany samples each time they are transported to the laboratory. Matrix spike and matrix spike duplicates (MS/MSD) will be collected at the rate of one per 20 samples submitted to the laboratory and duplicate samples will be collected at a rate of one per ten samples submitted to the laboratory.

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3.0 ANALYTICAL PROCEDURES

3.1 Laboratory Analysis

Samples will be analyzed by the NYSDOH ELAP laboratory for one or more of the following parameters: TCL VOCs by USEPA Method 8260C; 1,4-dioxane by USEPA Method 8270 SIM mode; LC-MS/MS for Per- and Polyfluoroalkyl Substances (PFAS) compounds by USEPA Method 537 (modified); TCL SVOCs by USEPA Method 8270D; Target Analyte List (TAL) and TCL Metals 6010; pesticides / PCBs by USEPA Method 8081B/8082A; herbicides by USEPA Method 8151A (Table 2).

PFAS Analyte List

Group	Chemical Name	Abbreviation	CAS Number
Perfluoroalkyl sulfonates	Perfluorobutanesulfonic acid	PFBS	375-73-5
	Perfluorohexanesulfonic acid	PFHxS	355-46-4
	Perfluoroheptanesulfonic acid	PFHpS	375-92-8
	Perfluorooctanessulfonic acid	PFOS	1763-23-1
	Perfluorodecanesulfonic acid	PFDS	335-77-3
Perfluoroalkyl carboxylates	Perfluorobutanoic acid	PFBA	375-22-4
	Perfluoropentanoic acid	PFPeA	2706-90-3
	Perfluorohexanoic acid	PFHxA	307-24-4
	Perfluoroheptanoic acid	PFHpA	375-85-9
	Perfluorooctanoic acid	PFOA	335-67-1
	Perfluorononanoic acid	PFNA	375-95-1
	Perfluorodecanoic acid	PFDA	335-76-2
	Perfluoroundecanoic acid	PFUA/PFUdA	2058-94-8
	Perfluorododecanoic acid	PFDoA	307-55-1
	Perfluorotridecanoic acid	PFTriA/PFTrDA	72629-94-8
	Perfluorotetradecanoic acid	PFTA/PFTeDA	376-06-7
Fluorinated Telomer Sulfonates	6:2 Fluorotelomer sulfonate	6:2 FTS	27619-97-2
	8:2 Fluorotelomer sulfonate	8:2 FTS	39108-34-4
Perfluorooctane-sulfonamides	Perfluroroctanesulfonamide	FOSA	754-91-6
Perfluorooctane-sulfonamidoacetic acids	N-methyl perfluorooctanesulfonamidoacetic acid	N-MeFOSAA	2355-31-9
	N-ethyl perfluorooctanesulfonamidoacetic acid	N-EtFOSAA	2991-50-6

If any modifications or additions to the standard procedures are anticipated and if any nonstandard sample preparation or analytical protocol is to be used, the modifications and the nonstandard protocol will be explicitly defined and documented. Prior approval by EBC's PM will be necessary for any nonstandard analytical or sample preparation protocol used by the laboratory, i.e., dilution of samples or extracts by greater than a factor of five (5).

Laboratory SOPs for PFAS analysis are included in Attachment 4.

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4.0 DATA REDUCTION, REVIEW, AND REPORTING

4.1 Overview

The process of data reduction, review, and reporting ensures the assessments or a conclusion based on the final data accurately reflects actual site conditions. This plan presents the specific procedures, methods, and format that will be employed for data reduction, review and reporting of each measurement parameter determined in the laboratory and field. Also described in this section is the process by which all data, reports, and work plans are proofed and checked for technical and numerical errors prior to final submission.

4.2 Data Reduction

Standard methods and references will be used as guidelines for data handling, reduction, validation, and reporting. All data for the project will be compiled and summarized with an independent verification at each step in the process to prevent transcription/typographical errors. Any computerized entry of data will also undergo verification review.

Sample analysis will be provided by a New York State certified environmental laboratory. The ELAP approved laboratory is required to hold ELAP certification for PFOA and PFOS in drinking water by EPA Method 537 or ISO 25101 for PFAS analysis. Laboratory reports will include ASP category B deliverables for use in the preparation of a data usability summary report (DUSR). All results will be provided in accordance with the NYSDEC Environmental Information Management System (EIMS) electronic data deliverable (EDD) format. Analytical results shall be presented on standard NYSDEC ASP-B forms or equivalents, and include the dates the samples were received and analyzed, and the actual methodology used. Note that if waste characterization samples are analyzed they will be in results only format and will not be evaluated in the DUSR.

Laboratory QA/QC information required by the method protocols will be compiled, including the application of data QA/QC qualifiers as appropriate. In addition, laboratory worksheets, laboratory notebooks, chains-of-custody, instrument logs, standards records, calibration records, and maintenance records, as applicable, will be provided in the laboratory data packages to determine the validity of data. Specifics on internal laboratory data reduction protocols are identified in the laboratory's SOPs.

Following receipt of the laboratory analytical results by EBC, the data results will be compiled and presented in an appropriate tabular form. Where appropriate, the impacts of QA/QC qualifiers resulting from laboratory or external validation reviews will be assessed in terms of data usability. A resume for the proposed data validator is included in Attachment 5.

4.3 Laboratory Data Reporting

All sample data packages submitted by the analytical laboratory will be required to be reported in conformance to the NYSDEC ASP (7/2005), Category B data deliverable requirements as applicable to the method utilized. All results will be provided in accordance with the NYSDEC Environmental Information Management System (EIMS) electronic data deliverable (EDD) format. Note that waste characterization samples, if analyzed, will be in results only format and will not be evaluated in the DUSR.

Phoenix Environmental Laboratories, Inc. has confirmed that reporting limit for 1,4-Dioxane in groundwater is at least 0.25 µg/L, and 0.5 µg/Kg for soil. The reporting limit for PFAS is 2 ng/L for aqueous samples and 0.5 µg/Kg for soil samples. Laboratory MDLs for PFAS in soil are included in Attachment 3.

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5.0 CORRECTIVE ACTION

Review and implementation of systems and procedures may result in recommendations for corrective action. Any deviations from the specified procedures within approved project plans due to unexpected site-specific conditions shall warrant corrective action. All errors, deficiencies, or other problems shall be brought to the immediate attention of the EBC PM, who in turn shall contact the Quality Assurance/Data Quality Manager or his designee (if applicable).

Procedures have been established to ensure that conditions adverse to data quality are promptly investigated, evaluated and corrected. These procedures for review and implementation of a change are as follows:

- Define the problem.
- Investigate the cause of the problem.
- Develop a corrective action to eliminate the problem, in consultation with the personnel who defined the problem and who will implement the change.
- Complete the required form describing the change and its rationale (see below for form requirements).
- Obtain all required written approvals.
- Implement the corrective action.
- Verify that the change has eliminated the problem.

During the field investigation, all changes to the sampling program will be documented in field logs/sheets and the EBC PM advised.

If any problems occur with the laboratory or analyses, the laboratory must immediately notify the PM, who will consult with other project staff. All approved corrective actions shall be controlled and documented.

All corrective action documentation shall include an explanation of the problem and a proposed solution which will be maintained in the project file or associated logs. Each report must be approved by the necessary personnel (e.g., the PM) before implementation of the change occurs. The PM shall be responsible for controlling, tracking, implementing and distributing identified changes.

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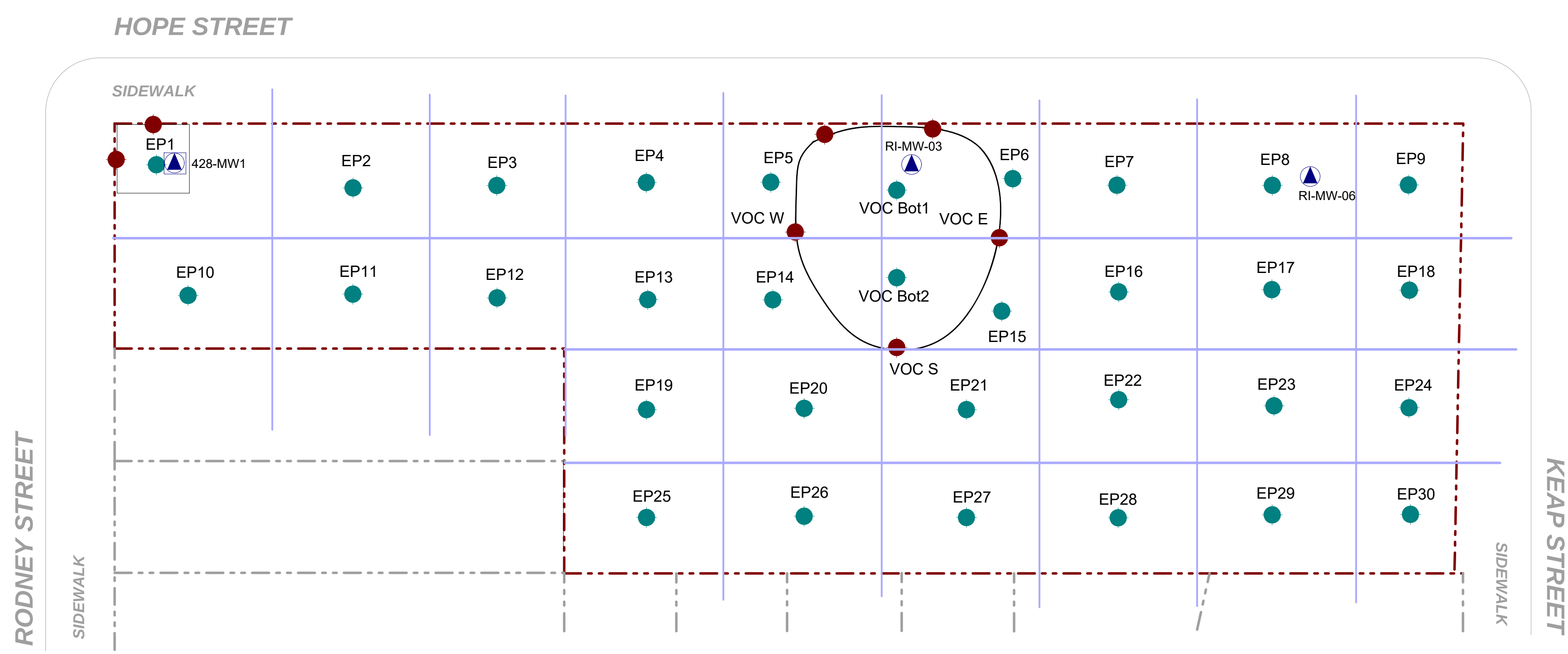
TABLE 2
SAMPLE COLLECTION AND ANALYSIS PROTOCOLS

Sample Type	Matrix	Sampling Device	Parameter	Sample Container	Sample Preservation	Analytical Method#	CRQL / MDLH	Holding Time
Grab	Soil	Scoop Direct into Jar	VOCs	(1) 2 oz Jar	Cool to 4° C	EPA Method 8260C (test method 5035A)	Compound specific (1-5 ug/kg)	14 days
Grab	Soil	Scoop Direct into Jar	SVOCs	(1) 8 oz jar	Cool to 4° C	EPA Method 8270D	Compound specific (1-5 ug/kg)	14 day ext/40 days
Grab	Soil	Scoop Direct into Jar	Pest/PCBs	from 8oz jar above	Cool to 4° C	EPA Method 8081B/8082A	Compound specific (1-5 ug/kg)	14 day ext/40 days
Grab	Soil	Scoop Direct into Jar	Metals	from 8oz jar above	Cool to 4° C	TAL Metals 6010	Compound specific (01-1 mg/kg)	6 months
Grab	Soil	Scoop Direct into Jar	1,4 – dioxane	(1) 8 oz jar	Cool to 4° C Water ice only	Method 8270 SIM	[0.1 mg/kg (ppm)]	14 days 40 days after extraction
Grab	Soil	Scoop Direct into Jar	PFAS Target Analyte List	(1) 8 oz jar	Cool to 4° C Water ice only	EPA Method 537 Modified	Compound specific [but less than 1 ug/kg (ppb)]	14 days 40 days after extraction
Grab	Water	Pump tubing	VOCs	(3) 40 ml vials	Cool to 4o C 1:1 HCL	EPA Method 8260C	Compound specific (1-5 ug/L)	14 days

Notes:
All holding times listed are from Verified Time of Sample Receipt (VTSR) unless noted otherwise. * Holding time listed is from time of sample collection.
The number in parentheses in the "Sample Container" column denotes the number of containers needed.
Triple volume required when collected MS/MSD samples
The number of trip blanks are estimated.
CRQL / MDL = Contract Required Quantitation Limit / Method Detection Limit
NA = Not available or not applicable.

TABLE 1
SUMMARY OF
SAMPLING PROGRAM RATIONALE AND ANALYSIS

Matrix	Location	Approximate Number of Samples	Frequency	Rationale for Sampling	Laboratory Analysis	Duplicates	Matrix Spikes	Spike Duplicates	Equipment Blanks	Trip Blanks
Soil	Lot 7 north-central Petroleum Hotspot	7	2 from the base of the excavation, and 5 sidewall samples	Endpoint Verification following removal of the petroleum contaminated soil	TCL VOCs EPA Method 8260C, TCL SVOCs EPA Method 8270, pesticide/PCBs EPA Method 8081/8082, herbicides EPA Method 8151A, TAL/TCL metals EPA 6010.	1 per day	1 per 20 samples	1 per 20 samples	1 per day	1 per trip
Soil	Lot 4 Petroleum Hotspot	3	1 from the base of the excavation, and 2 sidewall samples	Endpoint Verification following removal of the petroleum contaminated soil	TCL VOCs EPA Method 8260C, TCL SVOCs EPA Method 8270, pesticide/PCBs EPA Method 8081/8082, herbicides EPA Method 8151A, TAL/TCL metals EPA 6010.	1 per day	1 per 20 samples	1 per 20 samples	1 per day	1 per trip
Soil	Site Wide Excavation - Base of Excavation	3	10% of Sidewide excavation base samples.	Endpoint Verification following site-wide excavation to determine if SCOs were achieved	21 PFAS Compounds by EPA Method 537 Modified and 1,4-dioxane EPA 8270 SIM	1 per day	1 per 20 samples	1 per 20 samples	1 per day	1 per trip
Soil	Site Wide Excavation	30	1 per 900 square feet of excavation base	Endpoint Verification following site-wide excavation to determine if SCOs were achieved	TCL VOCs EPA Method 8260C, TCL SVOCs EPA Method 8270, pesticide/PCBs EPA Method 8081/8082, herbicides EPA Method 8151A, TAL/TCL metals EPA 6010.	1 per day	1 per 20 samples	1 per 20 samples	1 per day	1 per trip
Groundwater	From 3 monitoring wells following dewatering system operation	3	1 sample per monitoring well	To assess post-dewatering groundwater quality	TCL VOCs EPA Method 8260C	1 per day	1 per 20 samples	1 per 20 samples	If PFAS / 1,4-dioxane, 1 per day	1 per trip



KEY:

- Property Boundary
- Base Endpoint Soil Samples
- Sidewall Endpoint Soil Samples From Petroleum Hotspot
- Collect Post-Dewatering Groundwater Sample (VOCs)

SCALE:

0 20 40

Scale 1 Inch = 40 feet

2/22/2021

AMC Engineeting, PLLC
18-36 42nd Street
Astoria, NY 11105

Figure No.
11

Site Name: HOPE STREET PROJECT
Site Address: 108-134 HOPE STREET, BROOKLYN, NY
Drawing Title: VERIFICATION SAMPLING PLAN

QAPP
ATTACHMENT 1

EPA 537 (PFAS) Field Sampling Guidelines

PLEASE READ INSTRUCTIONS ENTIRELY PRIOR TO SAMPLING EVENT

Sampling for PFAS via EPA 537 can be challenging due to the prevalence of these compounds in consumer products. The following guidelines are strongly recommended when conducting sampling.

Reference-NHDES https://www.des.nh.gov/organization/divisions/waste/hwrb/documents/pfc-stakeholder-notification-20161122.pdf

FIELD CLOTHING and PPE

- No clothing or boots containing Gore-Tex®
- All safety boots made from polyurethane and PVC
- No materials containing Tyvek®
- Do not use fabric softener on clothing to be worn in field
- Do not used cosmetics, moisturizers, hand cream, or other related products the morning of sampling
- Do not use unauthorized sunscreen or insect repellant (see reference above for acceptable products)

FOOD CONSIDERATIONS

No food or drink on-site with exception of bottled water and/or hydration drinks (i.e., Gatorade and Powerade) that is available for consumption only in the staging area

OTHER RECOMMENDATIONS

Sample for PFAS first! Other containers for other methods may have PFAS present on their sampling containers

SAMPLE CONTAINERS

- All sample containers made of HDPE or polypropylene
- Caps are unlined and made of HDPE or polypropylene (no Teflon® -lined caps)

WET WEATHER (AS APPLICABLE)

Wet weather gear made of polyurethane and PVC only

EQUIPMENT DECONTAMINATION

- "PFAS-free" water on-site for decontamination of sample equipment. No other water sources to be used
- Only Alconox and Liquinox can be used as decontamination materials

FIELD EQUIPMENT

- Must not contain Teflon® (aka PTFE) or LDPE materials
- All sampling materials must be made from stainless steel, HDPE, acetate, silicon, or polypropylene
- No waterproof field books can be used
- No plastic clipboards, binders, or spiral hard cover notebooks can be used
- No adhesives (i.e. Post-It® Notes) can be used
- Sharpies and permanent markers not allowed; regular ball point pens are acceptable
- Aluminum foil must not be used
- Keep PFC samples in separate cooler, away from sampling containers that may contain PFAS
- Coolers filled with regular ice only - Do not use chemical (blue) ice packs

EPA 537 (PFAS) Field Sampling Guidelines

PLEASE READ INSTRUCTIONS ENTIRELY PRIOR TO SAMPLING EVENT

Sampler must wash hands before wearing nitrile gloves in order to limit contamination during sampling. Each sample set requires a set of containers to comply with the method as indicated below. **Sample set is composed of samples collected from the same sample site and at the same time.*

Container Count	Container Type	Preservative
3 Sampling Containers - Empty	250 mL container	Pre preserved with 1.25 g Trizma
1 Reagent Water for Field Blank use	250 mL container	Pre preserved with 1.25 g Trizma
P1 Field Blank (FRB) - Empty	250 mL container	Unpreserved

Sampling container must be filled to the neck. For instructional purposes a black line has been drawn to illustrate the required fill level for each of the 3 Sample containers

Field blanks are recommended and the containers have been provided, please follow the instructions below.

Field Blank Instructions:

1. Locate the Reagent Water container from the bottle order. The Reagent Water container will be pre-filled with PFAS-free water and is preserved with Trizma.
2. Locate the empty container labeled "Field Blank".
3. Open both containers and proceed to transfer contents of the "Reagent Water" container into the "Field Blank" container.
4. If field blanks are to be analyzed, they need to be noted on COC, and will be billed accordingly as a sample.

Both the empty Reagent Water container and the filled Field Blank container must be returned to the lab along with the samples taken.

Sampling Instructions:

1. Each sampling event requires 3 containers to be filled to the neck of the provided containers for each sampling location.
2. Before sampling, remove faucet aerator, run water for 5 min, slow water to flow of pencil to avoid splashing and fill sample containers to neck of container (as previously illustrated) and invert 5 times.
3. Do not overfill or rinse the container.
4. Close containers securely. Place containers in sealed ZipLoc® bags, and in a separate cooler (no other container types).
5. Ensure Chain-of-Custody and all labels on containers contain required information. Place sample, Field Blank and empty Reagent Blank containers in ice filled cooler (do not use blue ice) and return to the laboratory. Samples should be kept at 4°C ±2. Samples must not exceed 10°C during first 48 hours after collection. Hold time is 14 days.

Please contact your Alpha Analytical project manager with additional questions or concerns.

QAPP
ATTACHMENT 2

PFAS Sampling Instructions for non-Drinking Water (non-SDWA) for EPA Method 537 and/or LC/MS/MS Incorporating the Isotope Dilution Technique

Please read instructions entirely prior to sampling event.

It should be noted that there is considerable information available from the US EPA as well as a multitude of state regulatory agencies regarding the potential for PFAS cross-contamination during sampling. It is recommended that samplers consult the applicable regulatory guidance prior to sampling. For additional information, please refer to "METHOD 537. Version 1.1, September 2009, EPA Document #: EPA/600/R-08/092".

The sample handler should wash their hands before sampling and wear nitrile gloves while filling and sealing the sample bottles. PFAS contamination during sampling can occur from a number of common sources, such as food packaging and certain foods and beverages. Proper hand washing and wearing nitrile gloves will aid in minimizing this type of accidental contamination of the samples.

Container Count	Container Type	Preservative
2 Sampling Containers - Empty	275 mL container	Unpreserved
Reagent Water for Field Blank use	275 mL container	Unpreserved
1 Field Blank (FRB) Container - Empty	275 mL container	Unpreserved

**** Sampling container <u>must be filled to the neck</u>. For instructional purposes a black line has been drawn to illustrate the required fill level for each of the 2 Sample containers****

Sample containers for field blanks are included with your container order. If you wish to submit field blanks (billable samples) in addition to your field samples, please prepare them as instructed below:

Field Blank Instructions:

1. Locate the Reagent Water container from the bottle order. The Reagent Water container is prefilled with PFAS-free water and preserved with Trizma.
2. Locate the empty container labeled "Field Blank".
3. Open both containers and proceed to transfer contents of the "Reagent Water" container into the "Field Blank" container.

Both the <u>empty</u> Reagent Water container and the <u>filled</u> Field Blank container must be returned to the laboratory along with the samples taken.

Sampling Instructions:

1. Each sampling event requires 2 containers to be filled to the neck of the provided containers for each sampling location.
2. Fill sample containers to neck of container (as previously illustrated) and invert 5 times.
3. Do not overfill or rinse the container.
4. Close containers securely.
5. Ensure Chain-of-Custody and all labels on containers contain required information.
   Place sample, Field Blank and empty Reagent Blank containers in ice filled cooler and return to the laboratory. Samples should be kept at 4°C ±2. Samples must not exceed 10°C during first 48 hours after collection. Hold time is 14 days.

Please contact your project manager with additional questions or concerns.

QAPP
ATTACHMENT 3

Date Created: 05/14/19
Created By: Tom Tanico
File: PM6635-1
Page: 1

NY PFAAs via EPA 537(M)-Isotope Dilution (WATER)

Holding Time: 14 days
Container/Sample Preservation: 1 - 2 Plastic/1 Plastic/1 H20 Plastic

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Perfluorobutanoic Acid (PFBA)	375-22-4	2	0.3732	ng/l	67-148	30	67-148	30	30			
Perfluoropentanoic Acid (PFPeA)	2706-90-3	2	0.464	ng/l	63-161	30	63-161	30	30			
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	2	0.38	ng/l	65-157	30	65-157	30	30			
Perfluorohexanoic Acid (PFHxA)	307-24-4	2	0.492	ng/l	69-168	30	69-168	30	30			
Perfluoroheptanoic Acid (PFHpA)	375-85-9	2	0.372	ng/l	58-159	30	58-159	30	30			
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	2	0.436	ng/l	69-177	30	69-177	30	30			
Perfluorooctanoic Acid (PFOA)	335-67-1	2	0.46	ng/l	63-159	30	63-159	30	30			
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	27619-97-2	2	0.194	ng/l	49-187	30	49-187	30	30			
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	2	0.52	ng/l	61-179	30	61-179	30	30			
Perfluorononanoic Acid (PFNA)	375-95-1	2	0.436	ng/l	68-171	30	68-171	30	30			
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	2	0.56	ng/l	52-151	30	52-151	30	30			
Perfluorodecanoic Acid (PFDA)	335-76-2	2	0.62	ng/l	63-171	30	63-171	30	30			
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	39108-34-4	2	0.2908	ng/l	56-173	30	56-173	30	30			
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSA	2355-31-9	2	0.2504	ng/l	60-166	30	60-166	30	30			
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	2	0.424	ng/l	60-153	30	60-153	30	30			
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	2	0.386	ng/l	38-156	30	38-156	30	30			
Perfluorooctanesulfonamide (FOSA)	754-91-6	2	0.556	ng/l	46-170	30	46-170	30	30			
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	2	0.3728	ng/l	45-170	30	45-170	30	30			
Perfluorododecanoic Acid (PFDoA)	307-55-1	2	0.592	ng/l	67-153	30	67-153	30	30			
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	2	0.314	ng/l	48-158	30	48-158	30	30			
Perfluorotetradecanoic Acid (PFTA)	376-06-7	2	0.988	ng/l	59-182	30	59-182	30	30			
PFOA/PFOS, Total		2	0.46	ng/l				30	30			
Perfluoro[13C4]Butanoic Acid (MPFBA)	*NONE*									*2-156*		
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	*NONE*									*16-173*		
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	*NONE*									*31-159*		
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	*NONE*									*21-145*		
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	*NONE*									*30-139*		
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	*NONE*									*47-153*		
Perfluoro[13C8]Octanoic Acid (M8PFOA)	*NONE*									*36-149*		
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-	*NONE*									*1-244*		
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	*NONE*									*34-146*		
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	*NONE*									*42-146*		
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	*NONE*									*38-144*		
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-	*NONE*									*7-170*		
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid	*NONE*									*1-181*		
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	*NONE*									*40-144*		
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	*NONE*									*1-87*		
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (	*NONE*									*23-146*		
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	*NONE*									*24-161*		
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	*NONE*									*33-143*		

Please Note that the RL information provided in this table is calculated using a 100% Solids factor (Soil/Solids only)
Please Note that the information provided in this table is subject to change at anytime at the discretion of Alpha Analytical, In

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NY PFAAs via EPA 537(M)-Isotope Dilution (SOIL)

Holding Time: 28 days
Container/Sample Preservation: 1 - Plastic 8oz unpreserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Perfluorobutanoic Acid (PFBA)	375-22-4	1	0.0213	ng/g	71-135	30	71-135	30	30			
Perfluoropentanoic Acid (PFPeA)	2706-90-3	1	0.01035	ng/g	69-132	30	69-132	30	30			
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	1	0.0635	ng/g	72-128	30	72-128	30	30			
Perfluorohexanoic Acid (PFHxA)	307-24-4	1	0.064	ng/g	70-132	30	70-132	30	30			
Perfluoroheptanoic Acid (PFHpA)	375-85-9	1	0.064	ng/g	71-131	30	71-131	30	30			
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	1	0.057	ng/g	67-130	30	67-130	30	30			
Perfluorooctanoic Acid (PFOA)	335-67-1	1	0.04105	ng/g	69-133	30	69-133	30	30			
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	27619-97-2	1	0.198	ng/g	64-140	30	64-140	30	30			
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	1	0.136	ng/g	70-132	30	70-132	30	30			
Perfluorononanoic Acid (PFNA)	375-95-1	1	0.083	ng/g	72-129	30	72-129	30	30			
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	1	0.1205	ng/g	68-136	30	68-136	30	30			
Perfluorodecanoic Acid (PFDA)	335-76-2	1	0.072	ng/g	69-133	30	69-133	30	30			
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	39108-34-4	1	0.275	ng/g	65-137	30	65-137	30	30			
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSA	2355-31-9	1	0.103	ng/g	63-144	30	63-144	30	30			
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	1	0.056	ng/g	64-136	30	64-136	30	30			
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	1	0.097	ng/g	59-134	30	59-134	30	30			
Perfluorooctanesulfonamide (FOSA)	754-91-6	1	0.1025	ng/g	67-137	30	67-137	30	30			
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	1	0.09	ng/g	61-139	30	61-139	30	30			
Perfluorododecanoic Acid (PFDoA)	307-55-1	1	0.086	ng/g	69-135	30	69-135	30	30			
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	1	0.062	ng/g	66-139	30	66-139	30	30			
Perfluorotetradecanoic Acid (PFTA)	376-06-7	1	0.07	ng/g	69-133	30	69-133	30	30			
PFOA/PFOS, Total		1	0.04105	ng/g				30	30			
Perfluoro[13C4]Butanoic Acid (MPFBA)	*NONE*									*60-153*		
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	*NONE*									*65-182*		
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	*NONE*									*70-151*		
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	*NONE*									*61-147*		
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	*NONE*									*62-149*		
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	*NONE*									*63-166*		
Perfluoro[13C8]Octanoic Acid (M8PFOA)	*NONE*									*62-152*		
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-	*NONE*									*32-182*		
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	*NONE*									*61-154*		
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	*NONE*									*65-151*		
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	*NONE*									*65-150*		
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-	*NONE*									*25-186*		
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid	*NONE*									*45-137*		
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	*NONE*									*64-158*		
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	*NONE*									*1-125*		
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (	*NONE*									*42-136*		
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	*NONE*									*56-148*		
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	*NONE*									*26-160*		

Please Note that the RL information provided in this table is calculated using a 100% Solids factor (Soil/Solids only)
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QAPP ATTACHMENT 4

Determination of Selected Perfluorinated Alkyl Substances by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry Isotope Dilution (LC/MS/MS)

Reference: EPA Method 537, Version 1.1, September 2009, EPA Document #: EPA/600/R-08/09

EPA Method 537.1, Version 1, November 2018, EPA Document #: EPA/600/R-18/352

Department of Defense, Quality Systems Manual for Environmental Laboratories, Version 5.2, .2019

1. Scope and Application

Matrices: Drinking water, Non-potable Water, and Soil Matrices

Definitions: Refer to Alpha Analytical Quality Manual.

1.1 This is a liquid chromatography/tandem mass spectrometry (LC/MS/MS) method for the determination of selected perfluorinated alkyl substances (PFAS) in Non-Drinking Water and soil Matrices. Accuracy and precision data have been generated in reagent water, and finished ground and surface waters for the compounds listed in Table 1.

