FORMER ANDOR MEDICAL SYSTEMS

BCP SITE NO. C241234
26-22 4th Street
ASTORIA, NEW YORK 11202
Block 910, Lots 9 and 35

REMEDIAL ACTION WORK PLAN

MAY 2020

Prepared for:

4th Street Developments LLC
143 Division Avenue
Brooklyn, NY 11211

AMC Engineering, PLLC
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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).

I certify that all information and statements in this certification are true. I understand that a false statement made herein is punishable as Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law.

STATE OF NEW YORK ★ ARIEL CZEMERINSKI ★ 076508 LICENSED PROFESSIONAL ENGINEER

076508	05-27`-2020	
NYS Professional Engineer #	Date	Signature

It is a violation of Article 145 of New York State Education Law for any person to alter this document in any way without the express written verification of adoption by any New York State licensed engineer in accordance with Section 7209(2), Article 145, New York State Education Law.

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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 4th Street Developments LLC for the property located at 26-22 4th Street and 26-30 4th Street, in Queens, New York (the Site). An application for acceptance into the New York State Brownfield Cleanup Program (BCP) was previously submitted to the New York State by the former property owner 4th Street Developments LLC. On July 30, 2019, the New York State Department of Environmental Conservation (DEC) informed 4th Street Developments LLC that the property was accepted into the BCP. The Brownfield Cleanup Agreement (BCA) was executed by the DEC on August 29, 2019 (Site No. C-241234) with the Applicant classified as a "Volunteer."

The street addresses for the Site are 26-22 4th Street and 26-30 4th Street, Queens, New York 11102 (Figure 1). The Site is located in the Astoria neighborhood of Queens County and is comprised of two tax lots (Block 910, Lots 9 & 35) totaling 25,473 square feet (0.584 acres). The Site is rectangular shaped with 100 feet of frontage along 3rd Street and 147.46 feet of frontage along 4th Street (Figure 2).

The Site is improved with one-story 20,000 sf industrial building constructed in 1961 (estimate) on Lot 9. Lot 35 is a paved parking area which was previously used by the former Lot 9 tenant. The entire site is covered by either the concrete building slab or the asphalt parking lot with no exposed soil. The lots are currently vacant as of the submission of his RAWP in preparation for the remedial action implementation.

The north side of the property is bordered by multi-family residential buildings. The south side is bordered by a single-family residential home and a contractor's yard. Properties to the west include a single-family residence and stone countertop businesses. Properties to the east across 4th Street include industrial properties and a Goodwill recycling center.

Surrounding land use includes industrial / manufacturing facilities north of 26th Avenue and a large multi-family, multi-building apartment complex south of 27th area. Adjacent properties to the east and west include a mix of commercial (contractor yards, warehouses, manufacturing) with single and multi-family residential properties interspersed among the commercial lots. The area surrounding the property is highly urbanized and predominantly consists of industrial / commercial buildings to the north and residential apartment complexes to the south.

Only one school was identified within 1,000 feet of the Site; AHRC – Astoria Blue Feather – Special Education School located at 27-07 8th Street approximately 750 feet to the southeast. The Hallet Cove Child Development Center was identified within the Astoria Houses complex located south of the Site. There were no nursing homes or hospitals identified within 1,000 feet of the Site.

The Site has been developed since at least 1898 with a residential home located on each lot through at least 1950. The present 1-story building was constructed in 1961 and used for unidentified manufacturing (1961 CO, 1967 Sanborn map). From 1977 to 2007, the building was labeled with a W which refers in general to warehouse. City Directory Listings include SOS Distributers in 1983 and Andor Medical Systems in 1991. There were no other City Directory Listings for the property. The building has been vacant since at least August 2018. The Requestor purchased the property in January 2019.

SUMMARY OF PREVIOUS INVESTIGATIONS

Investigations performed at the Site include the following:

- Phase I Environmental Site Assessment (AES, August, 2018)
- Focused Phase II Subsurface Site Investigation (AES, October, 2018)
- Remedial Investigation Report (EBC, March 2020)

Phase I Environmental Site Assessment (AES)

In August 2018, Associated Environmental Services (AES) performed a due diligence Phase I Environmental Site Assessment at the 26-22 4th Street property. AES reported the following Recognized Environmental Conditions (RECs) in connection with the Property:

- The Property was occupied by Andor Medical Systems around 1991 which may have used chemicals related to medical imaging.
- According to NYCDOB, Department of Finance Building Classification for Lot 35 is GARAGE/GAS STATION.
- A data gap exists for the tenants of the Property from 1961 to 1983.
- A 2,000-gallon fuel oil underground storage tank (UST) is present at the Property.

According to the records provided, the UST had recently passed a tightness test. However, the UST is registered as being installed in 1961. Due to the age and known useful life of single wall steel USTs (approximately 30 years) and the fact the top has been excavated, subsurface testing is recommended.

Focused Subsurface Site Investigation (AES, October 2018)

The subsurface investigation performed by AES was performed as part of a due diligence environmental assessment to further investigate the property and recognized environmental conditions that were identified in the Phase I ESA report. The subsurface investigation included a geophysical survey, and the advancement of 9 soil borings and the collection of 3 groundwater samples.

The results of soil analysis reported elevated levels of volatile and semi-volatile organic compounds (VOCs/SVOCs), pesticides, PCBs and metals. The chlorinated solvents cis-1,2-dichloroethene (cis-DCE), tetrachloroethene (PCE) and trichloroethene (TCE) were reported above Protection of Groundwater Soil Cleanup Objectives (SCOs) in one or more samples. Multiple SVOCs were reported in 4 of 6 soil samples above Restricted Residential and/or Restricted Commercial SCOs. The metals barium and lead were also reported above Restricted Commercial SCOs. The pesticide 4,4'-DDE, the PCB PCB-1254, and the metal mercury were all reported above Unrestricted Use SCOs.

The chlorinated VOCs, PCE, TCE and cis-DCE were all reported above Groundwater Quality Standards in all three groundwater samples collected by AES.

Summary of the Remedial Investigation

A Remedial Investigation was completed at the Site from December 10, 2019, through December 30, 2019, and documented in a Remedial Investigation Report dated March 2020. 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:

- The installation of ten soil borings to collect twenty soil samples for laboratory analysis of volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, PCBs, metals and emerging contaminants;
- The installation of six groundwater monitoring wells and the collection of six groundwater samples for laboratory analysis of VOCs, SVOCs, pesticides, PCBs, and total and dissolved metals and emerging contaminants;
- The collection of analysis of six sub-slab soil gas samples and two soil vapor samples for VOCs from eight sampling locations.

The results of sampling performed during this RI identified historic fill material across the Site to depths of 0 to 4 ft below the existing building slab and parking area and up to depths as great as 10 ft (Lot 9 and Lot 35). Depending on location, the historic fill material contains one or more of the metals arsenic, barium, chromium, copper, lead, or mercury, PCBs (PCB-1260), or pesticides (4,4'-DDD, 4,4'-DDT), above Unrestricted Use and/or Restricted Residential and/or Commercial SCOs. The chlorinated VOC PCE was detected above Unrestricted Use SCOs and Protection of Groundwater SCOs within two shallow soil samples.

PCE was detected within the groundwater samples collected in the central area of the existing building (Lot 9), the northeast corner of the existing building (Lot 9), and in the parking area (Lot 35). Concentrations were low (<10 μg/L) in all samples with the exception of the MW2 groundwater sample located in the south – central area of the parking area (Lot 35) near the property line. The PCE concentration at the MW2 location was 43 μg/L. The pesticide 4,4'-DDT was detected in the parts per trillion range in two of the samples and is likely related to suspended solids in the groundwater samples. Two dissolved metals were detected in all of the groundwater samples. Manganese and sodium were detected above AWQS in all six wells and are attributable to residual salt water intrusion. Low levels of PFAS compounds were detected in groundwater throughout the Site.

Petroleum-related VOCs were generally low in the soil gas samples and were consistent with typical background levels. Chlorinated VOCs in soil gas included PCE (ranged from 6.07 $\mu g/m^3$ to 1,130 $\mu g/m^3$), TCE (ranged from 9.18 $\mu g/m^3$ to 57.5 $\mu g/m^3$), and cis-DCE (ranged from 5.67 $\mu g/m^3$ to 201 $\mu g/m^3$). PCE was reported in all of the soil gas samples, and TCE and cis-DCE were detected within 5 and 4 of the soil gas samples respectively. The highest CVOC concentrations were in the northeast corner of the existing building and did not correlate with the highest concentrations in soil or in groundwater.

Qualitative Human Health Exposure Assessment

The qualitative exposure assessment identified potential completed routes of exposure to construction workers and remediation workers through inhalation, ingestion and dermal contact of petroleum compounds, VOCs, PAHs, pesticides and heavy metals during excavation activities. The Health and Safety Plan prepared for the site identifies such exposures and provides instructions for on-site workers to minimize potential exposure. Occupants in the proposed on-Site building and existing adjacent off-Site buildings may be exposed to CVOCs through the vapor intrusion pathway, from CVOC vapors migrating into the new building.

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 at the Site (to the north) and the distance to the East River.

Summary of the Remedy

The remedy recommended for the Site is a Track 1 remedy (Alternative 1), which consists of the removal of all on-Site soil in exceedance of Track 1 Unrestricted Use Soil Cleanup Objectives (SCOs). It is expected that a Track 1 alternative will require excavation across the Site to depths varying between 0 to 4 ft below the existing building slab and parking area and up to depths as great as 10 ft (Lot 9 and Lot 35) to remove historic fill material with parameters above Unrestricted Use SCOs, and up to 6 feet to remove all CVOC impacted with parameters above Protection of Groundwater SCOs and Unrestricted Use SCOs. All soil with parameters above Protection of Groundwater SCOs and Unrestricted Use SCOs will be removed from the Site and properly disposed of at off-site facilities. The Track 1 alternative also includes remediation of groundwater through dewatering during excavation activities. Over-excavated areas and portions of the Site that require grade to be raised will be backfilled with either virgin mined materials, recycled materials, or certified fill which meet Unrestricted Use SCOs.

1. Excavation of CVOC impacted soil exceeding Protection of Groundwater SCOs and Track 1 Unrestricted Use SCOs to depths approaching 6 feet below grade (Lot 9 and Lot 35) as listed in Table 1;
2. Excavation of historic fill material exceeding Track 1 Unrestricted Use SCOs as listed in Table 1 to depths varying between 0 to 4 ft below the existing building slab and parking area and up to depths as great as 10 ft (Lot 9 and Lot 35), with additional excavation as needed to meet Track 1 Unrestricted Use SCOs;
3. Screening for indications of contamination (by visual means, odor, and monitoring with PID) of all excavated soil during any intrusive Site work;
4. Collection and analysis of end-point samples to evaluate the performance of the remedy with respect to attainment of Track 1 Unrestricted Use SCOs;
5. 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;
6. Installation of SOE and a dewatering system to allow for excavation/removal of CVOC impacted soil and historic fill material at/below the groundwater table, and treatment (if needed) and discharge of groundwater to the NYC sewer system under a NYCDEP sewer discharge permit;
7. Installation of two down gradient monitoring wells to collect pre and post-dewatering groundwater samples for VOC (EPA Method 8260) analysis to demonstrate dewatering effectively addressed the pre-remedy groundwater conditions;
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. Perform a post-construction soil vapor intrusion evaluation, including a provision for implementing actions recommended to address exposures related to soil vapor intrusion within the new building;
10. If Track 1 SCOs are not achieved, and Track 2 Restricted Residential SCOs are also not achieved, a composite cover system consisting of the concrete building slab will be constructed.
11. If Track 1 cleanup is not achieved, implementation of a Site Management Plan (SMP) for long term maintenance of the Engineering Controls.