1.2 The data report packages present the documentation of any method modification related to the samples tested. Depending upon the nature of the modification and the extent of intended use, the laboratory may be required to demonstrate that the modifications will produce equivalent results for the matrix. Approval of all method modifications is by one or more of the following laboratory personnel before performing the modification: Area Supervisor, Department Supervisor, Laboratory Director, or Quality Assurance Officer.

1.3 This method is restricted to use by or under the supervision of analysts experienced in the operation of the LC/MS/MS and in the interpretation of LC/MS/MS data. Each analyst must demonstrate the ability to generate acceptable results with this method by performing an initial demonstration of capability.

2. Summary of Method

2.1 A 250-mL water sample is fortified with extracted internal standards (EIS) and passed through a solid phase extraction (WAX) cartridge containing a mixed mode, Weak Anion Exchange, reversed phase, water-wettable polymer to extract the method analytes and isotopically-labeled compounds. The compounds are eluted from the solid phase in two fractions with methanol followed by a small amount of 2% ammonium hydroxide in methanol solution. The extract is concentrated with nitrogen in a heated water bath, and then adjusted to a 1-mL volume with 80:20% (vol/vol) methanol:water. A 3 µl injection is made into an LC equipped with a C18 column that is interfaced to an MS/MS. The analytes are separated and identified by comparing the acquired mass spectra and retention times to reference spectra and retention times for calibration standards acquired under identical LC/MS/MS conditions. The concentration of each analyte is determined by using the isotope dilution technique. Extracted Internal Standards (EIS) analytes are used to monitor the extraction efficiency of the method analytes.

2.2 Method Modifications from Reference

None.

Table 1

Parameter	Acronym	CAS
PERFLUOROALKYL ETHER CARBOXYLIC ACIDS (PFECAs)		
Tetrafluoro-2-(heptafluoropropoxy)propanoic acid	HFPO-DA	62037-80-3
4,8-dioxa-3H-perfluorononanoic acid	ADONA	919005-14-4
PERFLUOROALKYLCARBOXILIC ACIDS (PFCAs)		
Perfluorobutanoic acid	PFBA	375-22-4
Perfluoropentanoic acid	PFPeA	2706-90-3
Perfluorohexanoic acid	PFHxA *	307-24-4
Perfluoroheptanoic acid	PFHpA *	375-85-9
Perfluorooctanoic acid	PFOA *	335-67-1
Perfluorononanoic acid	PFNA *	375-95-1
Perfluorodecanoic acid	PFDA *	335-76-2
Perfluoroundecanoic acid	PFUnA *	2058-94-8
Perfluorododecanoic acid	PFDoA *	307-55-1
Perfluorotridecanoic acid	PFTrDA *	72629-94-8
Perfluorotetradecanoic acid	PFTA *	376-06-7
Perfluorohexadecanoic acid	PFHxDA	67905-19-5
Perfluorooctadecanoic acid	PFODA	16517-11-6
PERFLUOROALKYLSULFONATES (PFASs)		
Perfluorobutanesulfonic acid	PFBS *	375-73-5
Perfluoropentanesulfonic acid	PFPeS	2706-91-4
Perfluorohexanesulfonic acid	PFHxS *	355-46-4
Perfluoroheptanesulfonic acid	PFHpS	375-92-8
Perfluorooctanesulfonic acid	PFOS *	1763-23-1
Perfluorononanesulfonic acid	PFNS	68259-12-1
Perfluorodecanesulfonic acid	PFDS	335-77-3
Perfluorododecanesulfonic acid	PFDoS	79780-39-5

*** also reportable via the standard 537 method**

Table 1 Cont.

Parameter	Acronym	CAS
CHLORO-PERFLUOROALKYLSULFONATE		
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid	11Cl-PF3OUdS	763051-92-9
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid	9Cl-PF3ONS	756426-58-1
PERFLUOROOCTANESULFONAMIDES (FOSAs)		
Perfluorooctanesulfonamide	PFOSA	754-91-6
N-methylperfluoro-1-octanesulfonamide	NMeFOSA	31506-32-8
N-ethylperfluoro-1-octanesulfonamide	NEtFOSA	4151-50-2
TELOMER SULFONATES		
1H,1H,2H,2H-perfluorohexane sulfonate (4:2)	4:2FTS	27619-93-8
1H,1H,2H,2H-perfluorooctane sulfonate (6:2)	6:2FTS	27619-97-2
1H,1H,2H,2H-perfluorodecane sulfonate (8:2)	8:2FTS	39108-34-4
1H,1H,2H,2H-perfluorododecane sulfonate (10:2)	10:2FTS	120226-60-0
PERFLUOROOCTANESULFONAMIDOACETIC ACIDS		
N-methyl perfluorooctanesulfonamidoacetic acid	NMeFOSAA *	2355-31-9
N-ethyl perfluorooctanesulfonamidoacetic acid	NEtFOSAA *	2991-50-6
NATIVE PERFLUOROOCTANESULFONAMIDOETHANOLS (FOSEs)		
2-(N-methylperfluoro-1-octanesulfonamido)-ethanol	NMeFOSE	24448-09-7
2-(N-ethylperfluoro-1-octanesulfonamido)-ethanol	NEtFOSE	1691-99-2

*** also reportable via the standard 537 method**

3. Reporting Limits

The reporting limit for PFAS's is 2 ng/L for aqueous samples (20 ng/L for HFPO-DA) and 1 ng/g (10 ng/g for HFPO-DA) for soil samples.

4. Interferences

4.1 PFAS standards, extracts and samples should not come in contact with any glass containers or pipettes as these analytes can potentially adsorb to glass surfaces. PFAS analyte and EIS standards commercially purchased in glass ampoules are acceptable; however, all subsequent transfers or dilutions performed by the analyst must be prepared and stored in polypropylene containers.

4.2 Method interferences may be caused by contaminants in solvents, reagents (including reagent water), sample bottles and caps, and other sample processing hardware that lead to discrete artifacts and/or elevated baselines in the chromatograms. The method analytes in this method can also be found in many common laboratory supplies and equipment, such as PTFE (polytetrafluoroethylene) products, LC solvent lines, methanol, aluminum foil, SPE sample transfer lines, etc. All items such as these must be routinely demonstrated to be free from interferences (less than 1/3 the RL for each method analyte) under the conditions of the analysis by analyzing laboratory reagent blanks as described in Section 9.2. **Subtracting blank values from sample results is not permitted.**

4.3 Matrix interferences may be caused by contaminants that are co-extracted from the sample. The extent of matrix interferences will vary considerably from source to source, depending upon the nature of the water. Humic and/or fulvic material can be co-extracted during SPE and high levels can cause enhancement and/or suppression in the electrospray ionization source or low recoveries on the SPE sorbent. Total organic carbon (TOC) is a good indicator of humic content of the sample.

4.4 SPE cartridges can be a source of interferences. The analysis of field and laboratory reagent blanks can provide important information regarding the presence or absence of such interferences. Brands and lots of SPE devices should be tested to ensure that contamination does not preclude analyte identification and quantitation.

5. Health and Safety

5.1 The toxicity or carcinogenicity of each reagent and standard used in this method is not fully established; however, each chemical compound should be treated as a potential health hazard. From this viewpoint, exposure to these chemicals must be reduced to the lowest possible level by whatever means available. A reference file of material safety data sheets is available to all personnel involved in the chemical analysis. Additional references to laboratory safety are available in the Chemical Hygiene Plan.

5.2 All personnel handling environmental samples known to contain or to have been in contact with municipal waste must follow safety practices for handling known disease causative agents.

5.3 PFOA has been described as "likely to be carcinogenic to humans." Pure standard materials and stock standard solutions of these method analytes should be handled with suitable protection to skin and eyes, and care should be taken not to breathe the vapors or ingest the materials.

6. Sample Collection, Preservation, Shipping and Handling

6.1 Sample Collection for Aqueous Samples

6.1.1 Samples must be collected in two (2) 250-mL high density polyethylene (HDPE) container with an unlined plastic screw cap.

6.1.2 The sample handler must wash their hands before sampling and wear nitrile gloves while filling and sealing the sample bottles. PFAS contamination during sampling can occur from a number of common sources, such as food packaging and certain foods and beverages. Proper hand washing and wearing nitrile gloves will aid in minimizing this type of accidental contamination of the samples.

6.1.3 Open the tap and allow the system to flush until the water temperature has stabilized (approximately 3 to 5 min). Collect samples from the flowing system.

6.1.4 Fill sample bottles. Samples do not need to be collected headspace free.

6.1.5 After collecting the sample and cap the bottle. Keep the sample sealed from time of collection until extraction.

6.1.6 Field Reagent Blank (FRB)

6.1.6.1 A FRB must be handled along with each sample set. The sample set is composed of samples collected from the same sample site and at the same time. At the laboratory, fill the field blank sample bottle with reagent water and preservatives, seal, and ship to the sampling site along with the sample bottles. For each FRB shipped, an empty sample bottle (no preservatives) must also be shipped. At the sampling site, the sampler must open the shipped FRB and pour the reagent water into the empty shipped sample bottle, seal and label this bottle as the FRB. The FRB is shipped back to the laboratory along with the samples and analyzed to ensure that PFAS's were not introduced into the sample during sample collection/handling.

The reagent water used for the FRBs must be initially analyzed for method analytes as a MB and must meet the MB criteria in Section 9.2.1 prior to use. This requirement will ensure samples are not being discarded due to contaminated reagent water rather than contamination during sampling.

6.2 Sample Collection for Soil and Sediment samples.

Grab samples are collected in polypropylene containers. Sample containers and contact surfaces containing PTFE shall be avoided.

6.3 Sample Preservation

Not applicable.

6.4 Sample Shipping

Samples must be chilled during shipment and must not exceed 10 °C during the first 48 hours after collection. Sample temperature must be confirmed to be at or below 10 °C when the samples are received at the laboratory. Samples stored in the lab must be held at or below 6 °C until extraction, but should not be frozen.

NOTE: Samples that are significantly above 10° C, at the time of collection, may need to be iced or refrigerated for a period of time, in order to chill them prior to shipping. This will allow them to be shipped with sufficient ice to meet the above requirements.

6.5 Sample Handling

6.5.1 Holding Times

6.5.1.1 Water samples should be extracted as soon as possible but must be extracted within 14 days. Soil samples should be extracted within 28 days. Extracts are stored at < 10 ° C and analyzed within 28 days after extraction.

7. Equipment and Supplies

7.1 SAMPLE CONTAINERS – 250-mL high density polyethylene (HDPE) bottles fitted with unlined screw caps. Sample bottles must be discarded after use.

7.2 POLYPROPYLENE BOTTLES – 4-mL narrow-mouth polypropylene bottles.

7.3 CENTRIFUGE TUBES – 50-mL conical polypropylene tubes with polypropylene screw caps for storing standard solutions and for collection of the extracts.

7.4 AUTOSAMPLER VIALS – Polypropylene 0.7-mL autosampler vials with polypropylene caps.

7.4.1 NOTE: Polypropylene vials and caps are necessary to prevent contamination of the sample from PTFE coated septa. However, polypropylene caps do not reseal, so evaporation occurs after injection. Thus, multiple injections from the same vial are not possible.

7.5 POLYPROPYLENE GRADUATED CYLINDERS – Suggested sizes include 25, 50, 100 and 1000-mL cylinders.

7.6 Auto Pipets – Suggested sizes include 5, 10, 25, 50, 100, 250, 500, 1000, 5000 and 10,000-µls.

7.7 PLASTIC PIPETS – Polypropylene or polyethylene disposable pipets.

7.8 ANALYTICAL BALANCE – Capable of weighing to the nearest 0.0001 g.

7.9 SOLID PHASE EXTRACTION (SPE) APPARATUS FOR USING CARTRIDGES

7.9.1 SPE CARTRIDGES – 0.5 g SPE cartridges containing a reverse phase copolymer characterized by a weak anion exchanger (WAX) sorbent phase.

7.9.2 VACUUM EXTRACTION MANIFOLD – A manual vacuum manifold with large volume sampler for cartridge extractions, or an automatic/robotic sample preparation system designed for use with SPE cartridges, may be used if all QC requirements discussed in Section 9 are met. Extraction and/or elution steps may not be changed or omitted to accommodate the use of an automated system. Care must be taken with automated SPE systems to ensure the PTFE commonly used in these systems does not contribute to unacceptable analyte concentrations in the MB (Sect. 9.2.1).

7.9.3 SAMPLE DELIVERY SYSTEM – Use of a polypropylene transfer tube system, which transfers the sample directly from the sample container to the SPE cartridge, is recommended, but not mandatory. Standard extraction manifolds come equipped with PTFE transfer tube systems. These can be replaced with 1/8" O.D. x 1/16" I.D. polypropylene or polyethylene tubing cut to an appropriate length to ensure no sample contamination from the sample transfer lines. Other types of non-PTFE tubing may be used provided it meets the MB (Sect. 9.2.1) and LCS (Sect. 9.3) QC requirements. The PTFE transfer tubes may be used, but an MB must be run on each PFTE transfer tube and the QC requirements in Section 13.2.2 must be met. In the case of automated SPE, the removal of PTFE lines may not be feasible; therefore, MBs will need to be rotated among the ports and must meet the QC requirements of Sections 13.2.2 and 9.2.1.

7.10 Extract Clean-up Cartridge – 250 mg 6ml SPE Cartridge containing graphitized polymer carbon

7.11 EXTRACT CONCENTRATION SYSTEM – Extracts are concentrated by evaporation with nitrogen using a water bath set no higher than 65 °C.

7.12 LABORATORY OR ASPIRATOR VACUUM SYSTEM – Sufficient capacity to maintain a vacuum of approximately 10 to 15 inches of mercury for extraction cartridges.

7.13 LIQUID CHROMATOGRAPHY (LC)/TANDEM MASS SPECTROMETER (MS/MS) WITH DATA SYSTEM

7.13.1 LC SYSTEM – Instrument capable of reproducibly injecting up to 10-µL aliquots, and performing binary linear gradients at a constant flow rate near the flow rate used for development of this method (0.4 mL/min). The LC must be capable of pumping the water/methanol mobile phase without the use of a degasser which pulls vacuum on the mobile phase bottle (other types of degassers are acceptable). Degassers which pull vacuum on the mobile phase bottle will volatilize the ammonium acetate mobile phase causing the analyte peaks to shift to earlier retention times over the course of the analysis batch. The usage of a column heater is optional.

NOTE: During the course of method development, it was discovered that while idle for more than one day, PFAS's built up in the PTFE solvent transfer lines. To prevent long delays in purging high levels of PFAS's from the LC solvent lines, they were replaced with PEEK tubing and the PTFE solvent frits were replaced with stainless steel frits. It is not possible to remove all PFAS background contamination, but these measures help to minimize their background levels.

7.13.2 LC/TANDEM MASS SPECTROMETER – The LC/MS/MS must be capable of negative ion electrospray ionization (ESI) near the suggested LC flow rate of 0.4 mL/min. The system must be capable of performing MS/MS to produce unique product ions for the method analytes within specified retention time segments. A minimum of 10 scans across the chromatographic peak is required to ensure adequate precision.

7.13.3 DATA SYSTEM – An interfaced data system is required to acquire, store, reduce, and output mass spectral data. The computer software should have the capability of processing stored LC/MS/MS data by recognizing an LC peak within any given retention time window. The software must allow integration of the ion abundance of any specific ion within specified time or scan number limits. The software must be able to calculate relative response factors, construct linear regressions or quadratic calibration curves, and calculate analyte concentrations.

7.13.4 ANALYTICAL COLUMN – An LC BEH C_{18} column (2.1 x 50 mm) packed with 1.7 µm d_p C_{18} solid phase particles was used. Any column that provides adequate resolution, peak shape, capacity, accuracy, and precision (Sect. 9) may be used.

8. Reagents and Standards

8.1 GASES, REAGENTS, AND SOLVENTS – Reagent grade or better chemicals should be used.

8.1.1 REAGENT WATER – Purified water which does not contain any measurable quantities of any method analytes or interfering compounds greater than 1/3 the RL for each method analyte of interest. Prior to daily use, at least 3 L of reagent water should be flushed from the purification system to rinse out any build-up of analytes in the system's tubing.

8.1.2 METHANOL (CH_3OH, CAS#: 67-56-1) – High purity, demonstrated to be free of analytes and interferences.

8.1.3 AMMONIUM ACETATE ($NH_4C_2H_3O_2$, CAS#: 631-61-8) – High purity, demonstrated to be free of analytes and interferences.

8.1.4 ACETIC ACID (H_3CCOOH, CAS#: 64-19-7) - High purity, demonstrated to be free of analytes and interferences.

8.1.5 1M AMMONIUM ACETATE/REAGENT WATER – High purity, demonstrated to be free of analytes and interferences.

8.1.6 2mM AMMONIUM ACETATE/METHANOL:WATER (5:95) – To prepare, mix 2 ml of 1M AMMONIUM ACETATE,1 ml ACETIC ACID and 50 ml METHANOL into I Liter of REAGENT WATER.

8.1.7 Methanol/Water (80:20) – To prepare a 1 Liter bottle, mix 200 ml of REAGENT WATER with 800 ml of METHANOL.

8.1.8 AMMONIUM HYDROXIDE (NH_3, CAS#: 1336-21-6) – High purity, demonstrated to be free of analytes and interferences.

8.1.9 Sodium Acetate ($NaOOCCH_3$, CAS#: 127-09-3) – High purity, demonstrated to be free of analytes and interferences.

8.1.10 25 mM Sodium Acetate Buffer – To prepare 250mls, dissolve .625 grams of sodium acetate into 100 mls of reagent water. Add 4 mls Acetic Acid and adjust the final volume to 250 mls with reagent water.

8.1.11 NITROGEN – Used for the following purposes: Nitrogen aids in aerosol generation of the ESI liquid spray and is used as collision gas in some MS/MS instruments. The nitrogen used should meet or exceed instrument manufacturer's specifications. In addition, Nitrogen is used to concentrate sample extracts (Ultra High Purity or equivalent).

8.1.12 ARGON – Used as collision gas in MS/MS instruments. Argon should meet or exceed instrument manufacturer's specifications. Nitrogen gas may be used as the collision gas provided sufficient sensitivity (product ion formation) is achieved.

8.2 STANDARD SOLUTIONS – When a compound purity is assayed to be 96% or greater, the weight can be used without correction to calculate the concentration of the stock standard. PFAS analyte and IS standards commercially purchased in glass ampoules are acceptable; however, all subsequent transfers or dilutions performed by the analyst must be prepared and stored in polypropylene containers. Standards for sample fortification generally should be prepared in the smallest volume that can be accurately measured to minimize the addition of excess organic solvent to aqueous samples.

NOTE: Stock standards and diluted stock standards are stored at ≤4 °C.

8.2.1 ISOTOPE DILUTION Extracted Internal Standard (ID EIS) STOCK SOLUTIONS - ID EIS stock standard solutions are stable for at least 6 months when stored at 4 °C. The stock solution is purchased at a concentration of 1000 ng/mL.

8.2.2 ISOTOPE DILUTION Extracted Internal Standard PRIMARY DILUTION STANDARD (ID EIS PDS) – Prepare the ID EIS PDS at a concentration of 500 ng/mL. The ID PDS is prepared in 80:20% (vol/vol) methanol:water. The ID PDS is stable for 6 months when stored at ≤4 °C.

Table 2

Isotope Labeled Standard	Conc. of EIS Stock (ng/mL)	Vol. of EIS Stock (mL)	Final Vol. of EIS PDS (mL)	Final Conc. of EIS PDS (ng/mL)
M4PFBA	1000	1.0	2.0	500
M5PFPeA	1000	1.0	2.0	500
M5PFHxA	1000	1.0	2.0	500
M4PFHpA	1000	1.0	2.0	500
M8PFOA	1000	1.0	2.0	500
M9PFNA	1000	1.0	2.0	500
M6PFDA	1000	1.0	2.0	500
M7PFUdA	1000	1.0	2.0	500
MPFDoA	1000	1.0	2.0	500
M2PFTeDA	1000	1.0	2.0	500
M2PFHxDA	50,000	.02	2.0	500
d3-N-MeFOSA	50,000	.02	2.0	500
d5-N-EtFOSA	50,000	.02	2.0	500
d7-N-MeFOSE	50,000	.02	2.0	500
d9-N-EtFOSE	50,000	.02	2.0	500
M8FOSA	1000	1.0	2.0	500
d3-N-MeFOSAA	1000	1.0	2.0	500
d5-N-EtFOSAA	1000	1.0	2.0	500
M3PFBS	929	1.0	2.0	464.5
M3PFHxS	946	1.0	2.0	473
M8PFOS	957	1.0	2.0	478.5
M2-4:2FTS	935	1.0	2.0	467.5
M2-6:2FTS	949	1.0	2.0	474.5
M2-8:2FTS	958	1.0	2.0	479
M3HFPO-DA	50,000	.4	2.0	10,000

8.2.3 ANALYTE STOCK STANDARD SOLUTION – Analyte stock standards are stable for at least 6 months when stored at 4 °C. When using these stock standards to prepare a PDS, care must be taken to ensure that these standards are at room temperature and adequately vortexed.

8.2.4 Analyte Secondary Spiking Standard Prepare the spiking solution of additional add on components for project specific requirements only. ANALYTE PRIMARY SPIKING STANDARD – Prepare the spiking standard at a concentration of 500 ng/mL in methanol. The spiking standard is stable for at least two months when stored in polypropylene centrifuge tubes at room temperature.

Table 3

Analyte	Conc. of IS Stock (ng/mL)	Vol. of IS Stock (mL)	Final Vol. of IS PDS (mL)	Final Conc. of IS PDS (ng/mL)
PFBA	2000	1	4	500
PFPeA	2000	1	4	500
PFHxA	2000	1	4	500
PFHpA	2000	1	4	500
PFOA	2000	1	4	500
PFNA	2000	1	4	500
PFDA	2000	1	4	500
PFUdA	2000	1	4	500
PFDoA	2000	1	4	500
PFTrDA	2000	1	4	500
PFTeDA	2000	1	4	500
FOSA	2000	1	4	500
N-MeFOSAA	2000	1	4	500
N-EtFOSAA	2000	1	4	500
L-PFBS	1770	1	4	442.5
L-PFPeS	1880	1	4	470
L-PFHxSK	1480	1	4	370
Br-PFHxSK	344	1	4	86
L-PFHpS	1900	1	4	475
L-PFOSK	1460	1	4	365
Br-PFOSK	391	1	4	97.75
L-PFNS	1920	1	4	480
L-PFDS	1930	1	4	482.5
4:2FTS	1870	1	4	467.5
6:2FTS	1900	1	4	475
8:2FTS	1920	1	4	480

8.2.5 Analyte Secondary Spiking Standard Prepare the spiking solution of additional add on components for project specific requirements only.

Table 4

Analyte	Conc. of IS Stock (ng/mL)	Vol. of IS Stock (mL)	Final Vol. of IS PDS (mL)	Final Conc. of IS PDS (ng/mL)
ADONA	2000	1	4	500
PFHxDA	2000	1	4	500
PFODA	2000	1	4	500
HFPO-DA	100,000	.4	4	10,000
9ClPF3ONS	50,000	0.04	4	500
11ClPF3OUdS	50,000	0.04	4	500

8.2.6 LOW, MEDIUM AND HIGH LEVEL LCS – The LCS's will be prepared at the following concentrations and rotated per batch; 2 ng/L, 40 ng/L, 500 ng/l for drinking waters. The analyte PDS contains all the method analytes of interest at various concentrations in methanol. The analyte PDS has been shown to be stable for six months when stored at ≤4 °C.

8.2.7 Isotope Dilution Labeled Recovery Stock Solutions (ID REC) – ID REC Stock solutions are stable for at least 6 months when stored at 4 °C. The stock solution is purchased at a concentration of 1000 ng/mL.

8.2.8 Isotope Dilution Labeled Recovery Primary Dilution Standard (ID REC PDS) - Prepare the ID REC PDS at a concentration of 500 ng/mL. The ID REC PDS is prepared in 80:20% (vol/vol) methanol:water. The ID REC PDS is stable for at least six months when stored in polypropylene centrifuge tubes at ≤4 °C.

Table 5

Analyte	Conc. of REC Stock (ng/mL)	Vol. of REC Stock (mL)	Final Vol. of REC PDS (mL)	Final Conc. of REC PDS (ng/mL)
M2PFOA	2000	1	4	500
M2PFDA	2000	1	4	500
M3PFBA	2000	1	4	500
M4PFOS	2000	1	4	500

8.2.9 CALIBRATION STANDARDS (CAL) –

Current Concentrations (ng/mL): 0.5, 1.0, 5.0, 10.0, 50.0, 125, 150, 250, 500

Prepare the CAL standards over the concentration range of interest from dilutions of the analyte PDS in methanol containing 20% reagent water. 20 µl of the EIS PDS and REC PDS are added to the CAL standards to give a constant concentration of 10 ng/ml. The lowest concentration CAL standard must be at or below the RL (2 ng/L), which may depend on system sensitivity. The CAL standards may also be used as CCVs (Sect. 9.8). To make calibration stock standards:

Table 6

Calibration Standard Concentration	Final Aqueous Cal STD Level Concentration	Final Soil Cal STD Level Concentration	24 compound stock added (ul)	PFHxDA Stock added (ul)	500 ng/ml PFHxDA dilution added (ul)	PFODA Stock added (ul)	500 ng/ml PFODA dilution added (ul)	ADONA, HFPO-DA, 11Cl-PF3OUdS, 9Cl-PF3ONS Stock added (ul)	500 ng/ml ADONA dilution added (ul)	Final Volume in MeOH/H_2O (82:20)
.5 ng/ml	2 ng/L	.25 ng/g	6.25		25		25		25	25 mls
1 ng/ml	4 ng/L	.5 ng/g	5		20		20		20	10 mls
5 ng/ml	20 ng/L	1 ng/g	25		100		100		100	10 mls
10 ng/ml	40 ng/L	5 ng/g	125	5		5		5		25 mls

50 ng/ml	200 ng/L	25 ng/g	250	10		10		10		10 mls
125 ng/ml	500 ng/L	62.5 ng/g	625	25		25		25		10 mls
150 ng/ml	600 ng/L	75 ng/g	750	30		30		30		10 mls
250 ng/ml	1000 ng/L	125 ng/g	625							5 mls
500 ng/ml	2000 ng/L	250 ng/g	1250							5 mls

9. Quality Control

The laboratory must maintain records to document the quality of data that is generated. Ongoing data quality checks are compared with established performance criteria to determine if the results of analyses meet the performance characteristics of the method.

9.1 MINIMUM REPORTING LIMIT (MRL) CONFIRMATION

9.1.1 Fortify, extract, and analyze seven replicate LCSs at 2 ng/l. Calculate the mean measured concentration (*Mean*) and standard deviation for these replicates. Determine the Half Range for the prediction interval of results (HR_{PIR}) using the equation below

$$HR_{PIR} = 3.963s$$

Where:

s = the standard deviation
3.963 = a constant value for seven replicates.

9.1.2 Confirm that the upper and lower limits for the Prediction Interval of Result ($PIR = Mean \pm HR_{PIR}$) meet the upper and lower recovery limits as shown below

The Upper PIR Limit must be ≤150% recovery.

$$\frac{Mean + HR_{PIR}}{Fortified\ Concentration} \times 100\% \leq 150\%$$

The Lower PIR Limit must be ≥ 50% recovery.

$$\frac{Mean - HR_{PIR}}{Fortified\ Concentration} \times 100\% \geq 50\%$$

9.1.3 The RL is validated if both the Upper and Lower PIR Limits meet the criteria described above. If these criteria are not met, the RL has been set too low and must be determined again at a higher concentration.

9.2 Blank(s)

9.2.1 **METHOD BLANK (MB)** - A Method Blank (MB) is required with each extraction batch to confirm that potential background contaminants are not interfering with the identification or quantitation of method analytes. Prep and analyze a MB for every 20 samples. If the MB produces a peak within the retention time window of any analyte that would prevent the determination of that analyte, determine the source of contamination and eliminate the interference before processing samples. Background contamination must be reduced to an acceptable level before proceeding. Background from method analytes or other contaminants that interfere with the measurement of method analytes must be below the RL. If the method analytes are detected in the MB at concentrations equal to or greater than this level, then all data for the problem analyte(s) must be considered invalid for all samples in the extraction batch. Because background contamination is a significant problem for several method analytes, it is highly recommended that the analyst maintain a historical record of MB data.

9.2.2 **FIELD REAGENT BLANK (FRB)** - The purpose of the FRB is to ensure that PFAS's measured in the Field Samples were not inadvertently introduced into the sample during sample collection/handling. Analysis of the FRB is required only if a Field Sample contains a method analyte or analytes at or above the RL. The FRB is processed, extracted and analyzed in exactly the same manner as a Field Sample.

9.3 Laboratory Control Sample (LCS) and Laboratory Control Sample Duplicates (LCSD)

9.3.1 An LCS is required with each extraction batch. The fortified concentration of the LCS may be rotated between low, medium, and high concentrations from batch to batch. Default limits of 50-150% of the true value may be used for analytes until sufficient replicates have been analyzed to generate proper control limits. Calculate the percent recovery (%*R*) for each analyte using the equation

$$\%R = \frac{A \times 100}{B}$$

Where:

A = measured concentration in the fortified sample
B =fortification concentration.

9.3.2 Where applicable, LCSD's are to be extracted and analyzed. The concentration and analyte recovery criteria for the LCSD must be the same as the batch LCS The RSD's must fall within ≤30% of the true value for medium and high level replicates, and ≤50% for low level replicates. Calculate the relative percent difference (RPD) for duplicate MSs (MS and MSD) using the equation

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

9.3.3 **If the LCS and or LCSD results do not meet these criteria for method analytes, then all data for the problem analyte(s) must be considered invalid for all samples in the extraction batch.**

9.4 Labeled Recovery Standards (REC)

The analyst must monitor the peak areas of the REC(s) in all injections during each analysis day.

9.5 Extracted Internal Standards (EIS)

9.5.1 The EIS standard is fortified into all samples, CCVs, MBs, LCSs, MSs, MSDs, FD, and FRB prior to extraction. It is also added to the CAL standards. The EIS is a means of assessing method performance from extraction to final chromatographic measurement. Calculate the recovery (%R) for the EIS using the following equation

$$\%R = (A / B) \times 100$$

Where:

A = calculated EIS concentration for the QC or Field Sample
B = fortified concentration of the EIS.

9.5.2 Default limits of 50-150% may be used for analytes until sufficient replicates have been analyzed to generate proper control limits. A low or high percent recovery for a sample, blank, or CCV does not require discarding the analytical data but it may indicate a potential problem with future analytical data. When EIS recovery from a sample, blank, or CCV are outside control limits, check 1) calculations to locate possible errors, 2) standard solutions for degradation, 3) contamination, and 4) instrument performance. For CCVs and QC elements spiked with all target analytes, if the recovery of the corresponding target analytes meet the acceptance criteria for the EIS in question, the data can be used but all potential biases in the recovery of the EIS must be documented in the sample report. If the associated target analytes do not meet the acceptance criteria,the data must be reanalyzed.

9.6 Matrix Spike (MS)

9.6.1 Analysis of an MS is required in each extraction batch and is used to determine that the sample matrix does not adversely affect method accuracy. Assessment of method precision is accomplished by analysis of a Field Duplicate (FD) (Sect. 9.6); however, infrequent occurrence of method analytes would hinder this assessment. If the occurrence of method analytes in the samples is infrequent, or if historical trends are unavailable, a second MS, or MSD, must be prepared, extracted, and analyzed from a duplicate of the Field Sample. Extraction batches that contain MSDs will not require the extraction of a field sample duplicate. If a variety of different sample matrices are analyzed regularly, for example, drinking water from groundwater and surface water sources, method performance should be established for each. Over time, MS data should be documented by the laboratory for all routine sample sources.

9.6.2 Within each extraction batch, a minimum of one Field Sample is fortified as an MS for every 20 Field Samples analyzed. The MS is prepared by spiking a sample with an appropriate amount of the Analyte Stock Standard (Sect. 8.2.3). Use historical data and rotate through the low, mid and high concentrations when selecting a fortifying concentration. Calculate the percent recovery (%*R*) for each analyte using the equation

$$\%R = \frac{(A - B)}{C} \times 100$$

Where:

A = measured concentration in the fortified sample
B = measured concentration in the unfortified sample
C = fortification concentration.

9.6.3 Analyte recoveries may exhibit matrix bias. For samples fortified at or above their native concentration, recoveries should range between 50-150%. If the accuracy of any analyte falls outside the designated range, and the laboratory performance for that analyte is shown to be in control in the LCS, the recovery is judged to be matrix biased. The result for that analyte in the unfortified sample is labeled suspect/matrix to inform the data user that the results are suspect due to matrix effects.

9.7 Laboratory Duplicate

9.7.1 FIELD DUPLICATE OR LABORATORY FORTIFIED SAMPLE MATRIX DUPLICATE (FD or MSD) – Within each extraction batch (not to exceed 20 Field Samples), a minimum of one FD or MSD must be analyzed. Duplicates check the precision associated with sample collection, preservation, storage, and laboratory procedures. If method analytes are not routinely observed in Field Samples, an MSD should be analyzed rather than an FD.

9.7.2 Calculate the relative percent difference (*RPD*) for duplicate measurements (*FD1* and *FD2*) using the equation

$$RPD = \frac{|FD1 - FD2|}{(FD1 + FD2)/2} \times 100$$

9.7.3 RPDs for FDs should be ≤30%. Greater variability may be observed when FDs have analyte concentrations that are within a factor of 2 of the RL. At these concentrations, FDs should have RPDs that are ≤50%. If the RPD of any analyte falls outside the designated range, and the laboratory performance for that analyte is shown to be in control in the CCV, the recovery is judged to be matrix biased. The result for that analyte in the unfortified sample is labeled suspect/matrix to inform the data user that the results are suspect due to matrix effects.

9.7.4 If an MSD is analyzed instead of a FD, calculate the relative percent difference (RPD) for duplicate MSs (MS and MSD) using the equation

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

9.7.5 RPDs for duplicate MSs should be ≤30% for samples fortified at or above their native concentration. Greater variability may be observed when MSs are fortified at analyte concentrations that are within a factor of 2 of the RL. MSs fortified at these concentrations should have RPDs that are ≤50% for samples fortified at or above their native concentration. If the RPD of any analyte falls outside the designated range, and the laboratory performance for that analyte is shown to be in control in the LCSD where applicable, the result is judged to be matrix biased. If no LCSD is present, the associated MS and MSD are to be re-analyzed to determine if any analytical has occurred. If the resulting RPDs are still outside control limits, the result for that analyte in the unfortified sample is labeled suspect/matrix to inform the data user that the results are suspect due to matrix effects.

9.8 Initial Calibration Verification (ICV)

9.8.1 As part of the IDC (Sect. 13.2), and after each ICAL, analyze a QCS sample from a source different from the source of the CAL standards. If a second vendor is not available, then a different lot of the standard should be used. The QCS should be prepared and analyzed just like a CCV. Acceptance criteria for the QCS are identical to the CCVs; the calculated amount for each analyte must be ±

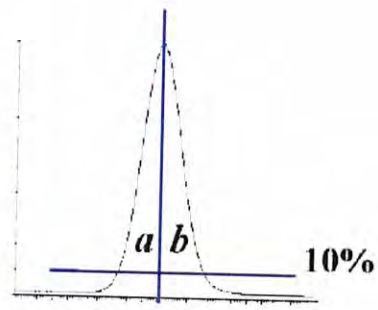
30% of the expected value. If measured analyte concentrations are not of acceptable accuracy, check the entire analytical procedureto locate and correct the problem.

9.9 Continuing Calibration Verification (CCV)

9.9.1 CCV Standards are analyzed at the beginning of each analysis batch, after every 10 Field Samples, and at the end of the analysis batch. See Section 10.7 for concentration requirements and acceptance criteria.

9.10 Method-specific Quality Control Samples

9.10.1 PEAK ASYMMETRY FACTOR – A peak asymmetry factor must be calculated using the equation below during the IDL and every time a calibration curve is generated. The peak asymmetry factor for the first two eluting peaks in a midlevel CAL standard (if only two analytes are being analyzed, both must be evaluated) must fall in the range of 0.8 to 1.5. Modifying the standard or extract composition to more aqueous content to prevent poor shape is not permitted. See guidance in Section 10.6.4.1 if the calculated peak asymmetry factors do not meet the criteria.



$$A_s = b / a$$

Where:

A_s = peak asymmetry factor
b = width of the back half of the peak measured (at 10% peak height) from the trailing edge of the peak to a line dropped perpendicularly from the peak apex
a = the width of the front half of the peak measured (at 10% peak height) from the leading edge of the peak to a line dropped perpendicularly from the apex.

9.11 Method Sequence

- CCV-LOW
- MB
- LCS
- LCSD
- MS
- Duplicate or MSD
- Field Samples (1-10)
- CCV-MID
- Field Samples (11-20)
- CCV-LOW

10. Procedure

10.1 Equipment Set-up

10.1.1 This procedure may be performed manually or in an automated mode using a robotic or automatic sample preparation device. If an automated system is used to prepare samples, follow the manufacturer's operating instructions, but all extraction and elution steps must be the same as in the manual procedure. Extraction and/or elution steps may not be changed or omitted to accommodate the use of an automated system. If an automated system is used, the MBs should be rotated among the ports to ensure that all the valves and tubing meet the MB requirements (Sect. 9.2).

10.1.2 Some of the PFAS's adsorb to surfaces, including polypropylene. Therefore, the aqueous sample bottles must be rinsed with the elution solvent (Sect 10.3.4) whether extractions are performed manually or by automation. The bottle rinse is passed through the cartridge to elute the method analytes and is then collected (Sect. 10.3.4).

10.1.3 **NOTE:** The SPE cartridges and sample bottles described in this section are designed as single use items and should be discarded after use. They may not be refurbished for reuse in subsequent analyses.

10.2 Sample Preparation and Extraction of Aqueous Samples

10.2.1 Samples are preserved, collected and stored as presented in Section 6.

The entire sample that is received must be sent through the SPE cartridge. In addition, the bottle must be solvent rinsed and this rinse must be sent through the SPE cartridge as well. The method blank (MB) and laboratory control sample (LCS) must be extracted in exactly the same manner (i.e., must include the bottle solvent rinse). It should be noted that a water rinse alone is not sufficient. This does not apply to samples with high concentrations of PFAS that are prepared using serial dilution and not SPE.

10.2.2 Determine sample volume. Weigh all samples to the nearest 1g. If visible sediment is present, centrifuge and decant into a new 250mL HDPE bottle and record the weight of the new container.

NOTE: Some of the PFAS's adsorb to surfaces, thus the sample volume may **NOT** be transferred to a graduated cylinder for volume measurement.

10.2.3 The MB, LCS and FRB may be prepared by measuring 250 mL of reagent water with a polypropylene graduated cylinder or filling a 250-mL sample bottle to near the top.

10.2.4 Adjust the QC and sample pH to 3 by adding acetic acid in water dropwise

10.2.5 Add 20 µL of the EIS PDS (Sect. 8.2.2) to each sample and QC, cap and invert to mix.

10.2.6 If the sample is an LCS, LCSD, MS, or MSD, add the necessary amount of analyte PDS (Sect. 8.2.3). Cap and invert each sample to mix.

10.3 Cartridge SPE Procedure

10.3.1 CARTRIDGE CLEAN-UP AND CONDITIONING – DO NOT allow cartridge packing material to go dry during any of the conditioning steps. Rinse each cartridge with 3 X 5 mL of 2% ammonium hydroxide in methanol, followed by 5mls of methanol. Next, rinse each cartridge with 5 mls of the 25 mM acetate buffer, followed by 15 mL of reagent water, without allowing the water to drop below the top edge of the packing. If the cartridge goes dry during the conditioning phase, the conditioning must be started over. Add 4-5 mL of reagent water to each cartridge, attach the sample transfer tubes (Sect. 7.9.3), turn on the vacuum, and begin adding sample to the cartridge.

10.3.2 SAMPLE EXTRACTON – Adjust the vacuum so that the approximate flow rate is approximately 4 mL/min. Do not allow the cartridge to go dry before all the sample has passed through.

10.3.3 SAMPLE BOTTLE AND CARTRIDGE RINSE – After the entire sample has passed through the cartridge, rinse the sample bottles with 4 ml reagent water followed by 4 ml 25 mM acetate buffer at pH 4 and draw the aliquot through the sample transfer tubes and the cartridges. Draw air or nitrogen through the cartridge for 5-10 min at high vacuum (10-15 in. Hg). **NOTE: If empty plastic reservoirs are used in place of the sample transfer tubes to pass the samples through the cartridges, these reservoirs must be treated like the transfer tubes. After the entire sample has passed through the cartridge, the reservoirs must be rinsed to waste with reagent water.**

10.3.4 SAMPLE BOTTLE AND CARTRIDGE ELUTION, Fraction 1 – Turn off and release the vacuum. Lift the extraction manifold top and insert a rack with collection tubes into the extraction tank to collect the extracts as they are eluted from the cartridges. Rinse the sample bottles with 12 mls of methanol and draw the aliquot through the sample transfer tubes and cartridges. Use a low vacuum such that the solvent exits the cartridge in a dropwise fashion.

SAMPLE BOTTLE AND CARTRIDGE ELUTION, Fraction 2 In a separate collection vial, rinse the sample bottles with 12 mL of 2% ammonium hydroxide in methanol and elute the analytes from the cartridges by pulling the 4 mL of methanol through the sample transfer tubes and the cartridges. Use a low vacuum such that the solvent exits the cartridge in a dropwise fashion. To the final extract, add 50 ul of acetic acid.

NOTE: If empty plastic reservoirs are used in place of the sample transfer tubes to pass the samples through the cartridges, these reservoirs must be treated like the transfer tubes. After the reservoirs have been rinsed in Section 10.3.3, the elution solvent used to rinse the sample bottles must be swirled down the sides of the reservoirs while eluting the cartridge to ensure that any method analytes on the surface of the reservoirs are transferred to the extract.

CLEAN-UP CARTRIDGE ELUTION, Elute the clean-up cartridge with 8 additional mls of methanol and draw the aliquot through the cartridge. Use a low vacuum such that the solvent exits the cartridge in a dropwise fashion.

10.3.5 Fractions 1 and 2 are to be combined during the concentration stage (section10.6)

10.4 Sample Prep and Extraction Protocol for Soils

10.4.1 Homogenize and weigh 2 grams of sample (measured to the nearest hundredth of a gram) intoa 50 ml polypropylene centrifuge tube. For laboratory control blanks and spikes, 2 grams of clean sand is used.

10.4.2 Add 20 µL of the EIS PDS (Sect. 8.2.2) to each sample and QC.

10.4.3 If the sample is an LCS, LCSD, MS, or MSD, add the necessary amount of analyte PDS (Sect. 8.2.3). Cap and invert each sample to mix.

10.4.4 To all samples, add 10 mls of methanol, cap, vortex for 25 seconds at 3000RPM and mix for 30 minutes using a shaker table of tumbler at 120RPM.

10.4.5 Following mixing, sonicate each sample for 30 minutes and let samples sit overnight (at least 2 hours is required for RUSH samples).

10.4.6 Centrifuge each sample at 3500RPM for 10 minutes.

10.4.7 Remove supernatant, and reserve for clean-up.

10.5 Extract Clean-up

10.5.1 CARTRIDGE CLEAN-UP AND CONDITIONING –. Rinse each cartridge with 15 mL of methanol and discard. If the cartridge goes dry during the conditioning phase, the conditioning must be started over. Attach the sample transfer tubes (Sect. 7.9.3), turn on the vacuum, and begin adding sample to the cartridge.

10.5.2 Adjust the vacuum so that the approximate flow rate is 1-2 mL/min. Do not allow the cartridge to go dry before all the sample has passed through.

10.5.3 SAMPLE BOTTLE AND CARTRIDGE RINSE – After the entire sample has passed through the cartridge, rinse the sample collection vial with two 1-mL aliquots of methanol and draw each aliquot through the cartridges. Draw air or nitrogen through the cartridge for 5 min at high vacuum (10-15 in. Hg).

10.5.4 If extracts are not to be immediately evaporated, cover collection tubes and store at ambient temperature till concentration.

10.6 Extract Concentration

10.6.1 Concentrate the extract to dryness under a gentle stream of nitrogen in a heated water bath (60-65 °C) to remove all the water/methanol mix. Add the appropriate amount of 80:20% (vol/vol) methanol:water solution and 20 µl of the ID REC PDS (Sect. 8.2.7) to the collection vial to bring the volume to 1 mL and vortex. Transfer two aliquots with a plastic pipet (Sect. 7.6) into 2 polypropylene autosampler vials.

NOTE: It is recommended that the entire 1-mL aliquot not be transferred to the autosampler vial because the polypropylene autosampler caps do not reseal after injection. Therefore, do not store the extracts in the autosampler vials as evaporation losses can occur occasionally in these autosampler vials. Extracts can be split between 2 X 700 µl vials (Sect. 7.4).

10.7 Sample Volume Determination

10.7.1 If the level of the sample was marked on the sample bottle, use a graduated cylinder to measure the volume of water required to fill the original sample bottle to the mark made prior to extraction. Determine to the nearest 10 mL.

10.7.2 If using weight to determine volume, weigh the empty bottle to the nearest 10 g and determine the sample weight by subtraction of the empty bottle weight from the original sample weight (Sect. 10.2.2). Assume a sample density of 1.0 g/mL. In either case, the sample volume will be used in the final calculations of the analyte concentration (Sect. 11.2).

10.8 Initial Calibration - Demonstration and documentation of acceptable initial calibration is required before any samples are analyzed. After the initial calibration is successful, a CCV is required at the beginning and end of each period in which analyses are performed, and after every tenth Field Sample.

10.8.1 ESI-MS/MS TUNE

10.8.1.1 Calibrate the mass scale of the MS with the calibration compounds and procedures prescribed by the manufacturer.

10.8.1.2 Optimize the [M-H]- for each method analyte by infusing approximately 0.5-1.0 µg/mL of each analyte (prepared in the initial mobile phase conditions) directly into the MS at the chosen LC mobile phase flow rate (approximately 0.4 mL/min). This tune can be done on a mix of the method analytes. The MS parameters (voltages, temperatures, gas flows, etc.) are varied until optimal analyte responses are determined. The method analytes may have different optima requiring some compromise between the optima.

10.8.1.3 Optimize the product ion for each analyte by infusing approximately 0.5-1.0 µg/mL of each analyte (prepared in the initial mobile phase conditions) directly into the MS at the chosen LC mobile phase flow rate (approximately 0.4 mL/min). This tune can be done on a mix of the method analytes. The MS/MS parameters (collision gas pressure, collision energy, etc.) are varied until optimal analyte responses are determined. Typically, the carboxylic acids have very similar MS/MS conditions and the sulfonic acids have similar MS/MS conditions.

10.8.2 Establish LC operating parameters that optimize resolution and peak shape. Modifying the standard or extract composition to more aqueous content to prevent poor shape is not permitted.

Cautions: LC system components, as well as the mobile phase constituents, contain many of the method analytes in this method. Thus, these PFAS's will build up on the head of the LC column during mobile phase equilibration. To minimize the background PFAS peaks and to keep background levels constant, the time the LC column sits at initial conditions must be kept constant and as short as possible (while ensuring reproducible retention times). In addition, prior to daily use, flush the column with 100% methanol for at least 20 min before initiating a sequence. It may be necessary on some systems to flush other LC components such as wash syringes, sample needles or any other system components before daily use.

10.8.3 Inject a mid-level CAL standard under LC/MS conditions to obtain the retention times of each method analyte. If analyzing for PFTA, ensure that the LC conditions are adequate to prevent co-elution of PFTA and the mobile phase interferants. These interferants have the same precursor and products ions as PFTA, and under faster LC conditions may co-elute with PFTA. Divide the chromatogram into retention time windows each of which contains one or more chromatographic peaks. During MS/MS analysis, fragment a small number of selected precursor ions ([M-H]-) for the analytes in each window and choose the most abundant product ion. For maximum sensitivity, small mass windows of ±0.5 daltons around the product ion mass were used for quantitation.

10.8.4 Inject a mid-level CAL standard under optimized LC/MS/MS conditions to ensure that each method analyte is observed in its MS/MS window and that there are at least 10 scans across the peak for optimum precision.

10.8.4.1 If broad, split or fronting peaks are observed for the first two eluting chromatographic peaks (if only two analytes are being analyzed, both must be evaluated), change the initial mobile phase conditions to higher aqueous content until the peak asymmetry ratio for each peak is 0.8 – 1.5. The peak asymmetry factor is calculated as described in Section 9.9.1 on a mid-level CAL standard. The peak asymmetry factor must meet the above criteria for the first two eluting peaks during the IDL and every time a new calibration curve is generated. Modifying the standard or extract composition to more aqueous content to prevent poor shape is not permitted.

NOTE: PFHxS, PFOS, NMeFOSAA, and NEtFOSAA have multiple chromatographic peaks using the LC conditions in Table 5 due to chromatographic resolution of the linear and branched isomers of these compounds. Most PFAS's are produced by two different processes. One process gives rise to linear PFAS's only while the other process produces both linear and branched isomers. Thus, both branched and linear PFAS's can potentially be found in the environment. For the aforementioned compounds that give rise to more than one peak, all the chromatographic peaks observed in the standard must be integrated and the areas totaled. Chromatographic peaks in a sample must be integrated in the same way as the CAL standard.

10.8.5 Prepare a set of CAL standards as described in Section 8.2.5. The lowest concentration CAL standard must be at or below the RL (2 ng/L), which may depend on system sensitivity.

10.8.6 The LC/MS/MS system is calibrated using the IS technique. Use the LC/MS/MS data system software to generate a linear regression or quadratic calibration curve for each of the analytes. This curve **must always** be forced through zero and may be concentration weighted, if necessary. Forcing zero allows for a better estimate of the background levels of method analytes. A minimum of 5 levels are required for a linear calibration model and a minimum of 6 levels are required for a quadratic calibration model.

10.8.7 CALIBRATION ACCEPTANCE CRITERIA – A linear fit is acceptable if the coefficient of determination (r^2) is greater than 0.99. When quantitated using the initial calibration curve, each calibration point, except the lowest point, for each analyte should calculate to be within 70-130% of its true value. The lowest CAL point should calculate to be within 50-150% of its true value. If these criteria cannot be met, the analyst will have difficulty meeting ongoing QC criteria. It is recommended that corrective action is taken to reanalyze the CAL standards, restrict the range of calibration, or select an alternate method of calibration (forcing the curve through zero is still required).

10.8.7.1 CAUTION: When acquiring MS/MS data, LC operating conditions must be carefully reproduced for each analysis to provide reproducible retention times. If this is not done, the correct ions will not be monitored at the appropriate times. As a precautionary measure, the chromatographic peaks in each window must not elute too close to the edge of the segment time window.

10.9 CONTINUING CALIBRATION CHECK (CCV) – Minimum daily calibration verification is as follows. Verify the initial calibration at the beginning and end of each group of analyses, and after every tenth sample during analyses. In this context, a "sample" is considered to be a Field Sample. MBs, CCVs, LCSs, MSs, FDs FRBs and MSDs are not counted as samples. The beginning CCV of each analysis batch must be at or below the RL in order to verify instrument sensitivity prior to any analyses. If standards have been prepared such that all low CAL points are not in the same CAL solution, it may be necessary to analyze two CAL standards to meet this requirement. Alternatively, the analyte concentrations in the analyte PDS may be customized to meet these criteria. Subsequent CCVs should alternate between a medium and Low concentration CAL standard.

10.9.1 Inject an aliquot of the appropriate concentration CAL standard and analyze with the same conditions used during the initial calibration.

10.9.2 Calculate the concentration of each analyte and EIS in the CCV. The calculated amount for each analyte for medium level CCVs must be within ± 30% of the true value with an allowance of 10% of the reported analytes to be greater than 30%, but less than 40%. The calculated amount for each EIS must be within ± 50% of the true value. The calculated amount for the lowest calibration point for each analyte must be within ± 50%. If these conditions do not exist, then all data for the problem analyte must be considered invalid, and remedial action should be taken (Sect. 10.7.4) which may require recalibration. Any Field or QC Samples that have been analyzed since the last acceptable calibration verification should be reanalyzed after adequate calibration has been restored, with the following exception. **If the CCV fails because the calculated concentration is greater than 130% (150% for the low-level CCV) for a particular method analyte, and Field Sample extracts show no detection for that method analyte, non-detects may be reported without re-analysis.**

10.9.3 REMEDIAL ACTION – Failure to meet CCV QC performance criteria may require remedial action. Major maintenance, such as cleaning the electrospray probe, atmospheric pressure ionization source, cleaning the mass analyzer, replacing the LC column, etc., requires recalibration (Sect 10.6) and verification of sensitivity by analyzing a CCV at or below the RL (Sect 10.7).

10.10 EXTRACT ANALYSIS

10.10.1 Establish operating conditions equivalent to those summarized in Tables 6-8 of Section 16. Instrument conditions and columns should be optimized prior to the initiation of the IDC.

10.10.2 Establish an appropriate retention time window for each analyte. This should be based on measurements of actual retention time variation for each method analyte in CAL standard solutions analyzed on the LC over the course of time. A value of plus or minus three times the standard deviation of the retention time obtained for each method analyte while establishing the initial calibration and completing the IDC can be used to calculate a suggested window size. However, the experience of the analyst should weigh heavily on the determination of the appropriate retention window size.

10.10.3 Calibrate the system by either the analysis of a calibration curve (Sect. 10.6) or by confirming the initial calibration is still valid by analyzing a CCV as described in Section 10.7. If establishing an initial calibration, complete the IDC as described in Section 13.2.

10.10.4 Begin analyzing Field Samples, including QC samples, at their appropriate frequency by injecting the same size aliquots under the same conditions used to analyze the CAL standards.

10.10.5 At the conclusion of data acquisition, use the same software that was used in the calibration procedure to identify peaks of interest in predetermined retention time windows. Use the data system software to examine the ion abundances of the peaks in the chromatogram. Identify an analyte by comparison of its retention time with that of the corresponding method analyte peak in a reference standard.

10.10.6 The analyst must not extrapolate beyond the established calibration range. If an analyte peak area exceeds the range of the initial calibration curve, the sample should be re-extracted with a reduced sample volume in order to bring the out of range target analytes into the calibration range. If a smaller sample size would not be representative of the entire sample, the following options are recommended. Re-extract an additional aliquot of sufficient size to insure that it is representative of the entire sample. Spike it with a higher concentration of internal standard. Prior to LC/MS analysis, dilute the sample so that it has a concentration of internal standard equivalent to that present in the calibration standard. Then, analyze the diluted extract.

11. Data Evaluation, Calculations and Reporting

11.1 Complete chromatographic resolution is not necessary for accurate and precise measurements of analyte concentrations using MS/MS. In validating this method, concentrations were calculated by measuring the product ions listed in Table 7.

11.2 Calculate analyte concentrations using the multipoint calibration established in Section 10.6. Do not use daily calibration verification data to quantitate analytes in samples. Adjust final analyte concentrations to reflect the actual sample volume determined in Section 10.6 where:

C_{ex} = (Area of target analyte * Concentration of Labeled analog) / (area of labeled analog * CF)

C_s = (C_{ex} / sample volume in ml) * 1000

C_{ex} = The concentration of the analyte in the extract
CF = calibration factor from calibration.

11.3 Prior to reporting the data, the chromatogram should be reviewed for any incorrect peak identification or poor integration.

11.4 PFHxS, PFOS, PFOA, NMeFOSAA, and NEtFOSAA have multiple chromatographic peaks using the LC conditions in Table 5 due to the linear and branch isomers of these compounds (Sect. 10.6.4.1). The areas of all the linear and branched isomer peaks observed in the CAL standards for each of these analytes must be summed and the concentrations reported as a total for each of these analytes.

11.5 Calculations must utilize all available digits of precision, but final reported concentrations should be rounded to an appropriate number of significant figures (one digit of uncertainty), typically two, and not more than three significant figures.

12. Contingencies for Handling Out-of-Control Data or Unacceptable Data

12.1 Section 9.0 outlines sample batch QC acceptance criteria. If non-compliant organic compound results are to be reported, the Organic Section Head and/or the Laboratory Director, and the Operations Manager must approve the reporting of these results. The laboratory Project Manager shall be notified, and may choose to relay the non-compliance to the client, for approval, or other corrective action, such as re-sampling and re-analysis. The analyst, Data Reviewer, or Department Supervisor performing the secondary review initiates the project narrative, and the narrative must clearly document the non-compliance and provide a reason for acceptance of these results.

12.2 All results for the organic compounds of interest are reportable without qualification if extraction and analytical holding times are met, preservation requirements (including cooler temperatures) are met, all QC criteria are met, and matrix interference is not suspected during extraction or analysis of the samples. If any of the below QC parameters are not met, all associated samples must be evaluated for re-extraction and/or re-analysis.

13. Method Performance

13.1 Detection Limit Study (DL) / Limit of Detection Study (LOD) / Limit of Quantitation (LOQ)

13.1.1 The laboratory follows the procedure to determine the DL, LOD, and/or LOQ as outlined in Alpha SOP ID 1732. These studies performed by the laboratory are maintained on file for review.

13.2 Demonstration of Capability Studies

13.2.1 The IDC must be successfully performed prior to analyzing any Field Samples. Prior to conducting the IDC, the analyst must first generate an acceptable Initial Calibration following the procedure outlined in Section 10.6.

13.2.2 INITIAL DEMONSTRATION OF LOW SYSTEM BACKGROUND – Any time a new lot of SPE cartridges, solvents, centrifuge tubes, disposable pipets, and autosampler vials are used, it must be demonstrated that an MB is reasonably free of contamination and that the criteria in Section 9.2.1 are met. If an automated extraction system is used, an MB should be extracted on each port to ensure that all the valves and tubing are free from potential PFAS contamination.

13.2.3 INITIAL DEMONSTRATION OF PRECISION (IDP) – Prepare, extract, and analyze four to seven replicate LCSs fortified near the midrange of the initial calibration curve according to the procedure described in Section 10. Sample preservatives as described in Section 6.2.1 must be added to these samples. The relative standard deviation (RSD) of the results of the replicate analyses must be less than 20%.

13.2.4 INITIAL DEMONSTRATION OF ACCURACY (IDA) – Using the same set of replicate data generated for Section 13.2.3, calculate average recovery. The average recovery of the replicate values must be within ± 30% of the true value.

13.2.5 INITIAL DEMONSTRATION OF PEAK ASYMMETRY FACTOR – Peak asymmetry factors must be calculated using the equation in Section 9.10.1 for the first two eluting peaks (if only two analytes are being analyzed, both must be evaluated) in a mid-level CAL standard. The peak asymmetry factors must fall in the range of 0.8 to 1.5. See guidance in Section 10.6.4.1 if the calculated peak asymmetry factors do not meet the criteria.