12. If Track 1 cleanup is not achieved, an Environmental Easement will be filed against the Site to ensure implementation of the SMP.

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 are not achieved, including achievement of groundwater and soil vapor remedial objectives, then a Track 2 or Track 4 remedy may result as described above.

REMEDIAL ACTION WORK PLAN

1.0 INTRODUCTION

This Remedial Action Work Plan (RAWP) was prepared on behalf of 4th Street Developments LLC for the property located at 26-22 4th Street and 26-30 4th Street in Queens, New York (the Site). An application for acceptance into the New York State Brownfield Cleanup Program (BCP) was previously submitted to the New York State by the former property owner 4th Street Developments LLC. On July 30, 2019, the New York State Department of Environmental Conservation (DEC) informed 4th Street Developments LLC that the property was accepted into the BCP. The Brownfield Cleanup Agreement (BCA) was executed by the DEC on August 29, 2019 (Site No. C-241234) with the Applicant classified as a "Volunteer."

This RAWP summarizes the nature and extent of contamination as determined from data gathered during the Remedial Investigation (RI), performed from December 10, 2019, through December 30, 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.

1.1 SITE LOCATION AND DESCRIPTION

The street addresses for the Site are 26-22 4th Street and 26-30 4th Street, Queens, New York 11102 (Figure 1). The Site is located in the Astoria neighborhood of Queens County and is comprised of a two tax lots (Block 910, Lots 9 & 35) totaling 25,473 square feet (0.584 acres). The Site is rectangular shaped with 100 feet of frontage along 3rd Street and 147.46 feet of frontage along 4th Street (Figure 2).

The Site is improved with one-story 20,000 sf industrial building constructed in 1961 (estimate) on Lot 9. The building is currently vacant. Lot 35 is a paved parking area which was previously used by the former Lot 9 tenant. The entire site is covered by either the concrete building slab or the asphalt parking lot with no exposed soil.

The elevation of the Site is approximately 19 feet above the National Geodetic Vertical Datum (NGVD). The area topography slopes fairly steeply to the east. Sidewalk elevation on the west side of the property (3rd Street) is approximately 13ft, and the sidewalk elevation on the east side of the property (4th Street) is approximately 20ft. The depth to groundwater beneath the Site is approximately 4.5 to 6.14 feet below the building slab which meets 3rd Street. The groundwater flow direction calculated for the Site was to the north.

1.2 CONTEMPLATED REDEVELOPMENT PLAN

The Requestors intend to redevelop the property with two new multi-family residential buildings (Tower A and Tower B) totaling 99 units. Tower A will be a 7-story building that fronts 4th Street, and Tower B will be a 5 story building that fronts 3rd Street. The project will set aside 30% of the units for affordable housing (no more than 130% AMI).

The two towers will share a first/ground floor which will cover the entire Site. The first/ground floor elevation will match the 4th Street sidewalk elevation. Therefore, the first/ground floor elevation of the 3rd Street side of the building approximately 5ft – 10in above the 3rd Street sidewalk, and stairs up the entrance will be required. The first/ground floor of Tower A will consist of a 1,923 ft^2 residential lobby, a 508 ft^2 recreation room, a 552 ft^2 1-bedroom apartment, and the building's bicycle parking room, fire pump room, electrical meter room, water service room, package room, and trash compactor room. The first/ground floor of Tower B will consist of a 1,080 ft^2 residential lobby, a 565 ft^2 studio apartment, and the buildings trash compactor room, electrical meter room, package room, and mechanical space. An attended parking garage will be constructed in the first/ground floor space between the towers, and will be accessible from 4th Street.

Excavation for the new building's foundation consists of general excavation of the entire Site (as needed) to elevation -1'-4", and deeper excavation for footings (elevation -4'-0") and elevator pits (elevation -9'-0"). For excavation purposes, the 4th Street sidewalk elevation is identified 0'-0", and the elevation for the 3rd Street sidewalk is -6'-0". Therefore, general excavation is limited to approximately 1.25ft on the 4th Street side of the Site, and no excavation (grade will have to be raised 5.75ft) on the 3rd Street side of the Site.

With groundwater present at 4.5 to 6.14 feet below grade, dewatering will be required during construction of the building's foundation.

1.3 DESCRIPTION OF SURROUNDING PROPERTY

The area surrounding the property is highly urbanized. Properties in the immediate area around the Site are generally industrial/commercial interspersed with residential homes. Large industrial properties are located along the waterfront/26th Avenue, and a large New York City Housing complex is located south of the Site along 27th Avenue. Adjacent land use includes residential homes to the north, 1-story commercial buildings to the south, auto repair shops, a rehabilitation center and commercial building to the east on the opposite side of 4th Street, and residential homes and industrial buildings to the west on the opposite side of 3rd Street.

2.0 DESCRIPTION OF REMEDIAL INVESTIGATION FINDINGS

The field work portion of the Remedial Investigation was conducted by EBC from December 10, 2019, through December 30, 2019. The investigation is summarized in the sections below. Further details are provided in the Remedial Investigation Report (EBC, March 2020).

2.1 SUMMARY OF REMEDIAL INVESTIGATIONS PERFORMED

2.1.1 Soil Borings

A total of 10 soil borings were advanced December 10, to identify source areas and to obtain general soil quality information present at the Site.

On December 10, 2019, ten soil borings (19B1 - 19B10) were advanced at the Site. Soil samples were collected continuously in 5-foot intervals to a depth of 10 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.

In accordance with the RI Work Plan, two samples were retained for laboratory analysis from the 0-2 ft and 8-10 ft interval from each of the ten soil borings.

A total of 20 soil samples were retained for laboratory analysis from the 10 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. The soil samples were analyzed for 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). Soil boring locations are identified in Figure 4.

2.1.2 Monitoring Wells

Six monitoring wells (MW1-MW6) were installed at the Site on December 16, 2019, and December 17, 2019, with a track mounted Geoprobe drilling machine using hollow stem augers, Each of the six new monitoring wells was constructed of 2-inch diameter PVC casing and ten 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 were 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 5.