13.2.6 Refer to Alpha SOP ID 1739 for further information regarding IDC/DOC Generation.

13.2.7 The analyst must make a continuing, annual, demonstration of the ability to generate acceptable accuracy and precision with this method.

14. Pollution Prevention and Waste Management

14.1 Refer to Alpha's Chemical Hygiene Plan and Hazardous Waste Management and Disposal SOP for further pollution prevention and waste management information.

14.2 This method utilizes SPE to extract analytes from water. It requires the use of very small volumes of organic solvent and very small quantities of pure analytes, thereby minimizing the potential hazards to both the analyst and the environment as compared to the use of large volumes of organic solvents in conventional liquid-liquid extractions.

14.3 The analytical procedures described in this method generate relatively small amounts of waste since only small amounts of reagents and solvents are used. The matrices of concern are finished drinking water or source water. However, laboratory waste management practices must be conducted consistent with all applicable rules and regulations, and that laboratories protect the air, water, and land by minimizing and controlling all releases from fume hoods and bench operations. Also, compliance is required with any sewage discharge permits and regulations, particularly the hazardous waste identification rules and land disposal restrictions.

15. Referenced Documents

Chemical Hygiene Plan – ID 2124

SOP ID 1732 Detection Limit (DL), Limit of Detection (LOD) & Limit of Quantitation (LOQ) SOP

SOP ID 1739 Demonstration of Capability (DOC) Generation SOP

SOP ID 1728 Hazardous Waste Management and Disposal SOP

16. Attachments

Table 7: LC Method Conditions

Time (min)	2 mM Ammonium Acetate (5:95 MeOH/H_2O)	100% Methanol
Initial	100.0	0.0
1.0	100.0	0.0
2.2	85.0	15.0
11	20.0	80.0
11.4	0.0	100.0
12.4	100.0	00.0
15.5	100.0	0.0
Waters Aquity UPLC ® BEHC_{18} 2.1 x 50 mm packed with 1.7 µm BEH C_{18} stationary phase Flow rate of 0.4 mL/min 2-5 µL injection		

Table 8: ESI-MS Method Conditions

ESI Conditions	
Polarity	Negative ion
Capillary needle voltage	.5 kV
Cone Gas Flow	25 L/hr
Nitrogen desolvation gas	1000 L/hr
Desolvation gas temp.	500 °C

Table 9: Method Analyte Source, Retention Times (RTs), and EIS References

#	Analyte	Transition	RT	IS	Type
1	M3PBA	216>171	2.65		REC
2	PFBA	213 > 169	2.65	2: M4PFBA	
3	M4PFBA	217 > 172	2.65	1: M3PBA	EIS
4	PFPeA	263 > 219	5.67	4: M5PFPEA	
5	M5PFPEA	268 > 223	5.66	1: M3PBA	EIS
6	PFBS	299 > 80	6.35	6: M3PFBS	
7	M3PFBS	302 > 80	6.35	29:M4PFOS	EIS
8	FtS 4:2	327 > 307	7.47	9: M2-4:2FTS	

#	Analyte	Transition	RT	IS	Type
9	M2-4:2FTS	329 > 81	7.47	29:M4PFOS	EIS
10	PFHxA	303 > 269	7.57	10: M5PFHxA	
11	M5PFHxA	318 > 273	7.57	19:M2PFOA	EIS
12	PFPeS	349 > 80	7.88	18: M3PFHxS	
13	PFHpA	363 > 319	8.80	14: M4PFHpA	
14	M4PFHpA	367 > 322	8.80	19:M2PFOA	EIS
15	L-PFHxS	399 > 80	8.94	18: M3PFHxS	
16	br-PFHxS	399 > 80	8.72	18: M3PFHxS	
17	PFHxS Total	399 > 80	8.94	18: M3PFHxS	
18	M3PFHxS	402 > 80	8.94	29:M4PFOS	EIS
19	MPFOA	415 > 370	9.7		REC
20	PFOA	413 > 369	9.7	23: M8PFOA	
21	br-PFOA	413 > 369	9.48	23: M8PFOA	
22	PFOA Total	413 > 369	9.7	23: M8PFOA	
23	M8PFOA	421 > 376	9.7	19: M2PFOA	EIS
24	FtS 6:2	427 > 407	9.66	25: M2-6:2FTS	
25	M2-6:2FTS	429 > 409	9.66	29:M4PFOS	EIS
26	PFHpS	449 > 80	9.78	33: M8PFOS	
27	PFNA	463 > 419	10.41	33: M8PFOS	
28	M9PFNA	472 > 427	10.41	19: M2PFOA	EIS
29	M4PFOS	501 > 80	10.45		REC
30	PFOS	499 > 80	10.45	33: M8PFOS	
31	br-PFOS	499 > 80	10.27	33: M8PFOS	
32	PFOS Total	499 > 80	10.45	33: M8PFOS	
33	M8PFOS	507 > 80	10.45	29: M4PFOS	EIS
34	FtS 8:2	527 > 507	10.99	38: M2-8:2FTS	
35	M2-8:2FTS	529 > 509	10.99	29:M4PFOS	EIS
36	M2PFDA	515 > 470	11.00		REC
37	PFDA	513 > 469	11.00	38: M6PFDA	
38	M6PFDA	519 > 474	11.00	36: M2PFDA	EIS
39	PFNS	549 > 80	11.02	33:M8PFOS	
40	NMeFOSAA	570 > 419	11.41	41: D3-NMeFOSAA	
41	d3-NMeFOSAA	573 > 419	11.41	36: M2PFDA	EIS
42	PFOSA	498 > 78	11.48	29: M8FOSA	
43	M8FOSA	506 > 78	11.48	19: M2PFOA	EIS
44	PFUnDA	563 > 519	11.51	41: M7-PFUDA	
45	M7-PFUDA	570 > 525	11.51	36: M2PFDA	EIS
46	PFDS	599 > 80	11.51	33:M8PFOS	
47	NEtFOSAA	584 > 419	11.68	48: d5-NEtFOSAA	

#	Analyte	Transition	RT	IS	Type
48	d5-NEtFOSAA	589 > 419	11.68	36: M2PFDA	EIS
49	PFDoA	613 > 569	11.96	50: MPFDOA	
50	MPFDOA	615 > 570	11.96	36: M2PFDA	EIS
51	PFTriA	663 > 619	12.34	50: MPFDOA	
52	PFTeA	713 > 669	12.6	53: M2PFTEDA	
53	M2PFTEDA	715 > 670	12.6	36: M2PFDA	EIS
54	M3HFPO-DA	329>285	7.97	19: M2PFOA	EIS
55	HFPO-DA	332>287	7.97	54: M3HFPO-DA	
56	ADONA	377>251	8.00	23: M8PFOA	
57	PFHxDA	813>769	13.20	59: M2PFHxDA	
58	PFODA	913>869	13.50	59: M2PFHxDA	
59	M2PFHxDA	815>770	13.20	36:M2PFDA	EIS
60	NEtFOSA	526>169	11.00	61: NMeFOSA	
61	NMeFOSA	512>169	10.50	63: d3-NMeFOSA	
62	d3-NMeFOSA	515>169	10.50	29: M4PFOS	EIS
63	d5-NEtFOSA	531>169	11.00	29: M4PFOS	EIS
64	NMeFOSE	556>122	11.25	66: d7-NMeFOSE	
65	NEtFOSE	570>136	10.75	67: d9-NEtFOSE	
66	d7-NMeFOSE	563>126	11.25	29: M4PFOS	EIS
67	d9-NEtFOSE	579>142	10.75	29: M4PFOS	EIS
68	FtS 10:2	627>607	11.50	25: M2-6:2FTS	
69	PFDoS	699>99	12.50	33: M8PFOS	

QAPP
ATTACHMENT 5

Sherri Pullar

Project Scientist

EDUCATION

B.S., State University of New York, New Paltz, NY

TRAINING / CERTIFICATIONS

EPA Guidance on QAPP/eQAPP

Training in ADR and EDMS

DOD database training

WORK HISTORY

Years with firm: 10 years

Years Experience: 25 years

Sherri specializes in data validation of inorganic, organic, and wet chemistry data including PFAS and 1,4-dioxane (including ADR and EDMS). Sherri has extensive experience preparing, supporting, and developing numerous quality assurance project plans, sampling analysis plans, quality assurance sampling plans, precision, accuracy, reproducibility, completeness, and comparability reports, and standard operating procedures for field sampling, work plans, remedial investigations, feasibility studies, remedial actions, health and safety plans, and reviewing data packages for quality control and acceptability. Sherri has extensive experience with database entry for DOD and NJDEP.

BACKGROUND / EXPERIENCE

Environmental Business Consultants (EBC), Numerous Projects, Ridge, NY Project Scientist. Worked on numerous sites with EBC to perform EPA Region II, level IV inorganic data validation, including metals and wet chemistry and organic data validation including volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, PCSs, 1,4-dioxane, and PFOS in soil, sediment, groundwater, and air samples.

U.S. Navy, LTM, Former Naval Air Warfare Center Trenton, West Trenton NJ Project Scientist. Performed inorganic data validation, including metals and wet chemistry and organic data validation including VOC and SVOC in groundwater, soil and air samples. Responsible for uploading data into Navy database.

U.S. Navy, LTM, Naval Weapons Industrial Reserve Plant NWIRP, Bedford MA Project Scientist. Performed inorganic data validation, including metals and wet chemistry and organic data validation including VOC and SVOC in groundwater, soil and air samples. Responsible for uploading data into Navy database.

USACE New England District, LTM, Former Fort Devens, MA Project Scientist. Performed organic data validation, including explosives and perchlorate using automated data validation (ADR) for groundwater and soil.

Northeastern Environmental Technologies (NEET), Numerous Projects, Ballston Spa, NY Project Scientist. Worked on two sites with NEET to perform EPA Region II, level IV inorganic data validation, including metals and wet chemistry and organic data validation including volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), in soil, groundwater, and air samples.

U.S. Navy, LTM, Naval Weapons Industrial Reserve Plant NWIRP, Calverton, NY Project Scientist. Performed inorganic data validation, including metals and wet chemistry and organic data validation including VOC and SVOC in groundwater and soil samples. Responsible for uploading data into Navy database.

Foote Mineral GMP, LTM, East Whiteland Township, PA. Project Scientist. Performed inorganic data validation, including metals and wet chemistry and organic data validation including VOC in groundwater samples. Responsible for uploading data into Navy database.

USACE New England District, LTM, Former Massachusetts Military Reservation, MA. Project Scientist. Performed organic data validation, including explosives and perchlorate and inorganic data validation, metals and wet chemistry using automated data validation (ADR) for soil and groundwater.

QAPP
ATTACHMENT 6

EBC

ENVIRONMENTAL BUSINESS CONSULTANTS

Keith W. Butler, Senior Project Manager

PROFILE

Mr. Butler has extensive project management experience with respect to environmental due diligence and subsurface investigations. He is responsible for the preparation of project proposals, Phase I and II Environmental Site Assessments, Work Plans, Health and Safety Plans, Quality Assurance Project Plans, and investigation reports. Additionally, Mr. Butler has conducted and managed numerous Phase I and II ESAs. In these roles, Mr. Butler is responsible for applying the various state and local regulations, which govern environmental compliance and determine the need for additional investigation and/or remediation.

SELECTED PROJECTS

Madison National Bank, Various Sites, New York

Mr. Butler served as the Project Manager and principal contact for Madison National Bank. He was responsible for the preparation of Transaction Screen and Phase I/II Environmental Site Assessments (ESAs) at various sites throughout the New York metropolitan area, as required by the bank to satisfy client mortgage or construction loan requests.

Jewish Home & Hospital, Manhattan, NY

Most recently, Mr. Butler completed a Phase I ESA at their Bronx campus to obtain US. Housing and Urban Development (HUD) funding for a future construction project. Mr. Butler was also responsible for implementing a Remedial Action Work (RAW) Plan at the Bronx facility as required by the NYSDEC under a Voluntary Cleanup Agreement. The RAW included the preparation of contract documents, excavation of over 2,000 tons petroleum contaminated soils, installation of a Soil Vapor Extraction (SVE) system remedial oversight, and sampling.

Pulte Homes of New York, Patchogue, NY

Mr. Butler served as the Project Manager for the re-development of this six-acre site and was responsible for field oversight and coordination between remediation contractors and various regulatory agencies. Initial phases of the project included the completion of Phase I and II ESAs. Subsequent remediation consisted of UST removal, excavation of petroleum-impacted soils, closure of three NYSDEC spill numbers, removal of contaminated UIC sediment/sludge, the closure of commercial and residential UIC structures and the excavation of arsenic and metals contaminated soil. The project was conducted under approved Remedial Work and Soil Management Plans with oversight from the State, County and Village agencies.

Town of Islip, Blydenburgh Road Landfill, Hauppauge, NY

Mr. Butler served as the Project Manager for the groundwater and leachate monitoring program at the Blydenburgh Road Landfill - Cleanfills 1 and 2 and Leachate Impoundment Area. Mr. Butler was the principal contact for the Town's Resource Recovery Agency. He prepared the quarterly and annual monitoring reports, oversaw sampling efforts, and coordinated with the Town's analytical laboratory and data validation contractors. Mr. Butler was also responsible for preparing quarterly well condition reports and leachate quality reports for compliance with the Town's Suffolk County Discharge Certification Permit.

Ogden Aviation, Various Sites, JFK International Airport, Jamaica, New York

Mr. Butler served as the project manager for the rehabilitation of the satellite fuel farm recovery well system. Recovery wells at the fuel farm had become clogged with iron deposits and bacteria limiting product recovery efforts. Mr. Butler developed and supervised chemical cleaning and redevelopment of recovery wells under the approval of the NYSDEC. The chemical treatment has resulted in significant increases in product recovery volumes.

Brookhaven National Laboratory, Upton, NY

Mr. Butler has worked on a number of remediation system and monitoring well installation projects at BNL. His duties included oversight of installations, system pump tests, performance evaluations, and well development. He also provided oversight of soil borings, temporary well construction, soil and water sampling, and air monitoring for groundwater screening survey of two operable units in hazardous and radioactive waste storage areas. Mr. Butler also provided oversight for groundwater monitoring, well construction, well abandonment, and methane-monitoring wells for landfill closure.

metroPCS, Various Sites, New York

Mr. Butler served as the Project Manager for metroPCS' Long Island region telecommunications site acquisition and expansion program. Mr. Butler was responsible for the preparation of Phase I ESAs, the conduct of Phase II ESAs, including asbestos, lead paint and soil sampling, and coordination of National Environmental Policy Act (NEPA) reports and planning studies at various locations proposed for construction of new cellular telephone facilities. Reports and associated communications were transmitted electronically through metroPCS' data management system.

Dormitory Authority - State of New York, Harlem Hospital Center Modernization Project - Hazardous and Universal Waste Survey, Harlem Hospital, New York, NY

Mr. Butler served as the field team leader for conducting hazardous and universal waste surveys in multiple buildings affiliated with Harlem Hospital Center. The survey included the identification of hazardous and universal waste materials including chemicals, paints, fluorescent bulbs, high intensity discharge bulbs/fixtures, battery operated equipment, above and underground petroleum storage tank identification, PCB containing light ballasts and electrical equipment.

The hospital is comprised of a number of buildings, many that were abandoned and slated for demolition.

SVE Monitoring at Newark International Airport, Elizabeth, NJ

A routine leak detection test indicated that two 10,000-gallon underground storage tanks, which were used to store unleaded gasoline, had failed tightness tests. Follow-up investigation revealed that the product had impacted the subsurface environment. In response to this, a soil vapor extraction system was installed to reduce the residual concentrations of petroleum constituents in soil and groundwater and to minimize vapor migration into subsurface utility vaults. Mr. Butler was responsible for implementing the Remedial Action Work Plan, developed for the site by Ogden and the State of New Jersey. Activities conducted under the RAW include quarterly groundwater monitoring, air sampling, vacuum pressure monitoring, system maintenance and reporting.

Federal Express Site, Newark International Airport, Elizabeth, NJ

Mr. Butler worked with Ogden Aviation and the State of New Jersey to address outstanding environmental issues at the site related to a spill of jet fuel, which occurred during a construction accident. Mr. Butler performed a site assessment, which included groundwater monitoring, product gauging, and groundwater flow modeling. After reviewing these data, Mr. Butler determined that fill material at the site was contributing to soil and groundwater contamination and has petitioned the State for partial site closure. Mr. Butler is continuing to address the remaining area of concern through product recovery and continued monitoring.

Northrop Grumman, Various Sites

Mr. Butler conducted three Phase I ESAs and a Phase II investigation for the presence of PCBs in soil. He also inspected and supervised the removal of underground storage tanks, asbestos abatement projects, and sanitary system closures related to the facility decommissioning. Mr. Butler also conducted groundwater investigations and provided oversight during soil sampling, drilling and soil remediation activities.

New York City Department of Environmental Protection, Various Sites

Mr. Butler served as an Environmental Scientist for hazard investigation at seven sewage pump stations. Mr. Butler addressed a wide range of environmental concerns including asbestos, lead based paints, PCB oil, light ballasts, and other hazardous building materials. He conducted field investigations, sampling, and prepared Hazardous Materials Survey Reports for use during preparation of plans and specifications for proposed pump station construction projects.

Fresh Kills Landfill, Staten Island, New York

Mr. Butler participated in the field operations during pump and yield tests conducted on Cells 1 and 9. The tests were performed to determine the hydraulic properties of the landfill's refuse. He collected groundwater and leachate measurements in recovery wells and in adjacent observation wells under pumping and non-pumping conditions.

PREVIOUS EXPERIENCE

DECA Real Estate Advisors
Director of Environmental Services, 2011-2017

VHB Engineering, Surveying and Landscape Architecture PC, Hauppague NY
Senior Project Manager, 2005-2011

Parsons Brinkerhoff, Inc. New York NY
Senior Project Manager, 2004-2005

P.W. Grosser Consulting, Bohemia, NY
Senior Project Manager, 1998-2004

Eder Associates, Locust Valley, NY
Field Hydrogeologist, 1992-1998

EDUCATION

BS, Geology, Slippery Rock University of Pennsylvania, 1990

PROFESSIONAL REGISTRATIONS/CERTIFICATIONS

OSHA Certification, 40-hour Health & Safety Training at Hazardous Waste Sites

OSHA Certification, 8-hour Refresher Health & Safety Training at Hazardous Waste Sites

OSHA Confined Space Entry Training

Charles B. Sosik, PG, PHG, Principal

Professional Experience

25 years

Education

MS, Hydrogeology, Adelphi University, NY
BS, Geology, Northern Arizona University, AZ

Areas of Expertise

- Brownfields Redevelopment
- Hazardous Waste Site Investigations
- Pre-purchase Site Evaluations and Support
- Regulatory Negotiations
- Remedial Planning and "Cost to Cure" Analysis
- Strategic Planning
- Real Estate Transactions
- NYC "E" Designations

Professional Certification

- Professional Geologist, NH
- Professional Geologist, Hydrogeologist, WA
- OSHA 40-hr HAZMAT
- OSHA 8-hr. Supervisor
- NYC OER Qualified Environmental Professional

Professional Affiliation / Committees

- NYS Council of Professional Geologists (NYSCPG)
- Association of Groundwater Scientists & Engineers (AGSE)
- NYS RBCA Advisory Committee
- Massachusetts LSP Association
- New Hampshire Association of Professional Geologists
- Interstate Technology Regulatory Council/MTBE Team
- Environmental Business Association, Brownfields Task Force
- Part 375 Working Group

PROFILE

Mr. Sosik has 25 years of experience in environmental consulting. He specializes in advising clients on managing environmental compliance with federal, state, and municipal agencies and has successfully directed numerous investigation and remediation projects involving petroleum, pesticides, chlorinated solvents, heavy metals and radiologically activated media. His work included extensive three-dimensional investigations on MTBE, which have been used effectively to help shape public policy. He also has experience in applying models to groundwater related problems and has completed several large-scale projects to determine fate and transport of contaminants, establish spill scenarios, and closure criteria. His experience and expertise in the area of contaminant hydrogeology has resulted in requests from environmental attorneys, property owners and New York State to serve as an expert witness and technical advisor on a variety of legal disputes.

For the past 10 years Mr. Sosik has been primarily engaged in providing environmental consulting to developers responding to the extensive re-zoning of former industrial and commercial properties, which is currently taking place throughout New York City. These services include everything from pre-purchase evaluations and contract negotiations to gaining acceptance in and moving projects through the NYS Brownfields Program. Mr. Sosik has taken a pro-active role in the continued development of the NYS Brownfields Program and related policy, by attending numerous working seminars, active participation in work groups and task forces and by providing commentary to draft versions of new guidance documents. Throughout his professional career, Mr. Sosik has remained committed to developing innovative cost- efficient solutions to environmental issues, specifically tailored to the needs of his clients.

SELECTED PROJECTS

Scavenger Waste Treatment Facility (SWTF), Suffolk County, NY

Water Treatment Plant EIS - Focused EIS - In response to requests from the Suffolk County Council on Environmental Quality and the Brookhaven Conservation Advisory Council, Mr. Sosik prepared a focused EIS to evaluate the potential impacts to an important surface water resource from the proposed facility including cumulative and synergistic effects with established contaminant plumes in the area.

Advanced Residential Communities, Rockville Centre, NY

Brownfield Project – As the senior project manager on this large scale, high profile redevelopment project, Mr. Sosik was asked to develop a plan to accelerate the regulatory process in the face of general community opposition. Through numerous discussions with the BCP management team, He was able to condense the schedule and review period, through the submission of supporting documents (Investigation Report, Remedial Work Plan) with the BCP application package. Community opposition, which focused on the environmental condition of the site as a means to block the project, was used to advantage in expediting approval of the aggressive interim remedial plan. This will allow the developer to begin remedial work approximately 5 months ahead of schedule.

Former Temco Uniform site, West Haverstraw, NY

Brownfield Project – Mr. Sosik took over management of this project from another consultant following transition of this VCP site to the BCP. Mr. Sosik used the opportunity to renegotiate and revise the scope of work to allow a more cost effective and focused investigation plan without re-writing or resubmitting the RIWP. During the NYSDEC's review of the transition package, he met with and coordinated changes with the NYSDEC Project Manager to gain approval. The result saved the client a significant amount of money, but perhaps more importantly in this case, did so without loss of time.

Grovick Properties, Jackson Heights, NY

Brownfield Project – This Brownfield property is somewhat unique in that it had been investigated and partially remediated by the NYSDEC through the petroleum spill fund. The client was interested in purchasing the property and redeveloping it as office and retail space. Mr. Sosik reviewed the NYSDEC investigation and developed a supplemental plan to meet the requirements of an RI under the BCP program. By performing this limited amount of field work "up-front" he was able to complete an RI Report and Remedial Plan and submit both with the BCP application package. The NYSDEC and NYSDOH approved the RI Report and the Remedial Plan with minor changes. This cut 120 days from the review process and allowed the client to arrange financing and move his project forward knowing what the clean-up costs would be at the outset.

Metro Management, Bronx, NY

Brownfield Project – The site of a former gas station, the developer had planned to construct a 12-story affordable housing apartment complex with first floor retail space. Since the site was located in an Environmental zone, potential tax credits of 22% for site development, remediation and tangible property could be realized under the BCP. In a pre-application meeting with the NYSDEC, Mr. Sosik realized that the department did not believe the site was eligible for the BCP, since it had been previously investigated and closed under the spills program.

Mr. Sosik assisted the developer in securing financing, and due to the demands of an aggressive construction schedule developed an Interim Remedial Measure (IRM), based on chemical oxidation treatment. Working closely with the clients environmental counsel, Mr. Sosik was able to get the IRM approved without a public comment period. Implementation of the IRM is currently underway.

The project was awarded the 2009 NYC Brownfield Award for Innovation.

Brandt Airflex, NY

Technical Consulting Services - Mr. Sosik provided senior level technical advice and strategic planning in developing an off-site RI/FS for the site, in negotiating a tax reduction for the property due to the environmental condition and in preparing a cost to cure estimate for settlement between business partners. After achieving a favorable tax consideration and settlement agreement for his client

Allied Aviation Services, Dallas, Fort Worth, Airport, Dallas, TX

Jet Fuel Investigation - Mr. Sosik developed and managed an investigative plan to quickly identify the extent and source of jet fuel which was discharging from the Airport's storm drain system to a creek a mile away. Through the use of a refined conceptual model, accelerated investigative techniques and a flexible work plan, he was able to identify the source of the fuel and the migration route within a single week. He then identifed remedial options and successfully negotiated a risk based plan with the Texas regulatory agency that had issued a notice of enforcement action against the facility.

KeySpan – Former LILCO Facilities, Various NY Locations

Pesticide Impact Evaluation - Mr. Sosik developed, negotiated and implemented a site screening procedure to evaluate impact to public health and the environment as the result of past herbicide use at 211 utility sites. Using an unsaturated zone leaching model (PRZM) on a small subset of the sites, he was able to establish mass loading schedules for the remaining sites. This was combined with public well data in a GIS environment to perform queries with respect to mass loading, time transport and proximity to vunerable public supply wells. Using this approach Mr. Sosik was able to show that there were no concerns for future impact. This effort satisfied the public health and resource concerns of the state environmental agency and county health department in a reasonable amount of time and at a fraction of the cost of a full scale investigation.

Former Computer Circuits (Superfund) Site, Hauppauge, NY

CERCLA RI/FS - As Senior Project Manager for the site, he played a major role in regaining control of the investigation activites for the PRP. This action prevented the USEPA from initiating an extensive investigation at the site using a RAC II contractor allowing the client to perform a more efficient investigation. He was involved in all negotiations with EPA and was the project lead in developing a revised site characterization plan (work plan, field sampling plan, quality assurance plan, etc.). By carefully managing all phases of the investigation and continued interaction with each of the three regulatory agencies involved, Mr. Sosik was able to keep the project focused and incrementally reinforce the clients position. The estimated cost of the revised investigation is expected to save the client 1.5 to 2 million dollars.

Sun Oil, Seaford, NY

Remediation Consuliting Services & Project Management - Under an atmosphere of regulatory distrust, political pressure and mounting public hostility toward the client, Mr. Sosik conducted an off-site 3-D investigation to define the extent of contamination and the potential impact on public health. By designing and implementing an aggressive source area remediation program and personal interaction with the public and regulatory agencies, he was able to successfully negotiate a limited off-site remediation favorable to the client. Source area remediation was completed within 6 months and the project successfully closed without damage to the client's public image or working relationship with the regulatory agencies.

Con Edison, Various Locations, NY

Hydrogeologic Consulting Services - Under a general consulting contract, Mr. Sosik conducted detailed subsurface hydrogeologic investigations at five locations to assist in the development of groundwater contingency planning. He also developed and implemented work plans to investigate and remediate existing petroleum, cable fluid, and PCB releases at many of the generating facilities and substations. An important aspect of his role was in assisting the client in strategic planning and negotiations with the regulatory agency.

Keyspan - Tuthill Substation, Aqueboque, NY

Accelerated Site Characterization - Using accelerated site characterization techniques, Mr. Sosik presented the project as a case study in establishing the transport of an herbacide and its metobolites aplied at utility sites in the 1980's The results were then used to establish a screening method for evaluating 211 similar sites controlled by the client in a reasonable and eficient manner.

NYSDEC Spill, East Moriches, NY

Spill Release Analysis - With recognized expertise in the area of gasoline plume development on Long Island, Mr. Sosik was asked by the State to establish the release date (and principal responsible party) of an extensive petroleum spill, which impacted a residential neighborhood. He used multiple lines of evidence, and a new EPA model (HSSM), which he has helped to refine, to reconstruct the release scenario and spill date, in support of the State Attorney General's cost recovery effort from the PRP.

Minmilt Realty, Farmingdale, NY

Fate & Transport Modeling - He completed an RI/FS at this location for a PCE plume that had been in transit for over 30 years. Mr. Sosik applied a conservative model to evaluate time/concentration impacts under a variety of transport scenarios to a municipal wellfield located 13,000 feet away. Through the use of the model and careful interpretation of an extensive data set compiled from several sources, Mr. Sosik was able to propose a plan which was both acceptable to the regulator and favorable to the client.

Sebonack Golf Course Project, Town of Southampton, NY

IPM Pesticide Study - Provided professional hydrogeologic services in support of the EIS prepared for the development of the site. The proposed development included an 18-hole golf course, clubhouse, dormitory facility, cottages, associated structures, and a 6,000 square foot research station for Southampton College. Mr. Sosik performed an extensive evaluation (using a pesticide-leaching model) on the effects of pesticide and nitrogen loading to groundwater as part of the projects commitment to an Integrated Pest Management (IPM) approach.

NYSDEC, Spills Division, Regions 1 – 4

Petroleum Spills Investigation & Remediation - As a prime contractor/consultant for the NYSDEC in Regions 1-4, Mr. Sosik has managed the investigation and remediation of numerous petroleum spills throughout the State. Many of these projects required the development of innovative investigation and remediation techniques to achieve project goals. He was also involved in many pilot projects and research studies to evaluate innovative investigation techniques such as accelerated site characterization, and alternative approaches to remediation such as monitored natural attenuation and risk based corrective action.

Sun Oil, E. Meadow, NY

Exposure Assessment - Performed to seek closure of the spill file, despite the presence of contaminants above standards, Mr. Sosik determined after the extended assessment that the level of remaining contamination would not pose a future threat to human health or the environment. He used multiple lines of evidence, and a fate and transport model to show that degradation processes would achieve standards within a reasonable time.

Sand & Gravel Mine, NY

Property Development - As part of the development of a sand and gravel mine, Mr. Sosik provided environmental consulting services to assist in obtaining a mining permit, which would result in the construction of a 150-acre lake. Specifically, Mr. Sosik investigated if the proposed lake would reduce groundwater quantity to domestic and public well fields, and/or accelerate the migration of potential surface contaminants to the lower part of the aquifer. After assuming the lead role in negotiations with the regulatory agency, Mr. Sosik was able to obtain a permit for the client by adequately addressing water quality and quantity issues, and by preparing a monitoring plan and spill response plan, acceptable to all parties.

NYSDEC, Mamaroneck, NY

Site Characterization / Source Identification - In a complex hydrogeologic setting consisting of contaminant transport through fractured metomorphic bedrock and variable overburden materials, Mr. Sosik was able to develop and implement a sub-surface investigation to differentiate and separate the impact associated with each of two sources. The results of this investigation were successful in encouraging the spiller to accept responsibility for the release.

Riverhead Municipal Water District, NY

Site Characterization / Remedial Planning - Using accelerated characterization techniques, he implemented a 3-D site investigation to identify two service stations 4,000 ft. away as the source of contamination impacting a municipal wellfield. In accordance with the strict time table imposed by the need to return the wellfield to production by early spring, he designed and implemented a multi-point (9 RW, 6 IW) recovery and injection well system using a 3-d numerical flow model, and completed the project on time. Using a contaminant transport model, Mr. Sosik developed clean-up goals which were achieved in 9 months of operation, well below the projected 3 to 5 year project duration.

Montauk Fire Department, NY

Site Assessment - Mr. Sosik performed a limited investigation and used a 2-D flow model to demonstrate that the property could not have been the source of contamination which had impacted an adjacent wellfield as per the results of a previous investigation. This small focused effort successfully reversed a $500,000, and rising, claim against the department by the water district and the NYSDEC.

PREVIOUS EXPERIENCE

P.W. Grosser Consulting, Bohemia, NY
Senior Project Manager, 1999-2006

Environmental Assessment & Remediation, Patchogue, NY
Senior Project Manager, 1994-1999

Miller Environmental Group, Calverton, NY
Project Manager, 1989-1994

DuPont Biosystems, Aston, PA
Hydrogeologist, 1988-1989

Charles B. Sosik, PG, PHG, Principal

EXPERT WITNESS TESTIMONY AND DEPOSITIONS

Fact Witness -Testimony on relative age of petroleum spill based on nature and extent of residual and dissolved components at the Delta Service Station in Uniondale, NY Fall/1999

Expert Witness / Expert Report for defendant in cost recovery case by NYS Attorney General regarding a Class II Inactive Hazardous Waste (State Superfund) project by the NYSDEC (October 2004 – present, Report: March 2005, Deposition: April 2005, 2nd Report: Aug. 2013, 2nd Deposition Nov. 2013, Bench Trial: December 2013 - qualified as expert in Federal Court),

Expert Witness / Fact Witness for plaintiff seeking compensation for partial expenses incurred during the investigation and remediation of a USEPA CERCLA site due to the release and migration of contaminants from an "upgradient" industrial property. (Deposition May 2005, case settled April 2007).

Expert Witness / Fact Witness for NYS Attorney General with respect to cost recovery for a NYSDEC petroleum spill site in Holtzville, NY (Deposition April 2005 - case settled).

Expert Witness – Statement of opinion and expert testimony at trial for plaintiff seeking damages from a major oil corporation for contamination under a prior leasing agreement in Rego Park, NY. Case decided in favor of plaintiff. Trial July 2007, in favor of Plaintiff. Qualified as Expert.

Expert Witness / Fact Witness for NYS Attorney General with respect to cost recovery for a NYSDEC petroleum spill site in Lindenhurst, NY (Trial date Dec. 2009, in favor of plaintiff. Qualified as Expert State Supreme Court.

Expert Witness - for NYS Attorney General regarding NYSDEC cost recovery for a petroleum spill site at Riverhead, NY. Case settled July 2008.

Expert Witness for plaintiffs in class action case with respect to damages from chlorinated plume impact to residences in Dayton, OH. (Draft Report – May 2013).

Expert Witness / Fact Witness for defendant with respect to cost recovery and third party responsibility for a NYSDEC petroleum spill site in Lindenhurst, NY (Expert Statement of Fact – October 2005).

Expert Witness for plaintiff seeking damages related to a petroleum spill from the previous owner/operator of a gas station in College Point, NY. Case settled 2009.

Expert Witness for plaintiff (municipal water supply purveyor) seeking damages from major oil companies and manufacturer of MTBE at various locations in Suffolk County, NY. Expert reports July 2007, August 2007 and October 2007, Case settled August, 2008.

Expert Witness - Deposition for NYS Attorney General regarding NYSDEC cost recovery for a petroleum spill site at Sag Harbor, NY. August 2002

Expert Witness for defendant responding to a claim from adjacent commercial property owner on the origin of chlorinated solvents on plaintiff's property located in Cedarhurst, NY. Expert opinion submitted to lead counsel on March 6, 2009, case settled April 2009.

Expert Report - for Attorney General on modeling performed to determine the spill release scenario at a NYSDEC petroleum spill site in East Moriches, NY. June 2000.

Expert Witness - for plaintiff in case regarding impact to private wells from a spill at adjacent Town and County properties with open gasoline spill files in Goshen, NY. Expert report submitted August 2013.

Expert Witness for defendant with respect to cost recovery from Sunoco for a NYSDEC petroleum spill site. (Declaration – January 2013).

Expert Witness - for plaintiff (municipal water supply purveyor) seeking damages from Dow Chemical for PCE impact at various locations in Suffolk County, NY. Affidavit submitted 2011.

MODELING EXPERIENCE (PARTIAL LISTING)

PROJECT	MODEL	APPLICATION
Riverhead Water District, Riverhead, NY	MODFLOW, MODPATH	Remediation system design to intercept MTBE plume and prevent continued impact to municipal well field.
NYSDEC - Region 1, Holbrook, NY	MODFLOW, MODPATH	Simulate transport of MTBE plume to predict future impact.
NYSDEC - Region 1, East Moriches, NY	HSSM	Evaluate release scenario and start date of petroleum spill in support of cost recovery by NYS AG office.
AMOCO, Deer Park, NY	HSSM	Estimate release amount, start date and spill scenario to evaluate the potential for mass unaccounted for
Keyspan Energy, Nassau/Suffolk Counties Substations	PRZM	Estimate mass load of simazine used at 211 electric substations and screen sites according to potential for human health and ecological impacts.
Saboneck Golf Club, Southampton NY	PRZM	Estimate mass load of proposed pesticides on new golf course to evaluate acceptability under an IPM program.
Suffolk County Department of Public Works (SCDPW) Scavenger Waste Treatment Plant, Yaphank, NY	DYNFLOW, DYNTRAC	Evaluate time-transport and nitrogen impact on local river system.
SCDPW SUNY Waste Water Treatment Plant, Stony Brook, NY	DYNFLOW, DYNTRAC	Determine outfall location and time-transport of nitrogen from proposed upgrades to an existing wastewater treatment plant
Water Authority of Great Neck North Great Neck, NY	MODFLOW, MODPATH, MT3D	Review of modeling study performed by EPA to evaluate potential future impact to Well field from PCE plume. Identified serious flaws in model construction and implementation, which invalidated conclusions

PUBLICATIONS / PROFESSIONAL PAPERS

Smart Pump & Treat Strategy for MTBE Impacting a Public Water Supply (14th Annual Conference on Contaminated Soils Proceedings, 1998)
Transport & Transformation of BTEX & MTBE in a Sand Aquifer (Groundwater Monitoring & Remediation 05/1998)
Characteristics of Gasoline Releases in the Water Table Aquifer of Long Island (Petroleum Hydrocarbons Conference Proceedings, 1999)
Field Applications of the Hydrocarbon Spill Screening Model (HSSM) (USEPA Interactive Modeling Web Course www.epa.gov/athens/software/training/webcourse Authored module on model application and applied use of calculators, 02/2000)
Comparative Evaluation of MTBE Sites on Long Island, US EPA Workshop on MTBE Bioremediation (Cincinnati, 02/2000)
Comparison of Four MTBE Plumes in the Upper Glacial Aquifer of Long Island (American Geophysical Union, San Francisco, 12/1996)
Analysis and Simulation of the Gasoline Spill at East Patchogue, New York (American Geophysical Union, San Francisco, 12/1998)

EBC

ENVIRONMENTAL BUSINESS CONSULTANTS

Chawinie Reilly, Project Manager / Industrial Hygienist

Professional Experience
EBC: March 2013
Prior: 8 years

Education
Bachelor of Science, Health Sciences, Concentration in Environmental Health and Safety, Stony Brook University, NY

Areas of Expertise
- Remedial Investigation Work Plans, Remedial Investigation Reports, Remedial Action Work Plans
- Phase I / Property Condition Assessments
- Occupational Health and Safety Sampling
- Indoor Air Quality (IAQ) Investigations
- Mold Investigations and Remediation
- Soil and Ground Water Investigations
- Noise Studies
- Lead Paint and Asbestos Surveys
- Hazardous Materials Assessments

Professional Certification
- OSHA 40-hr HAZWOPER
- NYS Asbestos Inspector
- NYC Asbestos Investigator
- USEPA Lead Inspector
- USEPA Lead Risk Assessor
- OSHA 10-hr Construction Health and Safety
- Hazard Analysis and Critical Control Point (HACCP) Certified

PROFILE

Mrs. Reilly has 13 year's experience as an environmental consultant/contractor and has worked on and managed a wide range of environmental projects. Major responsibilities include Remedial Investigation Work Plans, Remedial Investigation Reports, Remedial Action Work Plan and Noise Remedial Action Work Plans. Mrs. Reilly has conducted Phase Is and Property Condition Assessments for commercial, industrial, and residential properties in New York, New Jersey and Connecticut. In addition, Mrs. Reilly has conducted various IAQ, asbestos, mold and occupational health and safety sampling investigations for a variety of city, state, federal and private clients.

PREVIOUS EXPERIENCE

The Louis Berger Group, New York, New York-Industrial Hygienist, 2008-2013
AEI Consultants, Jersey City, New Jersey- Environmental Scientist, 2005-2008

ATTACHMENT D
Community Air Monitoring Plan

COMMUNITY AIR MONITORING PLAN

HOPE STREET PROJECT
BROOKLYN, NY

AUGUST - 2020

Prepared on behalf of:

Hope Keap LLC
C/O Clipper Equity
4311 12th Avenue, Suite 1L
Brooklyn, NY 11219

Prepared by:

EBC

ENVIRONMENTAL BUSINESS CONSULTANTS
RIDGE, NY 11961

COMMUNITY AIR MONITORING PLAN
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APPENDICES

1.0 INTRODUCTION

This Community Air Monitoring Plan (CAMP) has been prepared for the excavation and remediation activities to be performed under a Remedial Action Work Plan (RAWP). The CAMP provides measures for protection for the downwind community (i.e., off-site receptors including residences, businesses, and on-site workers not directly involved in the remedial activities) from potential airborne contaminant releases resulting from remedial activities at the site.

Compliance with this CAMP is required during remedial activities that have the potential to generate airborne particulate matter and volatile organic compounds (VOCs). These activities include soil excavation / loading and tank removal. This CAMP has been prepared to ensure that remedial activities do not adversely affect passersby, residents, or workers in the area immediately surrounding the Site and to preclude or minimize airborne migration of site-related contaminants to off-site areas.

1.1 Regulatory Requirements

This CAMP was established in accordance with the following requirements:

- New York State Department of Health's (NYSDOH) Generic Community Air Monitoring Plan as presented in DER-10 Technical Guidance for Site Investigation and Remediation (NYSDEC May 3, 2010). This guidance specifies that a community air-monitoring program shall be implemented to protect the surrounding community and to confirm that the work does not spread contamination off-site through the air;

- New York State Department of Environmental Conservation (NYSDEC) DER-10 Technical Guidance for Site Investigation and Remediation: This guidance provides a basis for developing and implementing a fugitive dust suppression and particulate monitoring program as an element of a hazardous waste site's health and safety program.

2.0 AIR MONITORING

Petroleum related VOCs / SVOCs, chlorinated VOCs and SVOCs and heavy metals are the constituents of concern at the Site. The appropriate method to monitor air for these constituents during remediation activities is through real-time VOC and air particulate (dust) monitoring.

The continuous monitoring locations for VOCs and particulates must reflect the nearest potentially exposed individuals and the location of ventilation system intakes for nearby structures.

2.1 Meteorological Data

At a minimum, wind direction will be evaluated at the start of each workday, noon of each workday, and the end of each workday. These readings will be utilized to position the monitoring equipment in appropriate upwind and downwind locations.

2.2 Community Air Monitoring Requirements

To establish ambient air background concentrations, air will be monitored at several locations around the site perimeter before activities begin. These points will be monitored continuously in series during the site work. The perimeter monitoring points will be located to represent the nearest potentially exposed individuals at the downwind location.

Fugitive respirable dust will be monitored using a MiniRam Model PDM-3 aerosol monitor (or equivalent). Air will be monitored for VOCs with a portable miniRAE 3000 photoionization detector (PID), or equivalent. All air monitoring data will be documented in a site log book by the designated site safety officer. The site safety officer or delegate must ensure that air monitoring instruments are calibrated and maintained in accordance with manufacturer's specifications. All instruments will be zeroed daily and checked for accuracy. A daily log will be kept. If additional monitoring is required, the protocols will be developed and appended to this plan.

3.0 VOC MONITORING, RESPONSE LEVELS, AND ACTIONS

Volatile organic compounds (VOCs) will be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis. Upwind concentrations will be measured at the start of each workday and periodically thereafter to establish background conditions. The monitoring work will be performed using equipment appropriate to measure the types of contaminants known or suspected to be present.

The equipment will be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment will be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

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

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

- If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown. All 15-minute readings must be recorded and be available for State (DEC and DOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

- If total VOC concentrations opposite the walls of occupied structures or next to the intake vents exceed 1 ppm, monitoring should occur within the occupied structure(s) (if access is granted by owner or occupants). Background readings in the occupied spaces must be taken prior to the commencement of the planned work. Any unusual background readings should be discussed with NYSDOH prior to the commencement of the work.

All readings will be recorded and made available for NYSDEC and NYSDOH personnel to review. If an exceedance of the Action Limits occurs, an Action Limit Report, as shown in Appendix A, will be completed.

3.1 Potential Corrective Measures and VOC Suppression Techniques

If the 15-minute integrated VOC level at the downwind location persists at a concentration that exceeds the upwind level by more than 5 ppm but less than 25 ppm during remediation activities, then vapor suppression techniques will be employed. The following techniques, or others, may be employed to mitigate the generation and migration of fugitive organic vapors:

- limiting the excavation size;
- limiting the drop-height when loading soil into trucks;
- spraying chemical odorants onto the soil;
- covering soil stockpiles with 6-mil plastic sheeting or tarps;
- hauling waste materials in properly tarped containers; and/or
- applying vapor suppressant foam.

4.0 PARTICULATE MONITORING

Air monitoring for particulates (i.e., dust) will be performed continuously during excavation and loading activities using both air monitoring equipment and visual observation at upwind and downwind locations. Monitoring equipment capable of measuring particulate matter smaller than 10 microns (PM10) and capable of integrating (averaging) over periods of 15 minutes or less will be set up at upwind (i.e., background) and downwind locations, at heights approximately four to five feet above land surface (i.e., the breathing zone). Monitoring equipment will be MIE Data Ram monitors, or equivalent. The audible alarm on the particulate monitoring device will be set at 90 micrograms per cubic meter (µg/m3). This setting will allow proactive evaluation of worksite conditions prior to reaching the action level of 100 µg/m^3 above background. The monitors will be calibrated at least once per day prior to work activities and recalibrated as needed thereafter. In addition, fugitive dust migration will be visually assessed during all intrusive work activities.

The following summarizes particulate action levels and the appropriate responses:

- If the downwind PM-10 particulate level is 100 µg/m^3 greater than background (upwind perimeter) for the 15-minute period, or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 µg/m^3 above the upwind level and provided that no visible dust is migrating from the work area.

- If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 µg/m^3 above the upwind level, work must be stopped and an evaluation of activities initiated. Work can resume provided that dust suppression measures (as described in Section 2.3.1 below) and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 µg/m^3 of the upwind level and in preventing visible dust migration.

- If the total particulate concentrations opposite the walls of occupied structures or next to intake vents exceeds 150 µg/m^3, work activities should be suspended until controls are implemented and are successful in reducing the total particulate concentration to 150 µg/m^3 or less at the monitoring point.

All readings will be recorded and be available for NYSDEC and NYSDOH personnel to review. If an exceedance of the Action Limits occurs, an Action Limit Report as shown in **Appendix A** will be completed.

4.1 Potential Particulate Suppression Techniques

If the integrated particulate level at the downwind location exceeds the upwind level by more than 100 µg/m^3 at any time during remediation activities, then dust suppression techniques will be employed. The following techniques, or others, may be employed to mitigate the generation and migration of fugitive dusts:

- limiting the excavation size;

- spraying water onto the excavation faces and equipment;
- covering soil stockpiles with plastic sheeting or tarps;
- Use of gravel paths / roadways;
- hauling waste materials in properly tarped containers; and/or
- limiting vehicle speeds onsite.

Work may continue with dust suppression techniques provided that downwind PM_{10} levels are not more than 150 $\mu g/m^3$ greater than the upwind levels.

There may also be situations where the dust is generated by remediation activities and migrates to downwind locations, but is not detected by the monitoring equipment at or above the action level. Therefore, if dust is observed leaving the working area, dust suppression techniques such as those listed above will be employed.

If dust suppression techniques do not lower particulates to below 150 $\mu g/m^3$, or visible dust persists, work will be suspended until appropriate corrective measures are identified and implemented to remedy the situation.

All air monitoring readings will be recorded in the field logbook and will be available for the NYSDEC and NYSDOH personnel to review.

5.0 DATA QUALITY ASSURANCE

5.1 Calibration

Instrument calibration shall be documented on instrument calibration and maintenance sheets or in the designated field logbook. All instruments shall be calibrated as required by the manufacturer. Calibration checks may be used during the day to confirm instrument accuracy. Duplicate readings may be taken to confirm individual instrument response.

5.2 Operations

All instruments shall be operated in accordance with the manufacturer's specifications. Manufacturers' literature, including an operations manual for each piece of monitoring equipment will be maintained on-site by the SSO for reference.

5.3 Data Review

The SSO will interpret all monitoring data based the established criteria and his/her professional judgment. The SSO shall review the data with the PM to evaluate the potential for worker exposure, upgrades/downgrades in level of protection, comparison to direct reading instrumentation and changes in the integrated monitoring strategy.

Monitoring and sampling data, along with all sample documentation will be periodically reviewed by the PM.

6.0 RECORDS AND REPORTING

All air readings must be recorded on daily air monitoring log sheets and made available for review by personnel from NYSDEC and NYSDOH.

APPENDIX A
ACTION LIMIT REPORT

CAMP
ACTION LIMIT REPORT

Project Location: ______________________________

Date: ____________________ Time: ____________________

Name: ____________________

Contaminant: ____________________ PM-10: __________ VOC: ____________________

Wind Speed: ____________________ Wind Direction: ______________

Temperature: ____________________ Barometric Pressure: __________

DOWNWIND DATA

Monitor ID #: ____________________ Location: __________ Level Reported: ______________

Monitor ID#: ____________________ Location: __________ Level Reported: ______________

UPWIND DATA

Monitor ID #: ____________________ Location: __________ Level Reported: ______________

Monitor ID#: ____________________ Location: __________ Level Reported: ______________

BACKGROUND CORRECTED LEVELS

Monitor ID #: Location: ______________ Level Reported: Level Reported: ________________

ACTIONS TAKEN

ATTACHMENT E
Citizen Participation Plan

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

Brownfield Cleanup Program

Citizen Participation Plan
for
Hope Street Project

January 2019

C224281
118, 120, 130, and 138 Hope Street; and 429 Keap Street [aka 134 Hope Street]
Brooklyn
Kings County, New York

Prepared by:

AKRF

AKRF, Inc.
440 Park Avenue South, 7th Floor
New York, NY 10016
(212) 696-0670

Table of Contents

* * * * *

Note: The information presented in this Citizen Participation (CP) Plan (CPP) was current as of the date of its approval by the New York State Department of Environmental Conservation (NYSDEC). Portions of this CPP may be revised during the site's investigation and cleanup process.

Applicant: **Hope Keap LLC ("Applicant")**
Site Name: **Hope Street Project ("Site")**
Site Address: **118, 120, 130, and 138 Hope Street; and 429 Keap Street [aka 134 Hope Street]**
Site County: **Kings**
Site Number: **C224281**

1. What is New York's Brownfield Cleanup Program (BCP)?

New York's BCP works with private developers to encourage the voluntary cleanup of contaminated properties known as "brownfields" so that they can be reused and developed. These uses include recreation, housing, and business.

A *brownfield* is any real property that is difficult to reuse or redevelop because of the presence or potential presence of contamination. Typically, a brownfield is a former industrial or commercial property where operations may have resulted in environmental contamination. A brownfield can pose environmental, legal, and financial burdens on a community. If a brownfield is not addressed, it can reduce property values in the area and affect the economic development of nearby properties.

The BCP is administered by the New York State Department of Environmental Conservation (NYSDEC), which oversees Applicants who conduct brownfield site investigation and cleanup activities. An Applicant is a person or entity who has requested to participate in the BCP and has been accepted by NYSDEC. The BCP contains investigation and cleanup requirements, ensuring that cleanups protect public health and the environment. When NYSDEC certifies that these requirements have been met, the property can be used or developed for the intended use.

For more information about the BCP, go online at: http://www.dec.ny.gov/chemical/8450.html.

2. Citizen Participation (CP) Activities

Why NYSDEC Involves the Public and Why It Is Important

NYSDEC involves the public to improve the process of investigating and cleaning up contaminated sites, and to enable citizens to participate more fully in decisions that affect their health, environment, and social well-being. NYSDEC provides opportunities for citizen involvement and encourages early two-way communication with citizens before decision makers form or adopt final positions.

Involving potentially affected and/or interested citizens in site investigation and cleanup programs is important for many reasons. These reasons include:

- Promoting the development of timely and effective site investigation and cleanup programs that protect public health and the environment;
- Improving public access to, and understanding of, issues and information related to a particular site and that site's investigation and cleanup process;
- Providing citizens with early and continuing opportunities to participate in NYSDEC's site investigation and cleanup process;

- Ensuring that NYSDEC makes site investigation and cleanup decisions that benefit from input that reflects the interests and perspectives found within the affected community; and
- Encouraging dialogue to promote the exchange of information among the affected/interested public, state agencies, and other interested parties that strengthens trust among the parties, increases understanding of site and community issues and concerns, and improves decision-making.

This Citizen Participation (CP) Plan (CPP) provides information about how NYSDEC will inform and involve the public during the investigation and cleanup of the Site identified above. The public information and involvement program will be carried out with assistance, as appropriate, from the Applicant.

Project Contacts

Appendix A identifies NYSDEC project contacts to whom the public should address questions or request information about the Site's investigation and cleanup program. The public's suggestions about this CPP and the CP program for the Site are always welcome. Interested people are encouraged to share their ideas and suggestions with the project contacts at any time.

Locations of Reports and Information

The locations of the reports and information related to the Site's investigation and cleanup program also are identified in Appendix A. These locations provide convenient access to important project documents for public review and comment. Some documents may be placed on the NYSDEC website. If this occurs, NYSDEC will inform the public in a fact sheet and/or by other means, as appropriate.

Site Contact List

Appendix B contains the Site contact list. The Site contact list has been developed to keep the community informed about, and involved in, the Site's investigation and cleanup process. The Site contact list will be used periodically to distribute fact sheets that provide updates about the status of the project. These will include notifications of upcoming activities at the Site (such as fieldwork), as well as availability of project documents and announcements about public comment periods.

The Site contact list includes, at a minimum:

- Chief executive officer and planning board chairperson of each county, city, town, and village in which the Site is located;
- Any residents, owners, and/or occupants of the Site, and properties adjacent to the Site;
- The public water supplier which services the area in which the Site is located;
- Any person who has requested to be placed on the Site contact list;
- The administrator of any school or day care facility located on or near the Site for purposes of posting and/or dissemination of information at the facility; and

- The location(s) of reports and information.

The Site contact list will be reviewed periodically and updated as appropriate. Individuals and organizations will be added to the Site contact list upon request. Such requests should be submitted to the NYSDEC project contact(s) identified in Appendix A. Other additions to the Site contact list may be made at the discretion of the NYSDEC project manager in consultation with other NYSDEC staff, as appropriate.

Note: The first Site fact sheet [usually related to the draft Remedial Investigation Work Plan (RIWP)] is distributed both by paper mailing through the postal service and through DEC Delivers, NYSDEC's email listserv service. The fact sheet includes instructions for signing up with the appropriate county listserv to receive future notifications about the Site. See http://www.dec.ny.gov/chemical/61092.html.

Subsequent fact sheets about the Site will be distributed exclusively through the listserv, except for households without internet access that have indicated the need to continue to receive Site information in paper form. Please advise the NYSDEC Site project manager identified in Appendix A if that is the case. Paper mailings may continue during the investigation and cleanup process for some sites, based on public interest and need.

Citizen Participation (CP) Activities

The table at the end of this section identifies the CP activities, at a minimum, that have been and/or will be conducted during the Site's investigation and cleanup program. The flow chart, provided as Appendix D, shows how these CP activities integrate with the Site investigation and cleanup process. The public is informed about the CP activities through fact sheets and notices distributed at significant points during the program. Elements of the investigation and cleanup process that match up with the CP activities are explained briefly in Section 5.

- **Notices and fact sheets** help the interested and affected public to understand contamination issues related to a site, and the nature and progress of efforts to investigate and clean up a site.
- **Public forums, comment periods, and contact with project managers** provide opportunities for the public to contribute information, opinions and perspectives that have potential to influence decisions about a site's investigation and cleanup.

The public is encouraged to contact project staff at any time during the Site's investigation and cleanup process with questions, comments, or requests for information.

This CPP may be revised due to changes in major issues of public concern identified in Section 3 or in the nature and scope of investigation and cleanup activities. Modifications may include additions to the Site contact list and changes in planned CP activities.

Technical Assistance Grant (TAG)

NYSDEC must determine if the Site poses a significant threat to public health or the environment. This determination generally is made using information developed during the investigation(s) of the Site, as described in Section 5.

If the Site is determined to be a significant threat, a qualifying community group may apply for a TAG. The purpose of a TAG is to provide funds to the qualifying group to obtain independent technical assistance. This assistance helps the TAG recipient to interpret and understand existing environmental information about the nature and extent of contamination related to the Site and the development/implementation of a remedy.

An eligible community group must certify that its membership represents the interests of the community affected by the Site, and that its members' health, economic well-being, and/or enjoyment of the environment may be affected by a release or threatened release of contamination at the Site.

As of the date the declaration (page 2) was signed by the NYSDEC project manager, the significant threat determination for the Site had not yet been made.

To verify the significant threat status of the Site, the interested public may contact the NYSDEC project manager identified in Appendix A.

For more information about TAGs, go online at http://www.dec.ny.gov/regulations/2590.html.

Note: The table identifying the CP activities related to the Site's investigation and cleanup program is shown on the next page.

Citizen Participation (CP) Activities	Timing of CP Activity(ies)
Application Process:	
• Prepare site contact list • Establish document repository(ies)	At time of preparation of application to participate in the BCP.
• Publish notice in Environmental Notice Bulletin (ENB) announcing receipt of application and 30-day public comment period • Publish above ENB content in local newspaper • Mail above ENB content to site contact list • Conduct 30-day public comment period	When NYSDEC determines that BCP application is complete. The 30-day public comment period begins on date of publication of notice in ENB. End date of public comment period is as stated in ENB notice. Therefore, ENB notice, newspaper notice, and notice to the site contact list should be provided to the public at the same time.
After Execution of Brownfield Site Cleanup Agreement (BCA):	
• Prepare Citizen Participation (CP) Plan (CPP)	Before start of Remedial Investigation (RI) **Note:** Applicant must submit CPP to NYSDEC for review and approval within 20 days of the effective date of the BCA.
Before NYSDEC Approves Remedial Investigation (RI) Work Plan (RIWP):	
• Distribute fact sheet to site contact list about proposed RI activities and announcing 30-day public comment period about draft RIWP. • Conduct 30-day public comment period	Before NYSDEC approves RIWP. If RIWP is submitted with application, public comment periods will be combined and public notice will include fact sheet. Thirty-day public comment period begins/ends as per dates identified in fact sheet.
After Applicant Completes RI:	
• Distribute fact sheet to site contact list that describes RI results	Before NYSDEC approves RI Report (RIR)
Before NYSDEC Approves RIWP:	
• Distribute fact sheet to site contact list about draft RIWP and announcing 45-day public comment period • Public meeting by NYSDEC about proposed RIWP (if requested by affected community or at discretion of NYSDEC project manager) • Conduct 45-day public comment period	Before NYSDEC approves RIWP. Forty-five day public comment period begins/ends as per dates identified in fact sheet. Public meeting would be held within the 45-day public comment period.
Before Applicant Starts Cleanup Action:	
• Distribute fact sheet to site contact list that describes upcoming cleanup action	Before the start of cleanup action.
After Applicant Completes Cleanup Action:	
• Distribute fact sheet to site contact list that announces that cleanup action has been completed and that NYSDEC is reviewing the Final Engineering Report (FER) • Distribute fact sheet to site contact list announcing NYSDEC approval of FER and issuance of Certificate of Completion (COC)	At the time the cleanup action has been completed. **Note:** The two fact sheets are combined when possible if there is not a delay in issuing the COC.