Prior to sampling, a synoptic round of depth-to-groundwater (DTW) measurements were obtained from the monitoring wells to determine the water table elevation and to calculate the volume of standing water in the well. The DTW was measured in all monitoring wells on January 28, 2020. The depth to groundwater ranged from 4.5 to 6.14 feet below grade.

2.1.3 Samples Collected

A summary of the sampling performed during the RI is provided in Table 2.

Soil Samples

A total of 21 soil samples were retained for laboratory analysis from the 10 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. The soil samples were analyzed for 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

A groundwater sample was collected from each of the six monitoring wells 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

Six sub-slab soil gas samples were collected from six sub-slab soil gas implants installed within the existing building (Lot 9) and two soil gas implants installed at a depth of approximately 2 feet below grade within the parking area (Lot 35). The six sub-slab soil gas implants consisted of ¼” polyethylene tubing inserted 2 inches into a ½-inch hole drilled through the concrete slab with a handheld drill. 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 2 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. The eight samples were collected in accordance with the procedures as described in section 2.4 of the approved RIR and the *Guidance for Evaluating Soil Vapor Intrusion in the State of New York (NYSDOH 10/06)*.

2.1.4 Chemical Analytical Work Performed

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 and groundwater sample analysis were provided by Phoenix Environmental Laboratories, Inc. of Manchester, Connecticut, a New York State ELAP certified environmental laboratory (ELAP Certification No. 11301). Analysis for emerging contaminants (PFAS, 1,4-dioxane) in soil and groundwater samples was provided by Alpha Analytical Laboratories (NY Cert No. 11148) of Westborough, Massachusetts.

Retained soil samples were submitted for laboratory analysis of the following: The soil samples were analyzed for 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).

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.

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

2.1.5 Documentation

A map showing the locations of the soil borings is provided in Figure 4. The locations of the monitoring wells and soil gas sample collection points are provided in Figure 5. The results of soil, groundwater and soil gas samples collected during the RI are summarized in Tables 3 through 16. Below is a summary of the RI findings.

- The results of sampling performed during this RI identified historic fill material from 0 to 4 ft below the existing building slab and parking area and up to depths as great as 10 ft (Lot 9 and Lot 35). Depending on location, the historic fill material contains one or more metals (arsenic, barium, chromium, copper, lead, mercury), SVOCs (indeno(1,2,3-cd)pyrene) and pesticides (4,4'-DDT, 4,4'-DDE) above Unrestricted Use and/or Restricted Residential and/or Commercial SCOs. Elevated levels of PCE above Unrestricted Use SCos were reported in the shallow soil samples from two of the borings.
- PCE was detected within the groundwater samples collected in the central area of the building, the northeast corner of the building, and in the parking lot. Concentrations were low (<10 μg/L) in all samples with the exception of the MW2 groundwater sample located in the south – central area of the parking lot near the property line. The PCE concentration at the MW2 location was 43 μg/L. The pesticide 4,4'-DDT was detected in the parts per trillion range in two of the samples and is likely related to suspended solids in the sample. Two dissolved metals were detected in all of the wells. Manganese and sodium were detected above AWQS in all six wells and are attributable to residual salt water intrusion. Low levels of PFAS compounds were detected in groundwater throughout the Site.
- Petroleum-related VOCs were generally low in the soil gas samples and were consistent with typical background levels. Chlorinated VOCs in soil vapor included PCE (ranged from 6.07 $\mu g/m^3$ to 1,130 $\mu g/m^3$), TCE (ranged from 9.18 $\mu g/m^3$ to 57.5 $\mu g/m^3$), and cis-DCE (ranged from 5.67 $\mu g/m^3$ to 201 $\mu g/m^3$). PCE was reported in all eight soil gas samples, and TCE and cis-DCE were detected within 5 and 4 of the eight soil gas samples respectively. The highest CVOC concentrations were in the northeast corner of the existing building (Lot 9) and did not correlate with the highest concentrations in soil or in groundwater.

2.2 SIGNIFICANT THREAT

The NYSDEC and NYSDOH have reviewed the RI Report and determined the Site does 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

The Site has been developed since at least 1898 with a residential home located on each lot through at least 1950. The present 1-story building was constructed in 1961 and used for unidentified manufacturing (1961 CO, 1967 Sanborn map). From 1977 to 2007, the building was labeled with a W which refers in general to warehouse. City Directory Listings include SOS Distributers in 1983 and Andor Medical Systems in 1991. There were no other City Directory Listings for the property. The building has been vacant since at least August 2018. The Requestor purchased the property in January 2019.

The Site is currently owned by 4th Street Developments LLC (Owner).

2.3.2 Summary of Previous Reports

Environmental investigations performed at the Site include the following:

- Phase I Environmental Site Assessment (AES, August, 2018)
- Focused Phase II Subsurface Site Investigation (AES, October, 2018)

Phase I Environmental Site Assessment (AES)

In August 2018, Associated Environmental Services (AES) performed a due diligence Phase I Environmental Site Assessment at the 26-22 4th Street property. AES reported the following Recognized Environmental Conditions (RECs) in connection with the Property:

- The Property was occupied by Andor Medical Systems around 1991 which may have used chemicals related to medical imaging.
- According to NYCDOB, Department of Finance Building Classification for Lot 35 is GARAGE/GAS STATION.
- A data gap exists for the tenants of the Property from 1961 to 1983.
- A 2,000-gallon fuel oil underground storage tank (UST) is present at the Property. According to the records provided, the UST had recently passed a tightness test. However, the UST is registered as being installed in 1961. Due to the age and known useful life of single wall steel USTs (approximately 30 years) and the fact the top has been excavated, subsurface testing is recommended.

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The subsurface investigation performed by AES was performed as part of a due diligence environmental assessment to further investigate the property and recognized environmental conditions that were identified in the Phase I ESA report. The subsurface investigation included a geophysical survey, and the advancement of 9 soil borings and the collection of 3 groundwater samples.