3. Major Issues of Public Concern

This section of the CPP identifies major issues of public concern that relate to the Site. Additional major issues of public concern may be identified during the course of the Site's investigation and cleanup process.

The Site is part of Census Tract 513. According to the 2009-2013 American Community Survey (ACS) Profile Survey Data, 17% of the population in Census Tract 513 is living below the poverty line, compared to the national poverty rate of 11.3% and the New York State poverty rate of 14.2%. The unemployment rate for Census Tract 513 is 5.5%, compared to the New York City unemployment rate of 4.4% (as of March 2017) and the national unemployment rate of 4.1% (as of April 2018).

The Williamsburg neighborhood in Brooklyn, New York was first developed for manufacturing and industrial uses in the early 1900's. The 2005 Greenpoint-Williamsburg Rezoning action, which encompasses a larger area including the Site, outlines a plan for the construction of low- to mid-rise housing to replace the decline of manufacturing and industrial operations in an economically beneficial manner. The proposed development of the Site includes the construction of a new residential building with a mix of affordable and market-rate units. The proposed end use of the Site is consistent with the Greenpoint-Williamsburg Rezoning.

The Site is located within a Special Mixed-Use District (MX-8), which was designed to: encourage investment in mixed residential and industrial neighborhoods; promote the opportunity for workers to live in the vicinity of their work; create new opportunities for mixed-use neighborhoods; recognize and enhance the vitality and character of existing and potential mixed-use neighborhoods; and promote the most desirable use of land in accordance with a plan to conserve its value of land and buildings, thereby protecting New York City tax revenue. The proposed end use of the Site is consistent with the objectives of the Special Mixed-Use District.

The July 2013 Subsurface Investigation Report prepared by FPM Group, Ltd. (FMP) concluded that contaminated soil and soil vapor are present at the Site. Groundwater was not sampled as part of the investigation. Chlorinated solvents and petroleum-related compounds, likely used during historic operations at the Site, were detected in on-site soil vapor. Other compounds, including semivolatile organic compounds (SVOCs) and metals, in soil/fill appear to be related to historic Site operations and/or filling with material of unknown origin.

The presence of contamination creates an impediment to development due to added costs related to remediation and construction time and risk. Under the de Blasio Administration, the development of affordable housing has become a major initiative for the City. Once remediation of Site contamination is completed, the Site redevelopment plan would be in line with the City's initiatives for affordable housing.

The proposed development plan consists of the construction of a seven-story building with mechanical space in the partial cellar on the northeastern portion of the Site; residential amenities and a lobby on the first floor; and residential units above. Approximately 20 percent of the units will consist of inclusionary housing. The proposed building will occupy the southern and western portion of the Site with tenant parking spaces on the northeastern portion of the Site. Excavation is expected to extend to approximately 12 feet below grade at the location of the partial cellar with localized deeper excavation for an elevator bay, and up to approximately 5 feet in the area of the slab-on-grade portion of the building and parking/driveway areas. The current zoning designation is M1-2/R6A (light manufacturing and residential). The proposed use is consistent with existing zoning for the Site and the objectives of the 2005 Greenpoint-Williamsburg Rezoning action.

Potential Remediation/Construction-Related Issues

Issues of concern during the on-site remediation phase will likely include those related to the on-site handling and off-site disposal of soil/fill. The likely concern to the surrounding community will be the possibility of the generation of vapors or particulates from the Site during remediation. On-site air quality and airborne particulate levels will be monitored during all soil/fill excavation and removal activities in accordance with a Site-specific Health and Safety Plan (HASP), which will be approved by NYSDEC and the New York State Department of Health (NYSDOH) prior to excavation. Particulate suppression techniques will be employed to prevent the generation of airborne particulates, as needed. All air monitoring will be performed in accordance with a Site-specific Community Air Monitoring Plan (CAMP) that will be included as part of a NYSDEC-approved Remedial Action Work Plan (RAWP) and NYSDOH's generic CAMP.

A likely additional remediation/construction concern will be the potential presence of trucks traveling through the community, and parking or idling at or near the Site during soil/fill excavation and disposal. The RAWP will include provisions for on-site soil handling techniques that minimize the number of trucks and duration of time within or near the Site. In addition, provisions will be included to restrict truck traffic (to the extent possible) to designated routes along main roads while minimizing traffic within the community.

The concern over construction-related noise is a common one for communities in which redevelopment is occurring. Construction plans will minimize noise to the extent possible and the operation of heavy equipment will be restricted to normal working hours, as mandated in required City-issued permits.

4. Site Information

Site Description

The "Hope Street Project" project site is located at 118, 120, and 130 Hope Street; and 138 Hope Street/429 Keap Street [aka 134 Hope Street] in the Williamsburg neighborhood of Brooklyn, New York. The Site was formerly identified as Brooklyn Tax Block 2386, Lots 7, 12, and 14 on the New York City Tax Map; however, an application for merger was filed with the New York City Department of Finance (NYCDOF) on June 13, 2018, which combined former Lots 7, 12, and 14 into Lot 7.

The Site is 20,034.68-square feet and consists of three adjoining, unpaved and fenced vacant lots. The Site is rectangular in shape and is bounded by Hope Street to the north followed by residential buildings; Keap Street to the east followed by residential and commercial buildings; residential buildings followed by Grand Street to the south; and residential and commercial buildings followed by Rodney Street to the west. The Site is located in a developed area predominantly consisting of residential and commercial properties with some manufacturing uses. Appendix C contains a map identifying the location of the Site.

History of Site Use, Investigation, and Cleanup

The Site is currently vacant. Historic records indicate the Site was divided into several lots developed with one- and two-story residences on the eastern portion and by the Matson and Hibbard Foundry with a molding shop on the western portion by 1887. By 1905, Brooklyn Coal Company was shown with coal sheds on the southwestern portion, a wagon shed on the central portion of the Site, and a wheel wright shop with a lumber shed and wagon painting on the western portion. By 1942, the Site was developed as two garages with a 550-gallon underground storage tank (UST) at 120 Hope Street (former Lot 7) and a gasoline tank at 138 Hope Street/429 Keap Street (former Lot 14). By 1951, 138 Hope Street/429 Keap Street (former Lot 14) was shown as a steel warehouse. By 2007, two gasoline tanks were shown at 138 Hope Street/429 Keap Street (former Lot 14) and the Site was depicted as three flats.

City Directory listings indicate that 120 Hope Street (former Lot 7) was formerly occupied by a garage between 1928 and 1949, a service garage in 1960, an electrical manufacturing company between 1965 and 1973, an upholsterer between 1976 and 1992, a machinery shop between 1997 and 2014, and a metal fabricator between 2000 and 2014; and 128 Hope Street (also former Lot 7) was occupied by Terriss Consolidated Industries Inc. between 1965 and 1976. 130 Hope Street (former Lot 12) was occupied by DC Center Corp. (a dry cleaner) between 2000 and 2005 and a dry cleaner in 2010. 429 Keap Street (former Lot 14) was occupied by a trucking company in 1945, a steel service company in 1949, a taxi company in 1960, and a plumbing and heating company in 1965 to 1976; and 138 Hope Street (former Lot 14) was occupied by Parkway Equipment Handlers between 1997 and 2005 and by World Trade Copiers Corp. between 2010 and 2014. The listings indicated that surrounding area was developed historically with residential, commercial, manufacturing, automotive, and woodworking uses.

FPM conducted a Subsurface Investigation at the Site and prepared a Subsurface (Phase II) Investigation Report in July 2013. The investigation included the advancement of eight soil borings with the collection and laboratory analysis of eight soil samples; and the installation of four temporary sub-slab soil vapor probes with the collection and laboratory analysis of four soil vapor samples. The July 2013 Subsurface Investigation Report prepared by FPM concluded that contaminated soil and soil vapor are present at the Site. Groundwater was not sampled as part of the investigation. Chlorinated solvents and petroleum-related VOCs, likely used during historic operations at the Site, were detected in on-site soil vapor. The semivolatile organic compounds SVOCs and metals in soil appear to be related to historic Site operations and/or filling with material of unknown origin.

Subsurface materials generally consisted of historic fill material, including sand with silt, clay, concrete, brick, gravel, and porcelain to boring termination depths, with the exception of one soil boring, where apparent native material (sand, silt, and clay) was reportedly observed below the fill. Field evidence of contamination, including elevated photoionization detector (PID) readings, petroleum-like odors, and dark staining, was observed in soil borings B-1 in the former cellar on the northwestern portion of the Site and B-4 on the north-central portion of the Site.

The results of the investigation identified elevated concentrations of SVOCs and heavy metals above Restricted Residential Soil Cleanup Objectives (RRSCOs) in soil across the Site. Petroleum- and solvent-related VOCs were detected in soil vapor at elevated concentrations. As of the date of this CPP, no cleanup activities have occurred at the Site.

5. Investigation and Cleanup Process

Application

The Applicant has applied for and been accepted into New York's BCP as a Participant. This means that the Applicant was the owner of the Site at the time of the disposal or discharge of contaminants, or was otherwise liable for the disposal or discharge of the contaminants. The Participant must fully characterize the nature and extent of contamination on-site, as well as the nature and extent of contamination, if any, that has migrated from the Site. The Participant must also conduct a "qualitative exposure assessment," a process that characterizes the actual or potential exposures of people, fish, and wildlife to contaminants on the Site and to contamination that has migrated from the Site.

The Applicant, in its Application, proposes that the Site will be used for restricted residential purposes.

To achieve this goal, the Applicant will conduct investigation and cleanup activities at the Site with oversight provided by NYSDEC. The Brownfield Cleanup Agreement (BCA), executed by NYSDEC and the Applicant, sets forth the responsibilities of each party in conducting these activities at the Site.

Investigation

The Applicant will conduct an investigation of the Site, officially called a "Remedial Investigation" (RI). The RI will be performed with NYSDEC oversight. The Applicant developed an RI Work Plan (RIWP), which was subject to public comment.

The RI has several goals:

1) Define the nature and extent of contamination in soil, groundwater, soil vapor, and any other parts of the environment that may be affected;
2) Identify the source(s) of the contamination;
3) Assess the impact of the contamination on public health and the environment; and
4) Provide information to support the development of a proposed remedy to address the contamination or the determination that cleanup is not necessary.

The Applicant submitted a Draft RIWP to NYSDEC for review and approval. NYSDEC made the Draft RIWP available to the public review during a 45-day public comment period, concurrently with the BCP Application.

When the RI is complete, the Applicant will prepare and submit a report called an RI Report (RIR) that summarizes the results. The RIR will recommend whether cleanup action is needed to address Site-related contamination. The RIR is subject to review and approval by NYSDEC.

NYSDEC will use the information from the RIR to determine if the Site poses a significant threat to public health and/or the environment. If the Site is a "significant threat", it must be cleaned up using a remedy selected by NYSDEC from an analysis of alternatives prepared by the Applicant and approved by NYSDEC. If the Site does not pose a significant threat, the Applicant may select the remedy from the approved analysis of alternatives.

Interim Remedial Measure (IRM)

An IRM is an action that can be undertaken at a Site when a source of contamination or exposure pathway can be effectively addressed before the Site investigation and analysis of alternatives are completed. If an IRM is likely to represent all or a significant part of the final remedy, NYSDEC will require a 30-day public comment period.

Remedy Selection

When the investigation of the Site has been determined to be complete, the project likely would proceed in one of two directions:

1. The Applicant may recommend in its RIR that no action is necessary at the Site. In this case, NYSDEC would make the RIR available for public comment for 45 days. NYSDEC then would complete its review, make any necessary revisions, and, if appropriate, approve the RIR. NYSDEC would then issue a "Certificate of Completion" (described below) to the Applicant.

or

2. The Applicant may recommend in its RIR that action needs to be taken to address Site contamination. After NYSDEC approves the RIR, the Applicant may then develop a cleanup plan, officially called a Remedial Action Work Plan (RAWP). The RAWP describes the Applicant's proposed remedy for addressing contamination related to the Site.

When the Applicant submits a Draft RAWP for approval, NYSDEC will announce the availability of the draft plan for public review during a 45-day public comment period.

Cleanup Action

NYSDEC will consider public comments, and revise the Draft RAWP, if necessary, before approving the proposed remedy. The NYSDOH must concur with the proposed remedy. After approval, the proposed remedy becomes the selected remedy. The selected remedy is formalized in the Site-specific Decision Document (DD).

The Applicant may then design and perform the cleanup action to address the Site contamination. NYSDEC and NYSDOH oversee these activities. When the Applicant completes cleanup activities, it will prepare a Final Engineering Report (FER) that certifies that cleanup requirements have been achieved or will be achieved within a specific time frame. NYSDEC will review the FER to be certain that the cleanup is protective of public health and the environment for the intended use of the Site.

Certificate of Completion (COC)

When NYSDEC is satisfied that cleanup requirements have been achieved or will be achieved for the Site, it will approve the FER. NYSDEC then will issue a COC to the Applicant. The COC states that cleanup goals have been achieved and relieves the Applicant from future liability for Site-related contamination, subject to certain conditions. The Applicant would be eligible to redevelop the Site after it receives a COC.

Site Management

The purpose of Site management is to ensure the safe reuse of the property if contamination will remain in place. Site management is the last phase of the Site cleanup program. This phase begins when the COC is issued. Site management incorporates any institutional controls (ICs) and/or engineering controls (ECs) required to ensure that the remedy implemented for the Site remains protective of public health and the environment. All significant activities are detailed in a Site Management Plan (SMP).

An *institutional control* (IC) is a non-physical restriction on use of the Site, such as a deed restriction that would prevent or restrict certain uses of the property. An IC may be used when the cleanup action leaves some contamination that makes the Site suitable for some, but not all uses.

An *engineering control* (EC) is a physical barrier or method to manage contamination. Examples include: caps, covers, barriers, fences, and treatment of groundwater.

Site management also may include the operation and maintenance of a component of the remedy, such as a system that pumps and treats groundwater. Site management continues until NYSDEC determines that it is no longer needed.

Appendix A
Project Contacts and Locations of Reports and Information

Project Contacts

For information about the Site's investigation and cleanup program, the public may contact any of the following project staff:

New York State Department of Environmental Conservation (NYSDEC):

Michael MacCabe, P.E. Project Manager Division of Environmental Remediation NYSDEC 625 Broadway Albany, NY 12233-7016 Tel: (518) 402-9687 Email: Michael.maccabe@dec.ny.gov	Thomas Panzone Citizen Participation Specialist NYSDEC Region 2 1 Hunters Point Plaza 47-40 21st Street Long Island City, NY 11101 Tel: (718) 482-4953 Email: Thomas.panzone@dec.ny.gov

New York State Department of Health (NYSDOH):
Dawn Hettrick, P.E.
Project Manahger
NYSDOH
Empire State Plaza
Corning Tower Room 1787
Albany, NY 12237
Tel: (518) 402-7860
Email: dawn.hettrick@health.ny.gov

Locations of Reports and Information

The facilities identified below are being used to provide the public with convenient access to important project documents:

Brooklyn Public Library, Leonard Branch 81 Devoe Street Brooklyn, New York 11211 Managing Librarian: Alexa Orr (718) 486-6006	Brooklyn Community Board District 1 435 Graham Avenue Brooklyn, New York 11211 Chairperson: Gerald A. Esposito bk01@cb.nyc.gov (718) 389-0009

Appendix B
Site Contact List

Local, State, and Federal Officials

Mayor Bill de Blasio Mayor of New York City City of New York 1 Centre Street New York, NY 10007-1200	Scott M. Stringer New York City Comptroller Office of the Comptroller, City of New York 1 Centre Street New York, NY 10007
Eric L. Adams Brooklyn Borough President 209 Joralemon Street Brooklyn, New York 11201	Martin Malavé Dilan NY State Senator, 18th District 142-01 Rockaway Boulevard South Ozone Park, New York 11436
Antonio Reynoso New York City Council District 34 76 Knickerbocker Avenue Brooklyn, New York 11207	Maritza Davila NY State Assemblywoman, District 53 619 Lorimer Street Brooklyn, New York 11211
Department of City Planning Brooklyn Borough Office 16 Court Street, 7th Floor Brooklyn, New York 11241	Department of City Planning City Government Office 120 Broadway, 31st Floor New York, NY 10271
Governor Andrew M. Cuomo NYS State Capitol Building Albany, New York 12224	NYSDEC, Division of Environmental Remediation 625 Broadway Albany, New York 12233
Nydia M. Velázquez U.S. House of Representatives, District 7 2234 Rayburn House Office Building Washington, DC 20515	Charles Schumer U.S. Senate 322 Hart Senate Office Building Washington, DC 20510
Kirsten Gillibrand U.S. Senate 478 Russell Senate Office Building Washington, DC 20510	Mark McIntyre, Director Mayor's Office of Environmental Remediation 100 Gold Street, 2nd Floor New York, NY 10038

Residents, Owners, and Occupants of the Site and Adjacent Properties

The Site is currently owned by Hope Keap LLC % Heatherwood Luxury Rentals, located at 58 Vanderbilt Parkway, Suite 100, Commack, New York 11725. A list of adjacent properties and their owners and occupants is provided below:

Adjacent to the north:	Adjacent to the south/southwest:
Block 2374, Lot 1 123 Hope Street Owner (Owner) % Adam America Real Estate Attn: Omri Sachs 850 Third Avenue, Suite 13D New York, NY 11556 Current Occupant(s) 432 Rodney Street Brooklyn, New York 11211 Block 2374, Lot 31 123 Hope Street Owner (Owner) % Adam America Real Estate Attn: Omri Sachs 850 Third Avenue, Suite 13D New York, NY 11556 Current Occupant(s) 123 Hope Street Brooklyn, New York 11211 Block 2374, Lot 28 Keap Retail Owner LLC (Owner) % Slate Property Group LLC Attn: Martin Nussbaum 850 Third Avenue, Suite 16B New York, NY 10022 Current Occupant(s)	Block 2386, Lot 18 Barchester Realty Corp. (Owner) 425 Keap Street Brooklyn, New York 11211 Current Occupant(s) 425 Keap Street Brooklyn, New York 11211 Block 2386, Lot 21 Grand Street Units LLC (Owner) 183 Wilson Street, Suite 133 Brooklyn, New York 11211 Current Occupant(s) 431 Grand Street Brooklyn, New York 11211 Block 2386, Lot 23 Felix M. Morales (Owner) 425 Grand Street Brooklyn, New York 11211 Current Occupant(s) 425 Grand Street Brooklyn, New York 11211 Adjacent to the south/southwest

<table>
<tr>
<td>129 Hope Street
Brooklyn, New York 11211

<u>Block 2374, Lot 27</u>

Keap Retail Owner LLC (Owner)
℅ Slate Property Group LLC
Attn: Martin Nussbaum
850 Third Avenue, Suite 16B
New York, NY 10022

Current Occupant(s)
441 Keap Street
Brooklyn, New York 11211</td>
<td rowspan="2"><u>(continued):</u>

<u>Block 2386, Lot 24</u>

Dana Schwister (Owner)
423 Grand Street
Brooklyn, New York 11211

Current Occupant(s)
423 Grand Street
Brooklyn, New York 11211

<u>Block 2386, Lot 25</u>

Candice Harder (Owner)
419 Grand Street
Brooklyn, New York 11211

Current Occupant(s)
419 Grand Street
Brooklyn, New York 11211

<u>Block 2386, Lot 26</u>

Grand Sax Realty LLC (Owner)
34 West 22nd Street, 5th Floor
New York, NY 10010

Current Occupant(s)
417 Grand Street
Brooklyn, New York 11211

<u>Block 2386, Lot 27</u>

Jose L. Montemuino (Owner)
415 Grand Street
Brooklyn, New York 11211

Current Occupant(s)
415 Grand Street
Brooklyn, New York 11211</td>
</tr>
<tr>
<td><u>Adjacent to the northeast:</u>

<u>Block 2375, Lot 1</u>

Keap The Hope, LLC (Owner)
487 Greenwich Street, Apartment 5A
New York, NY 10013

Current Occupant(s)
450 Keap Street
Brooklyn, New York 11211</td>
</tr>
</table>

Adjacent to the east:	Adjacent to the west:
Block 2387, Lot 2 Hope Street Holdings, LLC (Owner) 505 Flushing Avenue, Apt 1D Brooklyn, New York 11205 Current Occupant(s) 426 Keap Street Brooklyn, New York 11211 Block 2387, Lot 7501 Owner 441 Grand Street Brooklyn, New York 11211 Current Occupant(s) 441 Grand Street Brooklyn, New York 11211	Block 2386, Lot 2 Rojas Family Trust (Owner) 424 Rodney Street Brooklyn New York 11211 Current Occupant(s) 424 Rodney Street Brooklyn New York 11211 Block 2386, Lot 3 Jo-Ann D. Chavez (Owner) 426 Rodney Street Brooklyn New York 11211 Current Occupant(s) 426 Rodney Street Brooklyn New York 11211 Block 2386, Lot 4 Melissa Rojas (Owner) 428 Rodney Street Brooklyn New York 11211 Current Occupant(s) 428 Rodney Street Brooklyn New York 11211

Local News Media

Brooklyn Daily Eagle 16 Court Street, Suite 1208 Brooklyn, New York 11241	WABC-TV 7 Lincoln Square New York, NY 10023
New York 1 News 75 Ninth Avenue New York, NY 10011	1010 Wins – CBS Radio 345 Hudson Street New York, NY 10014
The New York Times 229 West 43rd Street New York, NY 10036	WNYW Fox 5 205 East 67th Street New York, NY 10021
New York Daily News 4 New York Plaza New York, NY 10004	WNBC News 4 30 Rockefeller Plaza, 7th Floor New York, NY 10112

Public Water Supply

Public water is provided by The City of New York, Department of Environmental Protection located at:
New York City Department of Environmental Protection
Bureau of Environmental Planning and Analysis
59-17 Junction Boulevard, 11th Floor
Flushing, New York 11373

Nearby Day Care Centers

Two By Two Childcare Academy 418 Keap Street Brooklyn, New York 11211 (718) 388-5600 Twobytwogrand@yahoo.com Distance: 30 feet west of the Site	Williamsburg Northside Infant & Toddler Center 70 Havenmeyer Street Brooklyn, New York 11249 (718) 313-0052 info@willnorth.org Distance: 910 feet northeast of the Site
Awesome Bunnies Childcare Center 349 Keap Street Brooklyn, New York 11211 (718) 676-0800 Distance: 1,030 feet south-southwest of the Site	JCC Brooklyn at North Williamsburg Preschool 14 Hope Street, Apt. 1 Brooklyn, New York 11211 (718) 407-6388 Williamsburg@jcc-brooklyn.org Distance: 1,175 feet south-southwest of the Site
Kiddie Academy of Williamsburg 288 South 5th Street Brooklyn, New York 11211 (718) 599-5437 Distance: 1,530 feet southwest of the Site	Young Garden Daycare 11 Meserole Street Brooklyn, New York 11206 (347) 987-4720 Distance: 1,660 feet southeast of the Site
Stagg Street Center For Children 77 Stagg Street Brooklyn, New York 11206 (718) 388-1395 Daycare77@aol.com Distance: 1,750 feet east-southeast of the Site	Small World Day Care Center 211 Ainslie Street Brooklyn, New York 11211 (718) 963-0330 Distance: 1,995 feet west-northwest of the Site

Nearby K-12 Schools

Brooklyn Arbor School 325 South 3rd Street Brooklyn, New York 11211 Principal: Eva Irizarry (718) 963-0393 Distance: 920 feet south-southwest of the Site	Williamsburg Northside Lower & Middle School 299 North 7th Street Brooklyn, New York 11211 Directors: Nicole Arndt (Lower School) and Libby Hixon (Middle School) (718) 599-9600 Distance: 985 feet north of the Site
P.S. 319 360 Keap Street Brooklyn, New York 11211 Principal: Aleyda Zamora Martinez (718) 388-1588 Distance: 895 feet south-southeast of the Site	P.S. 19 Roberto Clemente 325 South 3rd Street Brooklyn, New York 11211 Principal: Angela Olden Camiolo (718) 387-7820 Distance: 920 feet south-southwest of the Site
Williamsburg Northside Preschool 299 North 7th Street Brooklyn, New York 11211 Director: Bridget Lambrechts (718) 599-7300 Distance: 985 feet north of the Site	Acorn Community High School 561 Grand Street Brooklyn, New York 11211 Principal: Andrea Piper (718) 789-2258 Distance: 1,000 feet west-southwest of the Site
Williamsburg High School for Architecture and Design 257 North 6th Street Brooklyn, New York 11211 Principal: Noah Lansner (718) 388-1260 Distance: 1,050 feet northwest of the Site	Williamsburg/Brooklyn Preparatory High School 257 North 6th Street Brooklyn, New York 11211 Principal: Noah Lansner (718) 486-2550 Distance: 1,050 feet northwest of the Site
Conselyea Preparatory School (M.S. 577) 208 North 5th Street Brooklyn, New York 11211 Principal: Maria Masullo (718) 486-6221 Distance: 1,340 feet northwest of the Site	P.S. 132 The Conselyea School 320 Manhattan Avenue Brooklyn, New York 11211 Principal: Beth Lubeck (718) 599-7301 Distance: 1,340 feet northeast of the Site
J.H.S 050 John D. Wells 183 South 3rd Street Brooklyn, New York 11211 Principal: Benjamin Honoroff	Success Academy Williamsburg 183 South 3rd Street Brooklyn, New York 11211 Founder: Eva Moskowitz

(718) 387-4184 Distance: 1,680 feet west-southwest of the Site	(718) 704-1419 Distance: 1,680 feet west-southwest of the Site
P.S. 18 Edward Bush 101 Maujer Street Brooklyn, New York 11206 Principal: Alison Alexander (718) 387-3241 Distance: 1,850 feet east-southeast of the Site	The Brooklyn Latin School 223 Graham Avenue Brooklyn, New York 11206 Head Master: Gina Mautschke-Mitchell (718) 366-0154 Distance: 2,440 feet southwest of the Site

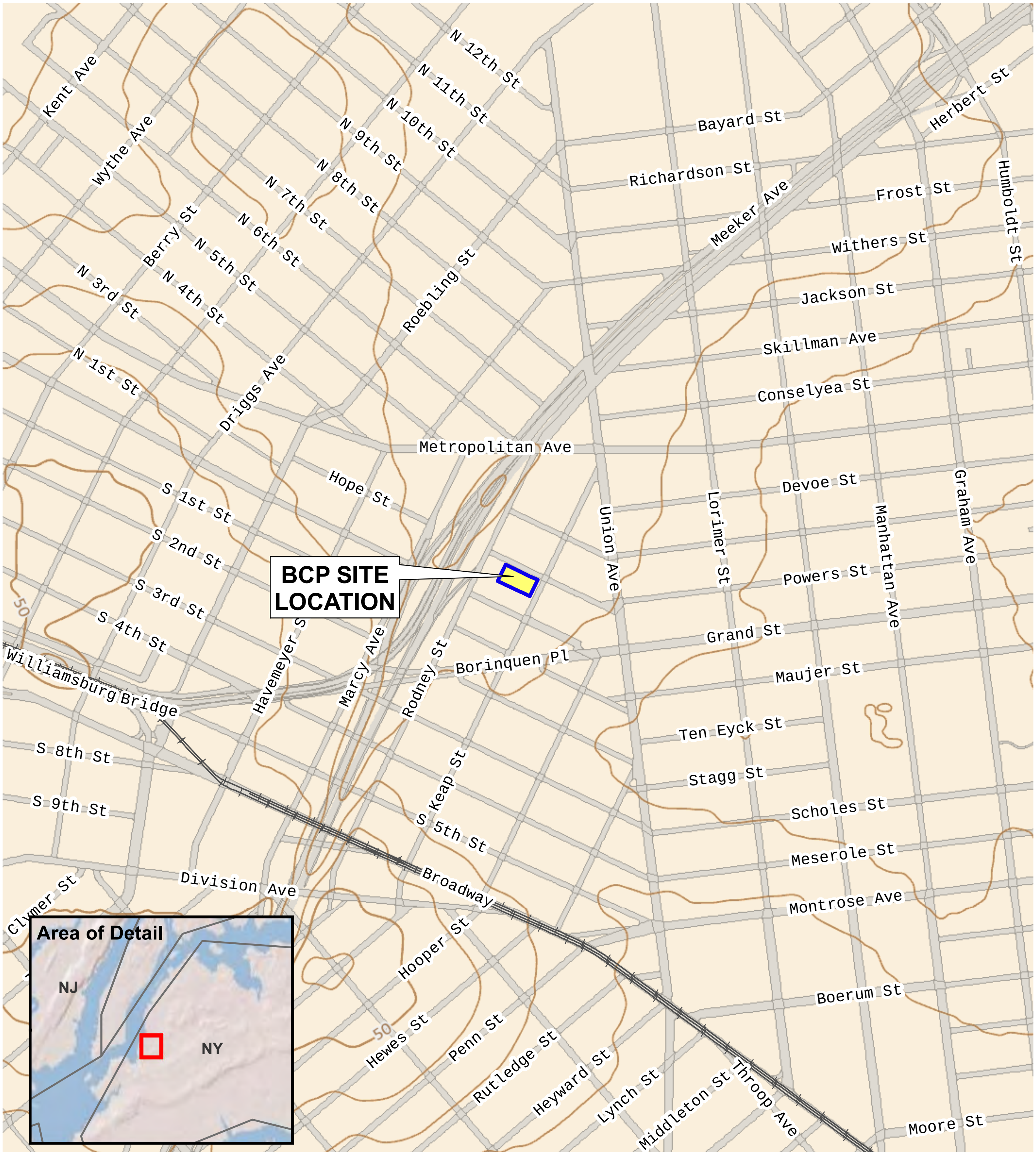
Document Repositories

Brooklyn Public Library, Leonard Branch 81 Devoe Street Brooklyn, New York 11211 Managing Librarian: Alexa Orr (718) 486-6006	Brooklyn Community Board District 1 435 Graham Avenue Brooklyn, New York 11211 Chairperson: Gerald A. Esposito bk01@cb.nyc.gov (718) 389-0009

Local Community Board

Brooklyn Community Board District 1
435 Graham Avenue
Brooklyn, New York 11211
Chairperson: Gerald A. Esposito
bk01@cb.nyc.gov
(718) 389-0009

Appendix C
Site Location Map



Map Source: USGS Topo base map service from The National Map

0 800 1,600

SCALE IN FEET

©2019 AKRF W:\Projects\180129 - HOPE KEAP\Technical\GIS and Graphics\Hazmat\180129 Fig 1 BCP Site Loc Map.mxd 1/29/2019 11:00:59 AM mveilleux

AKRF

440 Park Avenue South, New York, NY 10016

Hope Street Project
118, 120, and 130 Hope Street
and 138/429 Keap Street (aka 134 Hope Street)
Brooklyn, New York

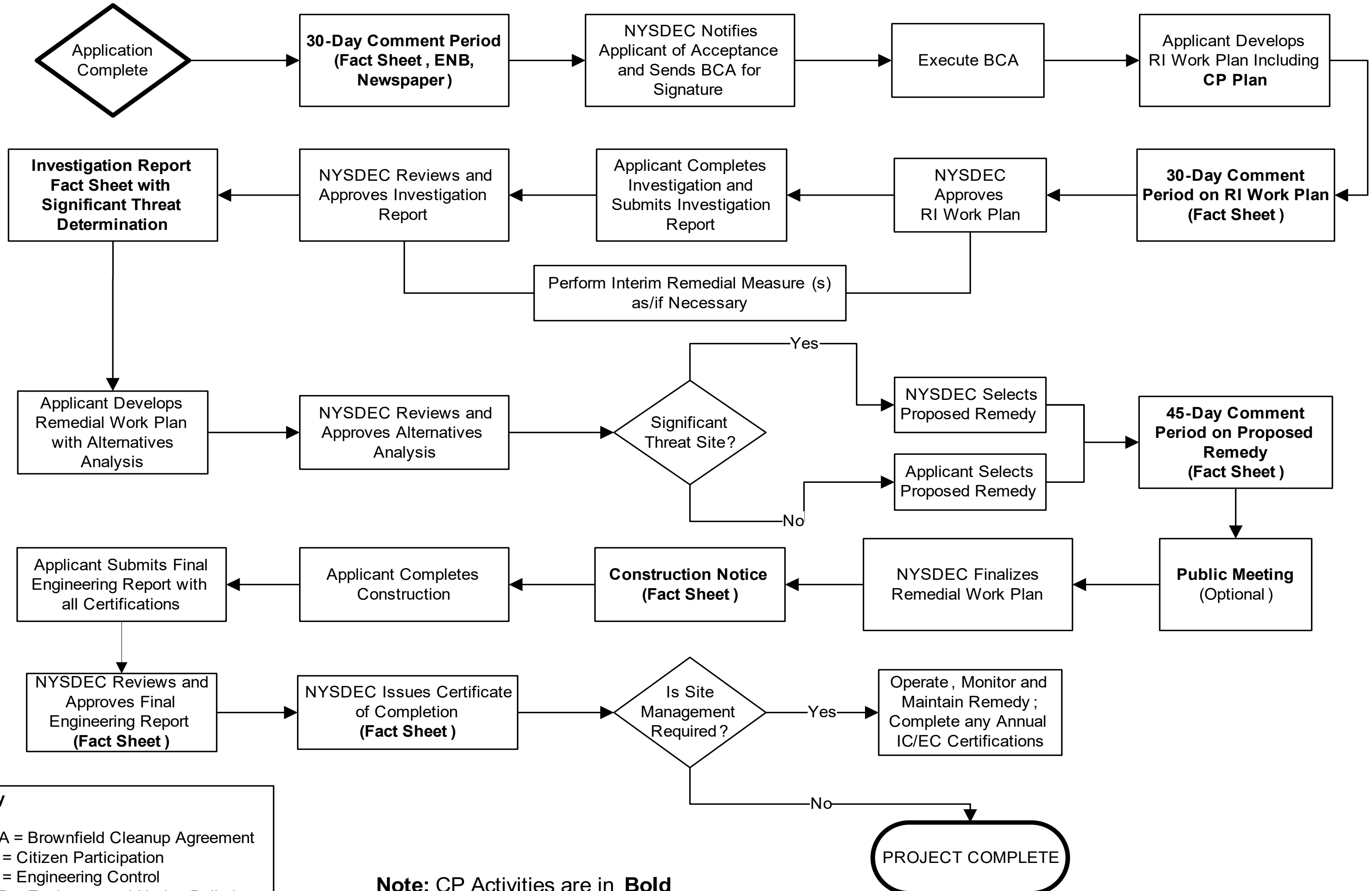
BCP SITE LOCATION MAP

DATE
1/29/2019

PROJECT NO.
180129

APPENDIX C

Appendix D– Brownfield Cleanup Program Process



Note: CP Activities are in **Bold**

Key

BCA = Brownfield Cleanup Agreement
CP = Citizen Participation
EC = Engineering Control
ENB = Environmental Notice Bulletin
IC = Institutional Control
RI = Remedial Investigation

Division of Environmental Remediation

Remedial Programs
Scoping Sheet for Major Issues of Public Concern

Instructions

This Scoping Sheet assesses major issues of public concern; impacts of the site and its remedial program on the community; community interest in the site; information the public needs; and information needed from the public.

The information generated helps to plan and conduct required citizen participation (CP) activities, and to choose and conduct additional CP activities, if appropriate. The scoping sheet can be revisited and updated as appropriate during the site's remedial process to more effectively implement the site's CP program.

Note: Use the information as an aid to prepare and update the Major Issues of Public Concern section of the site CP Plan.

General Instructions

- When to prepare: During preparation of the CP Plan for the site. It can be revisited and updated anytime during the site remedial process.
- Fill in site name and other information as appropriate.
- The Scoping Sheet may be prepared by DEC or a remedial party, but must be reviewed and approved by the DER site project manager or his/her designee.

Instructions for Numbered Parts

Consider the bulleted issues and questions below and any others that may be unique or appropriate to the site and the community to help complete the five Parts of this Scoping Sheet. Identify the issue stakeholders in Parts 1 through 3 and adjust the site's contact list accordingly.

Part 1. List Major Issues of Public Concern and Information the Community Wants.

- Is our health being impacted? (e.g. Are there problems with our drinking water or air? Are you going to test our water, yards, sumps, basements? Have health studies been done?)
- There are odors in the neighborhood. Do they come from the site and are they hazardous?
- Are there restrictions on what we may do (e.g. Can our children play outside? Can we garden? Must we avoid certain areas? Can we recreate (fish, hunt, hike, etc. on/around the site?)
- How and when were the site's contamination problems created?
- What contaminants are of concern and why? How will you look for contamination and find out where it is going? What is the schedule for doing that?
- The site is affecting our property values!
- How can we get more information (e.g. who are the project contacts?)
- How will we be kept informed and involved during the site remedial process?
- Who has been contacted in the community about site remedial activities?
- What has been done to this point? What happens next and when?
- The site is going to be cleaned up for restricted use. What does that mean? We don't want redevelopment on a "dirty" site.

Part 2. List Important Information Needed From the Community, if Applicable.

- Can the community supplement knowledge about past/current uses of the site?
- Does the community have knowledge that the site may be significantly impacting nearby people, properties, natural resources, etc.?
- Are activities currently taking place at the site or at nearby properties that may need to be restricted?
- Who may be interested or affected by the site that has not yet been identified?
- Are there unique community characteristics that could affect how information is exchanged?
- Does the community and/or individuals have any concerns they want monitored?
- Does the community have information about other sources in the area for the contamination?

Part 3. List Major Issues and Information That Need to be Communicated to the Community.

- Specific site investigation or remediation activities currently underway, or that will begin in the near future.
- The process and general schedule to investigate, remediate and, if applicable, redevelop the site.
- Current understanding about the site contamination and effects, if any, on public health and the environment.
- Site impacts on the community and any restrictions on the public's use of the site and/or nearby properties.
- Planned CP activities, their schedule, and how they relate to the site's remedial process.
- Ways for the community to obtain/provide information (document repositories, contacts, etc.).

Part 4. Community Characteristics

a. - e. Obtain information from local officials, property owners and residents, site reports, site visits, "windshield surveys," other staff, etc.

f. Has the affected community experienced other **significant** present or past environmental problems unrelated to this site? Such experiences could significantly affect public concerns and perspectives about the site; how the community will relate to project staff; the image and credibility of project staff within the community; and the ways in which project staff communicate with the community.

g. In its remedial programs, DER seeks to integrate, and be consistent with, environmental justice principles set forth in *DEC Commissioner Policy 29 on Environmental Justice* and *DER 23 – Citizen Participation Handbook for Remedial Programs*. Is the site and/or affected community wholly or partly in an Environmental Justice (EJ) Area? Use the Search feature on DEC's public web site for "environmental justice". DEC's EJ pages define an EJ area, and link to county maps to help determine if the site and/or community are in an EJ area.

h. Consider factors such as:

- Is English the primary language of the affected community? If not, provisions should be considered regarding public outreach activities such as fact sheets, meetings, door-to-door visits and other activities to ensure their effectiveness.
- The age demographics of the community. For example, is there a significant number of senior citizens in the community? It may be difficult for some to attend public meetings and use document repositories. This may suggest adopting more direct interaction with the community with activities such as door-to-door visits, additional fact sheets, visits to community and church centers, nursing homes, etc.
- How do people travel about the community? Would most people drive to a public meeting or document repository? Is there adequate public transportation?

Part 5. Affected/Interested Public.

Individuals and organizations who need or want information and input can change during the site's remedial process. This need is influenced by real, potential, or perceived impacts of the site or the remedial process. Some people may want information and input throughout the remedial process. Others may participate only during specific remedial stages, or may only be interested in particular issues.

It is important to revisit this question when reviewing this scoping sheet. Knowing who is interested in the site – and the issues that are important to them – will help to select and conduct appropriate outreach activities, and to identify their timing and the information to be exchanged.

Check all affected/interested parties that apply to the site. **Note: Adjust the site's contact list appropriately.** The following are some ways to identify affected/interested parties:

- Tax maps of adjacent property owners
- Attendees at public meetings
- Telephone discussions
- Letters and e-mails to DER, the remedial party, and other agencies
- Political jurisdictions and boundaries
- Media coverage
- Current/proposed uses of site and/or nearby properties (recreational, commercial, industrial)
- Discussions with community organizations: grass roots organizations, local environmental groups, environmental justice groups, churches, and neighborhood advisory groups

Division of Environmental Remediation

Remedial Programs
Scoping Sheet for Major Issues of Public Concern (see instructions)

Site Name: Hope Street Project

Site Number: C224281

Site Address and County: 118, 120, 130, and 138 Hope Street; and 429 Keap Street [aka 134 Hope Street], Kings County

Remedial Party(ies): Hope Keap LLC

Note: For Parts 1. – 3. the individuals, groups, organizations, businesses and units of government identified should be added to the site contact list as appropriate.

Part 1. List major issues of public concern and information the community wants. Identify individuals, groups, organizations, businesses and/or units of government related to the issue(s) and information needs. **Use this information as an aid to prepare or update the Major Issues of Public Concern section of the site Citizen Participation Plan.**

- The Site is proposed to be redeveloped for restricted residential and commercial uses. As such, there will be restrictions on Site use, which will be determined following remediation.
- The Site's contamination issues stem from commercial uses and historical filling throughout its history.
- A Remedial Investigation (RI) will be conducted to determine the nature and extent of on-site contamination, identify the source(s), assess the impact on public health and/or the environment, and support the Remedial Action Work Plan (RAWP) to remediate the Site. The RI will be completed in accordance with the approved proposed project schedule.
- Contact information is located in Appendix A.
- Adjacent property occupants and owners will be kept informed about the progress of the Site cleanup activities. Periodic fact sheets will be sent by mail.
- Local, state, and federal officials will be contact about the Site remediation activities.
- The Site will be cleaned up to levels that are safe for the proposed restricted residential use. Certain uses will be restricted and will be determined once cleanup is complete.

How were these issues and/or information needs identified?
Based upon previous investigations and NYSDEC/NYSDOH requirements.

Part 2. List important information needed **from** the community, if applicable. Identify individuals, groups, organizations, businesses and/or units of government related to the information needed.

- Adjacent property owners and occupants will be informed of the Site remediation activities. They can reach out to the Site's NYSDEC or NYSDOH project manager if they are concerned about the impact to the surrounding area.
- No activities are taking place at the Site that may need to be restricted. The Site is currently vacant and will remain so until it is remediated and redeveloped.
-The Site is located in an area with a large Hispanic-American community. As such, all fact sheets will be translated into Spanish.

How were these information needs identified?

- An RI will be conducted following NYSDEC approval of an RIWP.
- Following the RI, an RIR and RAWP will be prepared and submitted to NYSDEC for approval. A 45-day

Public Comment Period begins once the RIR and RAWP are submitted. The final RIR and RAWP are submitted to NYSDEC and then NYSDEC issues the Decision Document, which describes the selected remedy for cleanup of the Site. Remediation can begin after the Decision Document is issued. Redevelopment of the Site may begin once the Site remediation is complete.
- Document repositories, where copies of all documents regarding the investigation and remediation of the Site are available to the public, have been established at the Clason's Point branch of the New York Public Library located at 1215 Morrison Avenue, Bronx, New York 10472 and at Bronx Community Board located at 1967 Turnbull Avenue, Bronx, New York 10473.

Part 3. List major issues and information that need to be communicated **to** the community. Identify individuals, groups, organizations, businesses and/or units of government related to the issue(s) and/or information.
- An RI will be conducted following NYSDEC approval of an RIWP.
- Following the RI, an RIR will be submitted to NYSDEC and NYSDOH, and a fact sheeting, including a significant threat determination, will be distributed. A RAWP will be prepared and submitted to NYSDEC for approval. A 45-day Public Comment Period begins once the RIR and RAWP are submitted. The RAWP will be submitted to NYSDEC and then NYSDEC will issue the Decision Document, which describes the selected remedy for cleanup of the Site. Remediation can begin after the Decision Document is issued. Redevelopment of the Site may begin concurrently with or following completion of the remedial activities.
- Document repositories, where copies of all documents regarding the investigation and remediation of the Site are available to the public have been established at the Brooklyn Public Library, Leonard Branch at 81 Devoe Street Brooklyn, New York 11211; and at Bronx Community Board 1 located at 435 Graham Avenue, Brooklyn, New York 11211.

How were these issues and/or information needs identified?
These needs were identified by summarizing the proposed project schedule and information presented in the BCP Application.

Part 4. Identify the following characteristics of the affected/interested community. This knowledge will help to identify and understand issues and information important to the community, and ways to effectively develop and implement the site citizen participation plan (mark all that apply):

a. Land use/zoning at and around site:
☒ **Residential** ☐ **Agricultural** ☐ **Recreational** ☒ **Commercial** ☒ **Industrial**

b. Residential type around site:
☒ **Urban** ☐ **Suburban** ☐ **Rural**

c. Population density around site:
☐ **High** ☒ **Medium** ☐ **Low**

d. Water supply of nearby residences:
☒ **Public** ☐ **Private Wells** ☐ **Mixed**

e. Is part or all of the water supply of the affected/interested community currently impacted by the site?
☐ **Yes** ☒ **No**

Provide details if appropriate:
Water supply is not local.

f. Other environmental issues significantly impacted/impacting the affected community?
☐ **Yes** ☒ **No**

Provide details if appropriate:
Click here to enter text.

g. Is the site and/or the affected/interested community wholly or partly in an Environmental Justice Area?
☐ **Yes** ☒ **No**

h. Special considerations:
☐ **Language** ☐ **Age** ☐ **Transportation** ☐ **Other**

Explain any marked categories in **h:**
Click here to enter text.

Part 5. The site contact list must include, at a minimum, the individuals, groups, and organizations identified in Part 2. of the Citizen Participation Plan under 'Site Contact List'. Are *other* individuals, groups, organizations, and units of government affected by, or interested in, the site, or its remedial program? (Mark and identify all that apply, then adjust the site contact list as appropriate.)

☐ **Non-Adjacent Residents/Property Owners:** Click here to enter text.

☐ **Local Officials:** Click here to enter text.

☐ **Media:** Click here to enter text.

☐ **Business/Commercial Interests:** Click here to enter text.

☐ **Labor Group(s)/Employees:** Click here to enter text.

☐ **Indian Nation:** Click here to enter text.

☐ **Citizens/Community Group(s):** Click here to enter text.

☐ **Environmental Justice Group(s):** Click here to enter text.

☐ **Environmental Group(s):** Click here to enter text.

☐ **Civic Group(s):** Click here to enter text.

☐ **Recreational Group(s):** Click here to enter text.

☐ **Other(s):** Click here to enter text.

Prepared/Updated By: Amy Jordan, AKRF, Inc. **Date:** 01/30/2019

Reviewed/Approved By: Marc S. Godick, LEP, AKRF, Inc. **Date:** 01/302019

ATTACHMENT F
Resumes

AMC Engineering
99 Jericho Turnpike, Suite 300J
Jericho, NY 11590
Phone: (516) 417-8588

ARIEL CZEMERINSKI, P.E.

Mr. Czemerinski is a New York State Professional Engineer and CEO of AMC Engineering PLLC an EBC affiliate. Mr. Czemerinski has with 20 years of experience in the chemical and environmental areas. Areas of expertise include environmental compliance, permitting, remedial system design, process and plant safety, and management of a production facility. Mr. Czemerinski is a Registered Professional Engineer in NY, IN, IL, and MI.

Professional Experience
AMC: 14
Prior: 6 years

Education
Master of Science in Chemical Engineering, Columbia University, New York, NY, Feb. 1990. Bachelor of Science in Chemical Engineering, University Of Buenos Aires, Buenos Aires, Argentina, May 1987

Areas of Expertise

- Vapor Intrusion - Barrier and Sub Slab Venting System Design
- Environmental Assessment Statements and Environmental Impact Assessments under CEQR, ULURP
- Remedial Program Design and Management
- Environmental Compliance, Clean Water Act, Clean Air Act, Hazardous Materials
- Dewatering & Treatment System Design
- NYCDEP Sewer Discharge Permitting
- Transfer Station Permitting and Compliance
- Chemical Process Design and Optimization
- Wastewater Treatment Systems and Permitting, SPEDES, Air
- Zoning Regulations and Permitting
- Safety and Environmental Training
- Waste Management Plans

Professional Certifications

- OSHA 40-hr HAZWOPER
- OSHA 10-hr Construction Safety and Health

PROJECT EXPERIENCE (Representative Projects)

Project: Domsey Fiber Corp. - 431 Kent Avenue, Brooklyn NY
Project Description: NYS Brownfield cleanup project / NYC E-Designation. Soil contaminated with chlorinated solvents, petroleum and heavy metals requiring excavation, soil management and disposal under a Remedial Action Work Plan, Soil / Materials Management Plan, Construction Health and Safety Plan and Community Air Monitoring Plan
Client: Express Builders
Regulatory Authority: NYSDEC, NYCOER
Role: Mr. Czemerinski served as the Remedial Engineer for the project.

Project: Springfield Gardens Residential Area BMP - Springfield Gardens, Queens, NY
Project Description: NYC Residential infrastructure (sewer, gas, water) upgrade, drainage channel installation and pond restoration. Soil contaminated with, petroleum and heavy metals requiring excavation, soil management and disposal under a Materials Handling Plan, Construction Health and Safety Plan and Community Air Monitoring Plan
Client: EIC Associates - NYCEDC
Regulatory Authority: NYSDEC, NYCParks
Role: Mr. Czemerinski served as the Remedial Engineer for the project.

Project: Former Domino Sugar Site - Kent Avenue, Brooklyn NY
Project Description: NYC E-Designation. Soil contaminated with semi-volatile organic compounds and heavy metals requiring excavation, soil management and disposal under a Remedial Action Work Plan, Soil / Materials Management Plan, Construction Health and Safety Plan and Community Air Monitoring Plan
Client: Two Trees Management
Regulatory Authority: NYCOER
Role: Mr. Czemerinski served as the Remedial Engineer for the project.

Project: Former Uniforms For Industry Site - Jamaica Avenue, Queens NY
Project Description: NYS Brownfield cleanup project / NYC E-Designation. Soil contaminated with chlorinated solvents, petroleum, mop oil and heavy metals requiring excavation, soil management and disposal under a Remedial Action Work Plan, Soil / Materials Management Plan, Construction Health and Safety Plan and Community Air Monitoring Plan
Client: The Arker Companies
Regulatory Authority: NYSDEC, NYCOER
Role: Mr. Czemerinski served as the Remedial Engineer for the project.

PROJECT EXPERIENCE (Representative Projects)

Project: Former Charles Pfizer & Co. Site - 407 Marcy Avenue, Brooklyn, NY
Project Description: NYS Brownfield cleanup project / NYC E-Designation. Soil contaminated with chlorinated solvents, petroleum, and heavy metals requiring excavation, soil management and disposal under a Remedial Action Work Plan, Soil / Materials Management Plan, Construction Health and Safety Plan and Community Air Monitoring Plan
Client: The Rabsky Group
Regulatory Authority: NYSDEC, NYCOER
Role: Mr. Czemerinski served as the Remedial Engineer for the project.

Project: Former East Coast Industrial Uniforms Site - 39 Skillman Street, Brooklyn, NY
Project Description: NYS Brownfield cleanup project / NYC E-Designation. Soil contaminated with chlorinated solvents, petroleum, and heavy metals requiring excavation, soil management and disposal under a Remedial Action Work Plan, Soil / Materials Management Plan, Construction Health and Safety Plan and Community Air Monitoring Plan
Client: Riverside Builders
Regulatory Authority: NYSDEC, NYCOER
Role: Mr. Czemerinski served as the Remedial Engineer for the project.

Project: Former BP Amoco Service Station Site - 1800 Southern Boulevard, Bronx, NY
Project Description: NYS Brownfield cleanup project / NYC E-Designation. Soil contaminated with petroleum, and heavy metals requiring excavation, soil management and disposal under a Remedial Action Work Plan, Soil / Materials Management Plan, Construction Health and Safety Plan and Community Air Monitoring Plan
Client: SoBro, Joy Construction
Regulatory Authority: NYSDEC, NYCOER
Role: Mr. Czemerinski served as the Remedial Engineer for the project.

Project: Former Dico G Auto & Truck Repair Site - 3035 White Plains Road, Bronx, NY
Project Description: NYS Brownfield cleanup project. Soil contaminated with petroleum, and heavy metals requiring excavation, soil management and disposal under a Remedial Action Work Plan, Soil / Materials Management Plan, Construction Health and Safety Plan and Community Air Monitoring Plan
Client: The Arker Companies
Regulatory Authority: NYSDEC
Role: Mr. Czemerinski served as the Remedial Engineer for the project.

EBC

ENVIRONMENTAL BUSINESS CONSULTANTS

Charles B. Sosik, PG, PHG, Principal

Professional Experience

28 years

Education

MS, Hydrogeology, Adelphi University, NY
BS, Geology, Northern Arizona University, AZ

Areas of Expertise

- Brownfields Redevelopment
- Hazardous Waste Site Investigations
- Pre-purchase Site Evaluations and Support
- Regulatory Negotiations
- Remedial Planning and "Cost to Cure" Analysis
- Strategic Planning
- Real Estate Transactions
- NYC "E" Designations

Professional Certification

- Professional Geologist, NH
- Professional Geologist, Hydrogeologist, WA
- OSHA 40-hr HAZMAT
- OSHA 8-hr. Supervisor
- NYC OER Qualified Environmental Professional

Professional Affiliation / Committees

- NYS Council of Professional Geologists (NYSCPG)
- Association of Groundwater Scientists & Engineers (AGSE)
- NYS RBCA Advisory Committee
- Massachusetts LSP Association
- New Hampshire Association of Professional Geologists
- Interstate Technology Regulatory Council/MTBE Team
- Environmental Business Association, Brownfields Task Force
- Part 375 Working Group

PROFILE

Mr. Sosik has 28 years of experience in environmental consulting. He specializes in advising clients on managing environmental compliance with federal, state, and municipal agencies and has successfully directed numerous investigation and remediation projects involving petroleum, pesticides, chlorinated solvents, heavy metals and radiologically activated media. His work included extensive three-dimensional investigations on MTBE, which have been used effectively to help shape public policy. He also has experience in applying models to groundwater related problems and has completed several large-scale projects to determine fate and transport of contaminants, establish spill scenarios, and closure criteria. His experience and expertise in the area of contaminant hydrogeology has resulted in requests from environmental attorneys, property owners and New York State to serve as an expert witness and technical advisor on a variety of legal disputes.

For the past 15 years Mr. Sosik has been primarily engaged in providing environmental consulting to developers responding to the extensive re-zoning of former industrial and commercial properties, which is currently taking place throughout New York City. These services include everything from pre-purchase evaluations and contract negotiations to gaining acceptance in and moving projects through the NYS Brownfields Program. Mr. Sosik has taken a pro-active role in the continued development of the NYS Brownfields Program and related policy, by attending numerous working seminars, active participation in work groups and task forces and by providing commentary to draft versions of new guidance documents. Throughout his professional career, Mr. Sosik has remained committed to developing innovative cost- efficient solutions to environmental issues, specifically tailored to the needs of his clients.

SELECTED PROJECTS

Scavenger Waste Treatment Facility (SWTF), Suffolk County, NY

Water Treatment Plant EIS - Focused EIS - In response to requests from the Suffolk County Council on Environmental Quality and the Brookhaven Conservation Advisory Council, Mr. Sosik prepared a focused EIS to evaluate the potential impacts to an important surface water resource from the proposed facility including cumulative and synergistic effects with established contaminant plumes in the area.

Advanced Residential Communities, Rockville Centre, NY

Brownfield Project – As the senior project manager on this large scale, high profile redevelopment project, Mr. Sosik was asked to develop a plan to accelerate the regulatory process in the face of general community opposition. Through numerous discussions with the BCP management team, He was able to condense the schedule and review period, through the submission of supporting documents (Investigation Report, Remedial Work Plan) with the BCP application package. Community opposition, which focused on the environmental condition of the site as a means to block the project, was used to advantage in expediting approval of the aggressive interim remedial plan. This will allow the developer to begin remedial work approximately 5 months ahead of schedule.

Former Temco Uniform site, West Haverstraw, NY

Brownfield Project – Mr. Sosik took over management of this project from another consultant following transition of this VCP site to the BCP. Mr. Sosik used the opportunity to renegotiate and revise the scope of work to allow a more cost effective and focused investigation plan without re-writing or resubmitting the RIWP. During the NYSDEC's review of the transition package, he met with and coordinated changes with the NYSDEC Project Manager to gain approval. The result saved the client a significant amount of money, but perhaps more importantly in this case, did so without loss of time.

Grovick Properties, Jackson Heights, NY

Brownfield Project – This Brownfield property is somewhat unique in that it had been investigated and partially remediated by the NYSDEC through the petroleum spill fund. The client was interested in purchasing the property and redeveloping it as office and retail space. Mr. Sosik reviewed the NYSDEC investigation and developed a supplemental plan to meet the requirements of an RI under the BCP program. By performing this limited amount of field work "up-front" he was able to complete an RI Report and Remedial Plan and submit both with the BCP application package. The NYSDEC and NYSDOH approved the RI Report and the Remedial Plan with minor changes. This cut 120 days from the review process and allowed the client to arrange financing and move his project forward knowing what the clean-up costs would be at the outset.

Metro Management, Bronx, NY

Brownfield Project – The site of a former gas station, the developer had planned to construct a 12-story affordable housing apartment complex with first floor retail space. Since the site was located in an Environmental zone, potential tax credits of 22% for site development, remediation and tangible property could be realized under the BCP. In a pre-application meeting with the NYSDEC, Mr. Sosik realized that the department did not believe the site was eligible for the BCP, since it had been previously investigated and closed under the spills program.

Mr. Sosik assisted the developer in securing financing, and due to the demands of an aggressive construction schedule developed an Interim Remedial Measure (IRM), based on chemical oxidation treatment. Working closely with the clients environmental counsel, Mr. Sosik was able to get the IRM approved without a public comment period. Implementation of the IRM is currently underway.

The project was awarded the 2009 NYC Brownfield Award for Innovation.

Brandt Airflex, NY

Technical Consulting Services - Mr. Sosik provided senior level technical advice and strategic planning in developing an off-site RI/FS for the site, in negotiating a tax reduction for the property due to the environmental condition and in preparing a cost to cure estimate for settlement between business partners. After achieving a favorable tax consideration and settlement agreement for his client

Allied Aviation Services, Dallas, Fort Worth, Airport, Dallas, TX

Jet Fuel Investigation - Mr. Sosik developed and managed an investigative plan to quickly identify the extent and source of jet fuel which was discharging from the Airport's storm drain system to a creek a mile away. Through the use of a refined conceptual model, accelerated investigative techniques and a flexible work plan, he was able to identify the source of the fuel and the migration route within a single week. He then identifled remedial options and successfully negotiated a risk based plan with the Texas regulatory agency that had issued a notice of enforcement action against the facility.