The results of soil analysis reported elevated levels of volatile and semi-volatile organic compounds (VOCs/SVOCs), pesticides, PCBs and metals. The chlorinated solvents cis-1,2-dichloroethene, (cis-DCE), tetrachloroethene (PCE) and trichloroethene (TCE) were reported above Protection of Groundwater Soil Cleanup Objectives (SCOs) in one or more samples. Multiple SVOCs were reported in 4 of 6 soil samples above Restricted Residential and/or Restricted Commercial SCOs. The metals barium and lead were also reported above Restricted Commercial SCOs. The pesticide 4,4'-DDE, the PCB PCB-1254, and the metal mercury were all reported above Unrestricted Use SCOs.

The chlorinated VOCs, PCE, TCE and cis-DCE were all reported above Groundwater Quality Standards in all three groundwater samples collected by AES.

2.4 GEOLOGICAL CONDITIONS

The geologic setting of Long Island is well documented and consists of crystalline bedrock overlain by layers of unconsolidated deposits. According to geologic maps of the area created by the United States Geologic Survey (USGS), the bedrock in this area is an igneous intrusive classified as the Ravenswood grano-diorite of middle Ordovician to middle Cambrian age. Unconsolidated sediments overlie the bedrock and consist of Pleistocene aged sand, gravel and silty clays, deposited by glacial-fluvial activity. Non-native fill materials consisting of dredge spoils, rubble and / or other materials have historically been used to reinforce and extend shoreline areas and to raise and improve the drainage of low lying areas.

Subsurface soil on Lot 35 (parking area) consists of historic fill material that extends to 0 to 4 ft below grade and up to depths as great as 10 ft, underlain with a brown silty sand. The subsurface soil below the concrete slab of the existing building on Lot 9 consists of historic fill material that extends to 0 to 4 ft below the existing building slab and up to depths as great as 10 ft underlain with a brown/black silty clay and/or medium/coarse brown sand. The area topography slopes fairly steeply to the east. Sidewalk elevation on the west side of the property (3rd Street) is approximately 13ft above mean sea level, and the sidewalk elevation on the east side of the property (4th Street) is approximately 20ft above mean sea level.

Groundwater at the Site is present under water table conditions at a depth of 4.5 to 6.14 feet below grade. Based upon on-site measurements, groundwater flow is to the north.

2.5 CONTAMINATION CONDITIONS

2.5.1 Conceptual Model of Site Contamination

There is very little detail about what type of manufacturing took place at the Site historically and if those activities involved the use of chlorinated VOCs. However, elevated levels of CVOCs were reported in shallow soil and also in shallow groundwater. The wide distribution across the Site and the uniformity in concentration in both soil and groundwater suggest a surface release at multiple locations across the Site. However it is also possible that the release occurred in one location of the Site and was then spread around during a flooding condition (storm surge, hurricane Sandy, etc.). According to NYC open data resources, the western half of the Site was within the hurricane Sandy inundation zone. It is likely that the latter scenario is the case as the highest concentrations in soil did not correlate with that in groundwater.

Elevated levels of CVOCs are present in soil vapor indicating that CVOCs in shallow soil are transferring to the vapor phase. However, the highest concentrations reported in soil vapor did not correlate with the highest concentrations in either soil or groundwater.

2.5.2 Description of Areas of Concern

CVOC SOURCE

The CVOC PCE was detected above Unrestricted Use and Protection of Groundwater SCOs within numerous shallow soil samples collected from the intervals 0-2ft and 2-4ft below the existing building slab (Lot 9), and 0-2ft and 2-4ft below the asphalt parking lot (Lot 35).

The CVOC TCE was detected above Unrestricted Use SCOs and Protection of Groundwater SCOs within one 2-4ft soil sample in the approximate center of the existing building (Lot 9).

No other sources were identified during this RI.

Fill Material

Historic fill material has been identified across the Site to depths of 0 to 4 ft below the existing building slab and parking area and up to depths as great as 10 ft (Lot 9 and Lot 35). Depending on location, the historic fill material contains SVOCs, pesticides/PCBs, and/or metals above Unrestricted Use SCOs, Restricted Residential SCOs, and/or Restricted Commercial SCOs.

2.5.3 Soil/Fill Contamination

The results of sampling performed during this RI identified historic fill material from 0 to 4 ft below the existing building slab and parking area and up to depths as great as 10 ft (Lot 9 and Lot 35). Depending on location, the historic fill material contains SVOCs, metals (arsenic, barium, chromium, copper, lead, mercury), pesticides (4,4'-DDT, 4,4'-DDE) and PCBs above Unrestricted Use SCOs, Restricted Residential SCOs, and/or Commercial SCOs. Elevated levels of PCE were reported in the shallow soil samples from two of the borings performed by EBC and within four of the shallow soil samples collected by Associated Environmental Services, Ltd.

The CVOC PCE was detected above Unrestricted Use and Protection of Groundwater SCOs within numerous shallow soil samples collected from the intervals 0-2ft and 2-4ft below the existing building slab (Lot 9), and 0-2ft and 2-4ft below the asphalt parking lot (Lot 35). The CVOC TCE was detected above Unrestricted Use SCOs and Protection of Groundwater SCOs within one 2-4ft soil sample in the approximate center of the existing building (Lot 9).

Summary of Soil/Fill Data

Soil sample results from the RI are summarized in Tables 3 through 7. Further information on soil sample collection, handling and analysis can be found in the RI Report (EBC, March 2020).

Comparison of Soil/Fill with SCGs

Table 15 shows sample results above Track 1 Unrestricted SCOs for all overburden soil at the Site. Figure 7 is a spider map which shows soil sampling locations and summarizes shallow and deep sample results above Track 1 Unrestricted SCOs for all overburden soil.

2.5.4 On-Site and Off-Site Groundwater Contamination

PCE was detected within the groundwater samples collected in the central area of the building, the northeast corner of the building, and in the parking lot. Concentrations were low (<10 µg/L) in all samples with the exception of the MW2 groundwater sample (43 µg/L) located in the south – central area of the parking lot near the property line, and MW4 (13 µg/L). The chlorinated VOC cis-1,2-dichloroethene was detected in the GW-2 groundwater sample (15 µg/L) collected by Associated in September 2018, and the MW4 groundwater sample (9.9 µg/L) collected by EBC in December 2019. The pesticide 4,4'-DDT was detected in the parts per trillion range in two of the samples and is likely related to suspended solids in the sample. Two dissolved metals were detected in all of the wells. Manganese and sodium were detected above NYSDEC Ambient Water Quality Standards (AWQS) in all six wells and are attributable to residual salt water intrusion. Low levels of PFAS compounds were detected in groundwater throughout the Site.

Summary of Groundwater Data

The results of groundwater samples collected during the RI are summarized in Tables 8 through 13. Further information on groundwater sample collection, handling and analysis can be found in the RI Report (EBC, March 2020).

Comparison of Groundwater with SCGs

Sample results above groundwater standards in monitoring wells prior to the remedy are shown in Table 16. Spider maps which show groundwater sampling locations and summarize results above GA groundwater standards prior to the remedy are shown in Figure 8.

2.5.5 On-Site and Off-Site Soil Vapor Contamination

Petroleum-related VOCs were generally low in the soil gas samples and were consistent with typical background levels. Chlorinated VOCs in soil vapor included PCE (ranged from 6.07

μg/m^3 to 1,130 μg/m^3), TCE (ranged from 9.18 μg/m^3 to 57.5 μg/m^3), and cis-DCE (ranged from 5.67 μg/m^3 to 201 μg/m^3). PCE was reported in all eight soil gas samples, and TCE and cis-DCE were detected within 5 and 4 of the eight soil gas samples respectively. The highest CVOC concentrations were in the northeast corner of the building and did not correlate with the highest concentrations in soil or in groundwater.

Summary of Soil Vapor Data

A table of soil vapor data collected prior to the remedy is shown in Table 14. Further information on soil gas sample collection, handling and analysis can be found in the RI Report (EBC, March 2020). Soil vapor results are posted on Figure 9.

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

- 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.

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;
- 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 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 would include removal of the underground storage tank (UST), piping, etc. below the mezzanine along 4th Street, excavation varying between 0 to 4 ft below the existing building slab and parking area and up to depths as great as 10 ft (Lot 9 and Lot 35) to remove non-hazardous historic fill above Unrestricted Use SCOs, and excavation of all CVOC impacted soil above Protection of Groundwater and Unrestricted Use SCOs to 6 feet. An estimated 9,000 tons of non-hazardous historic fill material/soil and CVOC impacted soil will require removal to achieve Unrestricted Use SCOs. Contamination in groundwater would be removed from the Site through dewatering activities which would be required to excavate CVOC impacted soil present at/below the groundwater table and historic fill material present at/below the water table. Two down gradient monitoring wells would be installed to collect pre and post-dewatering groundwater samples for

VOC analysis (EPA Method 8260) to demonstrate that the dewatering effectively addressed the pre-remedy groundwater conditions. This alternative does not allow for the use of long-term Institutional/ Engineering Controls to address impacted media or prevent exposures which may be required beneath the new building.

- Alternative 2 - Track 2, remediation of all soils to Restricted Residential SCOs to a depth of 15 feet below grade with removal of soils below 15 feet which may be a source of contamination to the groundwater. This alternative would require many of the same elements as the Track 1 alternative including removal of the underground storage tank, piping, etc., excavation of all CVOC impacted soil above Protection of Groundwater SCOs and Unrestricted Use SCOs to a depth of approximately 6 feet, excavation varying between 0 to 4 feet of soil/fill across the Site to remove non-hazardous historic fill above Restricted Residential SCOs, and additional excavation up to 10 ft in a barium hotspot located at soil boring location 19B6 and other areas as needed to meet Restricted Residential SCOs. An estimated 9,000 tons of non-hazardous historic fill material/soil will require removal to achieve Restricted Residential SCOs. This alternative could potentially require a lesser degree of excavation than Alternative 1 because Alternative 1 would require deeper excavation of some areas to remove soil that has Unrestricted Use SCO exceedences, but not Restricted Residential SCO exceedences. Contamination in groundwater would be removed from the Site through dewatering activities which would be required to excavate CVOC impacted soil present at/below the groundwater table and historic fill material present at/below the water table. Two down gradient monitoring wells would be installed to collect pre and post-dewatering groundwater samples to demonstrate that the dewatering effectively addressed the pre-remedy groundwater conditions. Long-term Institutional/Engineering Controls are allowed to address or prevent exposures from any remaining impacted media, such as soil gas. This alternative is provided as a contingency in the event that Track 1 Unrestricted Use SCOs cannot be met. Since both Alternative 1 and Alternative 2 require excavation to remove the CVOC impacted soil, and the majority of non-hazardous fill materials, Alterative 2 has been added as a contingency in the event that Alternative 1 cannot be achieved for non-COC parameters.

- Alternative 3 - Track 4, remediation of all soil to site-specific SCOs. This alternative would require many of the same elements as the Track 1 and Track 2 alternatives including removal of the underground storage tank, piping, etc., excavation across the Site as needed to remove CVOC impacted soil from the source area(s) and installation of a cover system. Contamination in groundwater would be removed from the Site through dewatering activities which would be required to excavate CVOC impacted soil present at/below the groundwater table. Two down gradient monitoring wells would be installed to collect pre and post-dewatering groundwater samples to demonstrate that the dewatering effectively addressed the pre-remedy groundwater conditions. Since Alternative 3 allows the use of long-term Institutional/Engineering Controls (>5yrs) to meet SCOs and to address or prevent exposures from other impacted media such as soil gas, it is presented as a contingency to Alternative 2 in the event that deeper excavations are not possible and long term Engineering Controls will be required. This alternative will also require a cover system, an environmental easement and a Site Management Plan.