KeySpan – Former LILCO Facilities, Various NY Locations

Pesticide Impact Evaluation - Mr. Sosik developed, negotiated and implemented a site screening procedure to evaluate impact to public health and the environment as the result of past herbicide use at 211 utility sites. Using an unsaturated zone leaching model (PRZM) on a small subset of the sites, he was able to establish mass loading schedules for the remaining sites. This was combined with public well data in a GIS environment to perform queries with respect to mass loading, time transport and proximity to vunerable public supply wells. Using this approach Mr. Sosik was able to show that there were no concerns for future impact. This effort satisfied the public health and resource concerns of the state environmental agency and county health department in a reasonable amount of time and at a fraction of the cost of a full scale investigation.

Former Computer Circuits (Superfund) Site, Hauppauge, NY

CERCLA RI/FS - As Senior Project Manager for the site, he played a major role in regaining control of the investigation activites for the PRP. This action prevented the USEPA from initiating an extensive investigation at the site using a RAC II contractor allowing the client to perform a more efficient investigation. He was involved in all negotiations with EPA and was the project lead in developing a revised site characterization plan (work plan, field sampling plan, quality assurance plan, etc.). By carefully managing all phases of the investigation and continued interaction with each of the three regulatory agencies involved, Mr. Sosik was able to keep the project focused and incrementally reinforce the clients position. The estimated cost of the revised investigation is expected to save the client 1.5 to 2 million dollars.

Sun Oil, Seaford, NY

Remediation Consuliting Services & Project Management - Under an atmosphere of regulatory distrust, political pressure and mounting public hostility toward the client, Mr. Sosik conducted an off-site 3-D investigation to define the extent of contamination and the potential impact on public health. By designing and implementing an aggressive source area remediation program and personal interaction with the public and regulatory agencies, he was able to successfully negotiate a limited off-site remediation favorable to the client. Source area remediation was completed within 6 months and the project successfully closed without damage to the client's public image or working relationship with the regulatory agencies.

Con Edison, Various Locations, NY

Hydrogeologic Consulting Services - Under a general consulting contract, Mr. Sosik conducted detailed subsurface hydrogeologic investigations at five locations to assist in the development of groundwater contingency planning. He also developed and implemented work plans to investigate and remediate existing petroleum, cable fluid, and PCB releases at many of the generating facilities and substations. An important aspect of his role was in assisting the client in strategic planning and negotiations with the regulatory agency.

Keyspan - Tuthill Substation, Aqueboque, NY

Accelerated Site Characterization - Using accelerated site characterization techniques, Mr. Sosik presented the project as a case study in establishing the transport of an herbacide and its metobolites aplied at utility sites in the 1980's The results were then used to establish a screening method for evaluating 211 similar sites controlled by the client in a reasonable and eficient manner.

NYSDEC Spill, East Moriches, NY

Spill Release Analysis - With recognized expertise in the area of gasoline plume development on Long Island, Mr. Sosik was asked by the State to establish the release date (and principal responsible party) of an extensive petroleum spill, which impacted a residential neighborhood. He used multiple lines of evidence, and a new EPA model (HSSM), which he has helped to refine, to reconstruct the release scenario and spill date, in support of the State Attorney General's cost recovery effort from the PRP.

Minmilt Realty, Farmingdale, NY

Fate & Transport Modeling - He completed an RI/FS at this location for a PCE plume that had been in transit for over 30 years. Mr. Sosik applied a conservative model to evaluate time/concentration impacts under a variety of transport scenarios to a municipal wellfield located 13,000 feet away. Through the use of the model and careful interpretation of an extensive data set compiled from several sources, Mr. Sosik was able to propose a plan which was both acceptable to the regulator and favorable to the client.

Sebonack Golf Course Project, Town of Southampton, NY

IPM Pesticide Study - Provided professional hydrogeologic services in support of the EIS prepared for the development of the site. The proposed development included an 18-hole golf course, clubhouse, dormitory facility, cottages, associated structures, and a 6,000 square foot research station for Southampton College. Mr. Sosik performed an extensive evaluation (using a pesticide-leaching model) on the effects of pesticide and nitrogen loading to groundwater as part of the projects commitment to an Integrated Pest Management (IPM) approach.

NYSDEC, Spills Division, Regions 1 – 4

Petroleum Spills Investigation & Remediation - As a prime contractor/consultant for the NYSDEC in Regions 1-4, Mr. Sosik has managed the investigation and remediation of numerous petroleum spills throughout the State. Many of these projects required the development of innovative investigation and remediation techniques to achieve project goals. He was also involved in many pilot projects and research studies to evaluate innovative investigation techniques such as accelerated site characterization, and alternative approaches to remediation such as monitored natural attenuation and risk based corrective action.

Sun Oil, E. Meadow, NY

Exposure Assessment - Performed to seek closure of the spill file, despite the presence of contaminants above standards, Mr. Sosik determined after the extended assessment that the level of remaining contamination would not pose a future threat to human health or the environment. He used multiple lines of evidence, and a fate and transport model to show that degradation processes would achieve standards within a reasonable time.

Sand & Gravel Mine, NY

Property Development - As part of the development of a sand and gravel mine, Mr. Sosik provided environmental consulting services to assist in obtaining a mining permit, which would result in the construction of a 150-acre lake. Specifically, Mr. Sosik investigated if the proposed lake would reduce groundwater quantity to domestic and public well fields, and/or accelerate the migration of potential surface contaminants to the lower part of the aquifer. After assuming the lead role in negotiations with the regulatory agency, Mr. Sosik was able to obtain a permit for the client by adequately addressing water quality and quantity issues, and by preparing a monitoring plan and spill response plan, acceptable to all parties.

NYSDEC, Mamaroneck, NY

Site Characterization / Source Identification - In a complex hydrogeologic setting consisting of contaminant transport through fractured metomorphic bedrock and variable overburden materials, Mr. Sosik was able to develop and implement a sub-surface investigation to differentiate and separate the impact associated with each of two sources. The results of this investigation were successful in encouraging the spiller to accept responsibility for the release.

Riverhead Municipal Water District, NY

Site Characterization / Remedial Planning - Using accelerated characterization techniques, he implemented a 3-D site investigation to identify two service stations 4,000 ft. away as the source of contamination impacting a municipal wellfield. In accordance with the strict time table imposed by the need to return the wellfield to production by early spring, he designed and implemented a multi-point (9 RW, 6 IW) recovery and injection well system using a 3-d numerical flow model, and completed the project on time. Using a contaminant transport model, Mr. Sosik developed clean-up goals which were achieved in 9 months of operation, well below the projected 3 to 5 year project duration.

Montauk Fire Department, NY

Site Assessment - Mr. Sosik performed a limited investigation and used a 2-D flow model to demonstrate that the property could not have been the source of contamination which had impacted an adjacent wellfield as per the results of a previous investigation. This small focused effort successfully reversed a $500,000, and rising, claim against the department by the water district and the NYSDEC.

PREVIOUS EXPERIENCE

P.W. Grosser Consulting, Bohemia, NY

Senior Project Manager, 1999-2006

Environmental Assessment & Remediation, Patchogue, NY

Senior Project Manager, 1994-1999

Miller Environmental Group, Calverton, NY

Project Manager, 1989-1994

DuPont Biosystems, Aston, PA

Hydrogeologist, 1988-1989

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ENVIRONMENTAL BUSINESS CONSULTANTS

Charles B. Sosik, PG, PHG, Principal

EXPERT WITNESS TESTIMONY AND DEPOSITIONS

Fact Witness -Testimony on relative age of petroleum spill based on nature and extent of residual and dissolved components at the Delta Service Station in Uniondale, NY Fall/1999

Expert Witness / Expert Report for defendant in cost recovery case by NYS Attorney General regarding a Class II Inactive Hazardous Waste (State Superfund) project by the NYSDEC (October 2004 – present, Report: March 2005, Deposition: April 2005, 2nd Report: Aug. 2013, 2nd Deposition Nov. 2013, Bench Trial: December 2013 - qualified as expert in Federal Court),

Expert Witness / Fact Witness for plaintiff seeking compensation for partial expenses incurred during the investigation and remediation of a USEPA CERCLA site due to the release and migration of contaminants from an "upgradient" industrial property. (Deposition May 2005, case settled April 2007).

Expert Witness / Fact Witness for NYS Attorney General with respect to cost recovery for a NYSDEC petroleum spill site in Holtzville, NY (Deposition April 2005 - case settled).

Expert Witness – Statement of opinion and expert testimony at trial for plaintiff seeking damages from a major oil corporation for contamination under a prior leasing agreement in Rego Park, NY. Case decided in favor of plaintiff. Trial July 2007, in favor of Plaintiff. Qualified as Expert.

Expert Witness / Fact Witness for NYS Attorney General with respect to cost recovery for a NYSDEC petroleum spill site in Lindenhurst, NY (Trial date Dec. 2009, in favor of plaintiff. Qualified as Expert State Supreme Court.

Expert Witness - for NYS Attorney General regarding NYSDEC cost recovery for a petroleum spill site at Riverhead, NY. Case settled July 2008.

Expert Witness for plaintiffs in class action case with respect to damages from chlorinated plume impact to residences in Dayton, OH. (Draft Report – May 2013).

Expert Witness / Fact Witness for defendant with respect to cost recovery and third party responsibility for a NYSDEC petroleum spill site in Lindenhurst, NY (Expert Statement of Fact – October 2005).

Expert Witness for plaintiff seeking damages related to a petroleum spill from the previous owner/operator of a gas station in College Point, NY. Case settled 2009.

Expert Witness for plaintiff (municipal water supply purveyor) seeking damages from major oil companies and manufacturer of MTBE at various locations in Suffolk County, NY. Expert reports July 2007, August 2007 and October 2007, Case settled August, 2008.

Expert Witness - Deposition for NYS Attorney General regarding NYSDEC cost recovery for a petroleum spill site at Sag Harbor, NY. August 2002

Expert Witness for defendant responding to a claim from adjacent commercial property owner on the origin of chlorinated solvents on plaintiff's property located in Cedarhurst, NY. Expert opinion submitted to lead counsel on March 6, 2009, case settled April 2009.

Expert Report - for Attorney General on modeling performed to determine the spill release scenario at a NYSDEC petroleum spill site in East Moriches, NY. June 2000.

Expert Witness - for plaintiff in case regarding impact to private wells from a spill at adjacent Town and County properties with open gasoline spill files in Goshen, NY. Expert report submitted August 2013.

Expert Witness for defendant with respect to cost recovery from Sunoco for a NYSDEC petroleum spill site. (Declaration – January 2013).

Expert Witness - for plaintiff (municipal water supply purveyor) seeking damages from Dow Chemical for PCE impact at various locations in Suffolk County, NY. Affidavit submitted 2011.

MODELING EXPERIENCE (PARTIAL LISTING)

PROJECT	MODEL	APPLICATION
Riverhead Water District, Riverhead, NY	MODFLOW, MODPATH	Remediation system design to intercept MTBE plume and prevent continued impact to municipal well field.
NYSDEC - Region 1, Holbrook, NY	MODFLOW, MODPATH	Simulate transport of MTBE plume to predict future impact.
NYSDEC - Region 1, East Moriches, NY	HSSM	Evaluate release scenario and start date of petroleum spill in support of cost recovery by NYS AG office.
AMOCO, Deer Park, NY	HSSM	Estimate release amount, start date and spill scenario to evaluate the potential for mass unaccounted for
Keyspan Energy, Nassau/Suffolk Counties Substations	PRZM	Estimate mass load of simazine used at 211 electric substations and screen sites according to potential for human health and ecological impacts.
Saboneck Golf Club, Southampton NY	PRZM	Estimate mass load of proposed pesticides on new golf course to evaluate acceptability under an IPM program.
Suffolk County Department of Public Works (SCDPW) Scavenger Waste Treatment Plant, Yaphank, NY	DYNFLOW, DYNTRAC	Evaluate time-transport and nitrogen impact on local river system.
SCDPW SUNY Waste Water Treatment Plant, Stony Brook, NY	DYNFLOW, DYNTRAC	Determine outfall location and time-transport of nitrogen from proposed upgrades to an existing wastewater treatment plant
Water Authority of Great Neck North Great Neck, NY	MODFLOW, MODPATH, MT3D	Review of modeling study performed by EPA to evaluate potential future impact to Well field from PCE plume. Identified serious flaws in model construction and implementation, which invalidated conclusions

PUBLICATIONS / PROFESSIONAL PAPERS

Smart Pump & Treat Strategy for MTBE Impacting a Public Water Supply (14th Annual Conference on Contaminated Soils Proceedings, 1998)

Transport & Transformation of BTEX & MTBE in a Sand Aquifer (Groundwater Monitoring & Remediation 05/1998)

Characteristics of Gasoline Releases in the Water Table Aquifer of Long Island (Petroleum Hydrocarbons Conference Proceedings, 1999)

Field Applications of the Hydrocarbon Spill Screening Model (HSSM) (USEPA Interactive Modeling Web Course www.epa.gov/athens/software/training/webcourse Authored module on model application and applied use of calculators, 02/2000)

Comparative Evaluation of MTBE Sites on Long Island, US EPA Workshop on MTBE Bioremediation (Cincinnati, 02/2000)

Comparison of Four MTBE Plumes in the Upper Glacial Aquifer of Long Island (American Geophysical Union, San Francisco, 12/1996)

Analysis and Simulation of the Gasoline Spill at East Patchogue, New York (American Geophysical Union, San Francisco, 12/1998)

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ENVIRONMENTAL BUSINESS CONSULTANTS

Kevin R. Brussee, Vice President

Professional Experience
EBC: January 2008
Prior: 6 years

Education
Bachelor of Science, Environmental Science, Plattsburgh State University, NY
Master of Science, Environmental Studies, University of Massachusetts, Lowell

Areas of Expertise
- Management of Site Investigations / Remedial Oversight NYC "E" Designation Sites
- Management of RI Investigations / RAWP Implementation NYS BCP Sites
- NYSDEC Spill Site Investigations
- Phase I / Phase II Property Assessments
- Waste Characterization / Soil Management

Professional Certification
- OSHA 40-hr HAZWOPER
- OSHA 8-hr HAZWOPER Supervisor
- OSHA 10-hr Construction Health and Safety

PROFILE

Mr. Brussee has 10 years experience as an environmental consultant/contractor and has worked on and managed a wide range of environmental projects. Mr. Brussee has conducted Phase I, II and III Environmental Site Assessments for commercial, industrial, and residential properties in New York, New Jersey, Maryland and Delaware.

Mr. Brussee's field experience includes tank removal and installations, spill management and closure, soil and groundwater sampling, and both the oversight and operation of soil boring and well installation equipment. In addition, Mr. Brussee has performed project research, data reduction and evaluation, and has prepared reports for both regulatory and client use.

PREVIOUS EXPERIENCE

Eastern Environmental Solutions, Inc., Manorville, NY
Project Manager, 2006-2008

EA Engineering, Science & Technology
Hydrogeologist, 2005-2006

P.W. Grosser Consulting, Bohemia, NY
Field Hydrogeologist, 2002-2003

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ENVIRONMENTAL BUSINESS CONSULTANTS

Kevin R. Brussee, Vice President

SELECT PROJECT EXPERIENCE

Project:	Former Dico G, Auto and Truck Repair Site - Bronx Park Apartments, redevelopment from commercial to mixed use
Location:	Bronx, NY, White Plains Road
Type:	NYS BCP Site, Former gas station, repair shop & junk yard
Contamination:	Petroleum - Gasoline
Role:	Project Manager, during Site Management Phase
Project:	Former Uniforms for Industry Site – Richmond Hill Senior Living Residences / Richmond Place
Location:	Jamaica Ave, Richmond Hill Queens, NY
Type:	NYS BCP, NYC E-Site Hazmat, Noise, Former industrial Laundry
Contamination:	Chlorinated Solvents, Historic Fill, Petroleum - Fuel oil/Mop oil
Role:	Project Manager, RAWP implementation
Project:	Former Gas Station / car wash to mixed use affordable housing / commercial
Location:	Bronx, NY, Southern Boulevard
Type:	NYS BCP, NYC E-Site Hazmat, Former gas station / gar wash
Contamination:	Petroleum - Gasoline
Role:	Project Manager, RAWP implementation
Project:	Redevelopment of former industrial property to residential
Location:	Williamsburg section of Brooklyn, NY, Bedford Ave
Type:	NYC E-Designation Site, Former dye manufacturing plant
Contamination:	Hazardous levels of heavy metals, fuel oil tanks
Role:	Project Manager, RAWP implementation
Project:	Former Domsey Fiber Corp Site
Location:	Williamsburg section of Brooklyn, NY, Kent Ave
Type:	NYC E-Designation Site, Former commercial property
Contamination:	Chlorinated solvents, fuel oil and Historic fill
Role:	Project Manager, RIWP Development and Implementation, RAWP development and implementation, waste characterization and soil management
Project:	Former 110th Street Station
Location:	Manhattan, NY, 2040 Frederick Douglas Boulevard, Harlem
Type:	NYS BCP, NYC E-designation Hazmat
Role:	Senior Project Manager - RAWP implementation, SMP and FER Development, waste characterization and soil management

PUBLICATIONS

Chemical Stress Induced by Copper, Examination of a Biofilm System;
(Water Science Technology, 2006; 54(9): 191-199.)

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ENVIRONMENTAL BUSINESS CONSULTANTS

Keith W. Butler, Senior Project Manager

PROFILE

Mr. Butler has extensive project management experience with respect to environmental due diligence and subsurface investigations. He is responsible for the preparation of project proposals, Phase I and II Environmental Site Assessments, Work Plans, Health and Safety Plans, Quality Assurance Project Plans, and investigation reports. Additionally, Mr. Butler has conducted and managed numerous Phase I and II ESAs. In these roles, Mr. Butler is responsible for applying the various state and local regulations, which govern environmental compliance and determine the need for additional investigation and/or remediation.

SELECTED PROJECTS

Madison National Bank, Various Sites, New York

Mr. Butler served as the Project Manager and principal contact for Madison National Bank. He was responsible for the preparation of Transaction Screen and Phase I/II Environmental Site Assessments (ESAs) at various sites throughout the New York metropolitan area, as required by the bank to satisfy client mortgage or construction loan requests.

Jewish Home & Hospital, Manhattan, NY

Most recently, Mr. Butler completed a Phase I ESA at their Bronx campus to obtain US. Housing and Urban Development (HUD) funding for a future construction project. Mr. Butler was also responsible for implementing a Remedial Action Work (RAW) Plan at the Bronx facility as required by the NYSDEC under a Voluntary Cleanup Agreement. The RAW included the preparation of contract documents, excavation of over 2,000 tons petroleum contaminated soils, installation of a Soil Vapor Extraction (SVE) system remedial oversight, and sampling.

Pulte Homes of New York, Patchogue, NY

Mr. Butler served as the Project Manager for the re-development of this six-acre site and was responsible for field oversight and coordination between remediation contractors and various regulatory agencies. Initial phases of the project included the completion of Phase I and II ESAs. Subsequent remediation consisted of UST removal, excavation of petroleum-impacted soils, closure of three NYSDEC spill numbers, removal of contaminated UIC sediment/sludge, the closure of commercial and residential UIC structures and the excavation of arsenic and metals contaminated soil. The project was conducted under approved Remedial Work and Soil Management Plans with oversight from the State, County and Village agencies.

Town of Islip, Blydenburgh Road Landfill, Hauppauge, NY

Mr. Butler served as the Project Manager for the groundwater and leachate monitoring program at the Blydenburgh Road Landfill - Cleanfills 1 and 2 and Leachate Impoundment Area. Mr. Butler was the principal contact for the Town's Resource Recovery Agency. He prepared the quarterly and annual monitoring reports, oversaw sampling efforts, and coordinated with the Town's analytical laboratory and data validation contractors. Mr. Butler was also responsible for preparing quarterly well condition reports and leachate quality reports for compliance with the Town's Suffolk County Discharge Certification Permit.

Ogden Aviation, Various Sites, JFK International Airport, Jamaica, New York

Mr. Butler served as the project manager for the rehabilitation of the satellite fuel farm recovery well system. Recovery wells at the fuel farm had become clogged with iron deposits and bacteria limiting product recovery efforts. Mr. Butler developed and supervised chemical cleaning and redevelopment of recovery wells under the approval of the NYSDEC. The chemical treatment has resulted in significant increases in product recovery volumes.

Brookhaven National Laboratory, Upton, NY

Mr. Butler has worked on a number of remediation system and monitoring well installation projects at BNL. His duties included oversight of installations, system pump tests, performance evaluations, and well development. He also provided oversight of soil borings, temporary well construction, soil and water sampling, and air monitoring for groundwater screening survey of two operable units in hazardous and radioactive waste storage areas. Mr. Butler also provided oversight for groundwater monitoring, well construction, well abandonment, and methane-monitoring wells for landfill closure.

metroPCS, Various Sites, New York

Mr. Butler served as the Project Manager for metroPCS' Long Island region telecommunications site acquisition and expansion program. Mr. Butler was responsible for the preparation of Phase I ESAs, the conduct of Phase II ESAs, including asbestos, lead paint and soil sampling, and coordination of National Environmental Policy Act (NEPA) reports and planning studies at various locations proposed for construction of new cellular telephone facilities. Reports and associated communications were transmitted electronically through metroPCS' data management system.

Dormitory Authority - State of New York, Harlem Hospital Center Modernization Project - Hazardous and Universal Waste Survey, Harlem Hospital, New York, NY

Mr. Butler served as the field team leader for conducting hazardous and universal waste surveys in multiple buildings affiliated with Harlem Hospital Center. The survey included the identification of hazardous and universal waste materials including chemicals, paints, fluorescent bulbs, high intensity discharge bulbs/fixtures, battery operated equipment, above and underground petroleum storage tank identification, PCB containing light ballasts and electrical equipment.

Keith W. Butler, Senior Project Manager

The hospital is comprised of a number of buildings, many that were abandoned and slated for demolition.

SVE Monitoring at Newark International Airport, Elizabeth, NJ
A routine leak detection test indicated that two 10,000-gallon underground storage tanks, which were used to store unleaded gasoline, had failed tightness tests. Follow-up investigation revealed that the product had impacted the subsurface environment. In response to this, a soil vapor extraction system was installed to reduce the residual concentrations of petroleum constituents in soil and groundwater and to minimize vapor migration into subsurface utility vaults. Mr. Butler was responsible for implementing the Remedial Action Work Plan, developed for the site by Ogden and the State of New Jersey. Activities conducted under the RAW include quarterly groundwater monitoring, air sampling, vacuum pressure monitoring, system maintenance and reporting.

Federal Express Site, Newark International Airport, Elizabeth, NJ
Mr. Butler worked with Ogden Aviation and the State of New Jersey to address outstanding environmental issues at the site related to a spill of jet fuel, which occurred during a construction accident. Mr. Butler performed a site assessment, which included groundwater monitoring, product gauging, and groundwater flow modeling. After reviewing these data, Mr. Butler determined that fill material at the site was contributing to soil and groundwater contamination and has petitioned the State for partial site closure. Mr. Butler is continuing to address the remaining area of concern through product recovery and continued monitoring.

Northrop Grumman, Various Sites
Mr. Butler conducted three Phase I ESAs and a Phase II investigation for the presence of PCBs in soil. He also inspected and supervised the removal of underground storage tanks, asbestos abatement projects, and sanitary system closures related to the facility decommissioning. Mr. Butler also conducted groundwater investigations and provided oversight during soil sampling, drilling and soil remediation activities.

New York City Department of Environmental Protection, Various Sites
Mr. Butler served as an Environmental Scientist for hazard investigation at seven sewage pump stations. Mr. Butler addressed a wide range of environmental concerns including asbestos, lead based paints, PCB oil, light ballasts, and other hazardous building materials. He conducted field investigations, sampling, and prepared Hazardous Materials Survey Reports for use during preparation of plans and specifications for proposed pump station construction projects.

Fresh Kills Landfill, Staten Island, New York
Mr. Butler participated in the field operations during pump and yield tests conducted on Cells 1 and 9. The tests were performed to determine the hydraulic properties of the landfill's refuse. He collected groundwater and leachate measurements in recovery wells and in adjacent observation wells under pumping and non-pumping conditions.

PREVIOUS EXPERIENCE

DECA Real Estate Advisors
Director of Environmental Services, 2011-2017

VHB Engineering, Surveying and Landscape Architecture PC, Hauppague NY
Senior Project Manager, 2005-2011

Parsons Brinkerhoff, Inc. New York NY
Senior Project Manager, 2004-2005

P.W. Grosser Consulting, Bohemia, NY
Senior Project Manager, 1998-2004

Eder Associates, Locust Valley, NY
Field Hydrogeologist, 1992-1998

EDUCATION

BS, Geology, Slippery Rock University of Pennsylvania, 1990

PROFESSIONAL REGISTRATIONS/CERTIFICATIONS

OSHA Certification, 40-hour Health & Safety Training at Hazardous Waste Sites

OSHA Certification, 8-hour Refresher Health & Safety Training at Hazardous Waste Sites

OSHA Confined Space Entry Training

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ENVIRONMENTAL BUSINESS CONSULTANTS

Chawinie Reilly, Project Manager / Industrial Hygienist

Professional Experience
EBC: March 2013
Prior: 8 years

Education
Bachelor of Science, Health Sciences, Concentration in Environmental Health and Safety, Stony Brook University, NY

Areas of Expertise
- Remedial Investigation Work Plans, Remedial Investigation Reports, Remedial Action Work Plans
- Phase I / Property Condition Assessments
- Occupational Health and Safety Sampling
- Indoor Air Quality (IAQ) Investigations
- Mold Investigations and Remediation
- Soil and Ground Water Investigations
- Noise Studies
- Lead Paint and Asbestos Surveys
- Hazardous Materials Assessments

Professional Certification
- OSHA 40-hr HAZWOPER
- NYS Asbestos Inspector
- NYC Asbestos Investigator
- USEPA Lead Inspector
- USEPA Lead Risk Assessor
- OSHA 10-hr Construction Health and Safety
- Hazard Analysis and Critical Control Point (HACCP) Certified

PROFILE

Mrs. Reilly has 13 year's experience as an environmental consultant/contractor and has worked on and managed a wide range of environmental projects. Major responsibilities include Remedial Investigation Work Plans, Remedial Investigation Reports, Remedial Action Work Plan and Noise Remedial Action Work Plans. Mrs. Reilly has conducted Phase Is and Property Condition Assessments for commercial, industrial, and residential properties in New York, New Jersey and Connecticut. In addition, Mrs. Reilly has conducted various IAQ, asbestos, mold and occupational health and safety sampling investigations for a variety of city, state, federal and private clients.

PREVIOUS EXPERIENCE

The Louis Berger Group, New York, New York-Industrial Hygienist, 2008-2013
AEI Consultants, Jersey City, New Jersey- Environmental Scientist, 2005-2008

ENVIRONMENTAL BUSINESS CONSULTANTS

Thomas Gallo, Field Manager / Project Manager

Professional Experience
EBC: July 2015

Education
Bachelor of Arts, Geology, State University of New York at Potsdam, NY

Areas of Expertise
- Phase I Property Assessments
- Phase II Subsurface Investigations
- Indoor Air Quality (IAQ) Investigations
- NYSDEC Spill Site Investigations
- Asbestos Surveys
- Hazardous Materials Assessments
- Remedial Investigation Work Plans, Remedial Investigation Reports, Remedial Action Work Plans
- Remedial Oversight of NYC E-Designation Sites

Professional Certification
- OSHA 40-hr HAZWOPER
- NYS Asbestos Inspector
- OSHA 10-hr Construction Health and Safety

PROFILE

Mr. Gallo has 4 years' experience as an environmental consultant and has worked on and managed a wide range of environmental projects. Major responsibilities include Phase I and Phase II Site Assessments and Investigations for commercial, industrial, and residential properties in New York and New Jersey. Additional responsibilities include Remedial Investigation Work Plans, Remedial Investigation Reports, and Remedial Investigation Work Plans.

Mr. Gallos' field experience includes environmental sampling (groundwater, soil, surface water, air, soil gas), the oversight of soil boring and well installations, managing remediation on Site, tank removals, and spill management and closure. Mr. Gallo has prepared reports for both regulatory and client use.

ATTACHMENT G
Estimated Remedial Costs

HOPE STREET PROJECT
Brooklyn, NY

Summary of Project Costs

NYS Brownfields Cleanup Program

Costs by Task

TASK - ENVIRONMENTAL REMEDIATION	Alternative 1 - Track 1	Alternative 2 - Track 2	Alternative 3 - Track 4
UST Removal	$ 30,000.00	$ 30,000.00	$ 30,000.00
Shoring / SOE	$ 150,000.00	$ 150,000.00	$ 25,000.00
Excavation and Disposal	$ 1,051,000.00	$ 954,500.00	$ 161,500.00
Air Monitoring and Field Oversight	$ 110,500.00	$ 93,500.00	$ 12,750.00
Waste Characterization and Facility Approvals	$ 32,050.00	$ 19,750.00	$ 8,700.00
Endpoint analyis, DUSR, EDDs	$ 42,850.00	$ 46,000.00	$ 44,850.00
Dewatering and Treatment	$ 137,000.00	$ 137,000.00	$ 137,000.00
Project Management	$ 43,000.00	$ 37,000.00	$ 20,350.00
Status Reports	$ 3,000.00	$ 3,000.00	$ 3,000.00
Composite Cover System	-	-	$ 150,000.00
Environmental Easement Package	-	$ 12,500.00	$ 12,500.00
Site Management Plan	-	-	$ 11,500.00
Final Engineering Report	$ 25,450.00	$ 25,450.00	$ 25,450.00
Subtotal	$ 1,624,850.00	$ 1,508,700.00	$ 642,600.00
15% Contigency	$ 243,727.50	$ 226,305.00	$ 96,390.00
Total	**$ 1,868,577.50**	**$ 1,735,005.00**	**$ 738,990.00**