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 eliminating CVOC contaminants present in all affected soils at the Site, removing all historic fill soil, 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 and backfilling as needed with certified clean fill or virgin mined materials.

Potential post-remediation exposures to on-Site residents from soil vapors are not expected to require the operation of SSD systems, though 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 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 will also be achieved as impacted groundwater will be extracted and treated prior to discharge into the NYC sewer system (see Section 5.5.10) 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 CVOC impacted soil above Protection of Groundwater SCOs and Unrestricted Use SCOs and removal of groundwater by dewatering.

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 is eliminated and risk from groundwater impacts and soil vapor significantly reduced by removal of source materials. Alternative 1 will continue to meet RAOs for soil and groundwater 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 by removing the source area of contamination and meeting Unrestricted Use SCOs. The removal of on-site soil and groundwater 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 for the remediation of soils is both 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 $1,967,420. This cost estimate includes the following elements and assumptions:

- Removal of the underground storage tank and any other tanks which may be encountered during Site excavation;
- Excavate low-level CVOC impacted soil to achieve Protection of Groundwater SCOs and Unrestricted Use SCOs to a depth of approximately 6 feet;

- Excavate historic fill material depths varying from 0 to 4 ft below the existing building slab and parking area and up to depths as great as 10 ft (Lot 9 and Lot 35), and over-excavate as needed to achieve Track 1;
- Shoring and SOE work to accommodate excavation to a depth of at least 11 ft;
- Backfilling of the excavated areas of the Site to grade required for building construction;
- Loading, transport and disposal of approximately 9,000 tons of low-level CVOC impacted soil and historic fill material;
- Installation and operation of a dewatering system to allow for excavation/removal of CVOC impacted soil and historic fill material at/below the groundwater table;
- Waste characterization and endpoint verification sampling and analysis;
- HASP and CAMP monitoring for the duration of the remedial activities; and
- 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 eliminating CVOC contaminants present in all affected soils at the Site, removing historic fill, and by remediating groundwater by dewatering. The potential for human and environmental exposure to these constituents on-site will be eliminated by removing CVOC impacted soil and historic fill in excess of Restricted Residential criteria to a maximum depth of 15 feet, and off-site disposal of excavated materials, and backfilling as needed with certified clean fill or virgin mined materials.

Potential post-remediation exposures to on-Site occupants from soil vapors are not expected to require the operation of SSD systems, though 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 source removal to Track 2 Restricted Residential cleanup levels for the top 15 feet. SCGs for groundwater will also be achieved as impacted groundwater will be extracted and treated prior to discharge into the NYC sewer system (see Section 5.5.10) 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 CVOC 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. Under this Alternative, risk from soil impacts will be minimized. 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 reduce the toxicity, mobility, and volume of contaminants from on-Site soil by meeting Restricted Residential SCOs in the upper 15 feet.

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 to allow for excavation below the groundwater table for the remediation of soils are both a "low tech" and reliable method which has a long and proven track record on the remediation of contaminated brownfield sites.

3.5.7 Cost

Costs associated with Alternative 2 are estimated at approximately $1,981,795. This cost estimate includes the following elements and assumptions:

- Removal of the underground storage tank and any other tanks which may be encountered during Site excavation;
- Excavate low-level CVOC impacted soil to achieve Protection of Groundwater and Unrestricted Use SCOs to a depth of approximately 6 feet;
- Excavation historic fill material across the Site to depths varying between 4 and 6 feet below grade, over-excavate as needed to achieve Restricted Residential SCOs;
- Shoring and SOE work to accommodate excavation to a depth of at least 11 ft;
- Backfilling of the excavated areas of the Site to grade required for building construction;
- Loading, transport and disposal of approximately 9,000 tons of low-level CVOC impacted soil and historic fill material;
- Installation and operation of a dewatering system to allow for excavation/removal of CVOC impacted soil and historic fill material at/below the groundwater table;
- Waste characterization and endpoint verification sampling and analysis;
- HASP and CAMP monitoring for the duration of the remedial activities; and
- Preparation of a Site Management Plan;
- Preparation of a Final Engineering Report; and
- Preparation of and recording of an Environmental Easement 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 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 removing CVOC impacted soil above Protection of Groundwater SCOs and Unrestricted Use SCOs, removing the underground storage tank, piping, etc., and some historic fill material, but by otherwise capping any remaining residual historic fill material with parameters above Restricted Residential SCOs with appropriate cover system material such as the building foundation. The potential for human and environmental exposure to these constituents on-Site will be eliminated by the excavation and/or capping of all soils with parameters above Restricted Residential criteria. Potential post-remediation exposures to on-Site occupants from soil vapors are not expected to require the operation of SSD systems, though 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 CVOC impacted soil removal, the elimination of some of the historic fill, and capping any remaining residual fill with parameters above Restricted Residential SCOs. SCGs for groundwater will also be achieved as impacted groundwater will be extracted and treated prior to discharge into the NYC sewer system (see Section 5.5.10) 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 CVOC impacted soil above Protection of Groundwater SCOs and Unrestricted Use SCOs and removal of groundwater by dewatering.

3.6.3 Long-term Effectiveness and Permanence

Alternative 3 achieves long term effectiveness by removing CVOC impacted soil, some of the historic fill, and by capping any remaining residual fill material above Restricted Residential

SCOs with the building foundation. Under this Alternative, risk from dermal, ingestion or inhalation soil impacts is eliminated for on-site occupants coupled with a Site Management Plan to preserve the cover system and Environmental Easement to enforce compliance. Alternative 2 will continue to meet RAOs for soil in the future, providing an enforceable 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 by removing CVOC impacted soil. The removal of CVOC impacted soil will also reduce the toxicity, mobility, and volume of contaminants in groundwater and soil vapor.

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 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.

3.6.6 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 of soils 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. Shoring for remedial purposes will be required beyond that needed for construction purposes.

3.6.7 Cost

Costs associated with Alternative 3 are identical to Alternative 2 and estimated at approximately $ 1,893,388. This cost estimate includes the following elements and assumptions:

- Removal of the underground storage tank and any other tanks which may be encountered during Site excavation;
- Excavate low-level CVOC impacted soil to achieve Protection of Groundwater SCOs and Unrestricted Use SCOs to a depth of approximately 6 feet;
- Shoring and SOE work to accommodate excavation to a depth of at least 6 ft;
- Installation and operation of a dewatering system to allow for excavation/removal of CVOC impacted soil and historic fill material at/below the groundwater table;
- Backfilling of the excavated areas of the Site to grade required for building construction;
- Loading, transport and disposal of approximately 9,000 tons of low-level CVOC impacted soil and historic fill material;
- Waste characterization and endpoint verification sampling and analysis;
- HASP and CAMP monitoring for the duration of the remedial activities; and
- Preparation of a Site Management Plan;
- Preparation of a Final Engineering Report; and
- Preparation of and recording of an Environmental Easement.

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 the objectives for Restricted Residential Use which is appropriate for its planned residential 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 remedy (Alternative 1), which consists of the removal of all on-Site soil in exceedance of Track 1 Unrestricted Use Soil Cleanup Objectives (SCOs). It is expected that a Track 1 alternative will require excavation across the Site to depths varying between 0 to 4 ft below the existing building slab and parking area and up to depths as great as 10 ft (Lot 9 and Lot 35) to remove historic fill material with parameters above Unrestricted Use SCOs, and up to 6 feet across the Site to remove all CVOC impacted with parameters above Protection of Groundwater SCOs and Unrestricted Use SCOs. All soil with parameters above Protection of Groundwater SCOs and Unrestricted Use SCOs will be removed from the Site and properly disposed of at off-site facilities. The Track 1 alternative also includes remediation of groundwater through dewatering during excavation activities. Over-excavated areas and portions of the Site that require grade to be raised will be backfilled with either virgin mined materials, recycled materials, or certified fill which meet Unrestricted Use SCOs. As part of the Track 1 remedy, a 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.

In the event that Track 1 Unrestricted Use is not achieved, including achievement of groundwater and soil vapor remedial objectives, the remedy will achieve either a Track 2 or 4 cleanup.

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 lots are currently zoned R6 Residential. Residence districts are the most common zoning districts in New York City, accounting for about 75 percent of the city’s zoned land area. These districts accommodate an extraordinary variety of residential building forms - ranging from the single-family homes set amid wide lawns on the city’s outskirts to the soaring towers of Manhattan.

To regulate such diversity, the Zoning Resolution designates 10 basic residence districts - R1 through R10. The numbers refer to permitted bulk and density (with R1 having the lowest density and R10 the highest) and other controls such as required parking.

R6 zoning districts are widely mapped in built-up, medium-density areas in Brooklyn, Queens and the Bronx. The character of R6 districts can range from neighborhoods with a diverse mix of building types and heights to large-scale “tower in the park” developments.

Residences are permitted in all commercial districts except C7 and C8. Certain higher-density commercial districts mapped primarily in Manhattan are, in fact, substantially residential in character. In applicable commercial districts, the size of a residential building or the residential portion of a mixed building is governed by the bulk provisions of a specified equivalent residential district. For example, R6 is the residential district equivalent of C4-2 and C4-3 districts.

All residence districts permit most community facilities, such as schools, houses of worship and medical facilities. In certain districts, the maximum permitted floor area ratio (FAR) for community facilities exceeds the maximum permitted FAR for residential uses in order to accommodate needed services, such as medical centers or schools. In districts limited to one- and two-family homes, however, certain facilities are not permitted or are restricted in size.

The proposed redevelopment of the Site with two new multi-family residential buildings will be in full compliance with the current zoning.

Applicable Comprehensive Community Master Plans or Land Use Plans

There are no current master plans involving this area of Astoria, Queens. However the adjacent areas to the east were included in the Astoria Rezoning action completed by the City in May 2010.

The Astoria rezoning was completed to protect neighborhood character from out-of-scale development by mapping contextual zoning districts that more closely reflect the scale and form of existing buildings and set firm building height limits.

Since the proposed redevelopment will be in full compliance with R6 zoning it will meet the general purpose and intention of the Astoria rezoning which covers areas east of the project site.

Surrounding Property Uses

Surrounding land use includes industrial / manufacturing facilities north of 26th Avenue and a large multi-family multi-building apartment complex south of 27th Avenue. Adjacent properties to the east and west include a mix of commercial (contractor yards, warehouses, manufacturing) with single and multi-family residential properties interspersed among the commercial lots. The area surrounding the property is highly urbanized and predominantly consists of industrial / commercial buildings to the north and residential apartment complexes to the south.

Only one school was identified within 1,000 feet of the Site; AHRC – Astoria Blue Feather – Special Education School located at 27-07 8th Street approximately 750 feet to the southeast. The Hallet Cove Child Development Center was identified within the Astoria Houses complex located south of the Site. There were no nursing homes or hospitals identified within 1,000 feet of the Site.

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 (Astoria Branch of the Queens Public Library, Queens Community Board 1).

Environmental Justice Concerns

The Site is located within a potential Environmental Justice Area. 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 for the majority of the Site 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 Astoria Boulevard will assist soil transportation and contractor access to the Site. The Site is also accessible to mass transit and the N/Q subway line with subway stops on Ditmars Boulevard and 30th Avenue are located approximately 15 minutes east of the Site. 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 improve off-site groundwater impacts by removing CVOC impacted soil by excavation and contaminated groundwater by dewatering from the Site. The proposed remedy will not affect natural resources other than to potentially improve the quality of groundwater on a local basis.

Proximity to floodplains

The western half of the Site is located within a designated 1% (100yr) flood zone area.

Geography and geology of the Site

The selected remedy will excavate soil from the Site to a depth of at least 5 feet below sidewalk grade with excavation in some areas extending to at least 10 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 remedy (Alternative 1), which consists of the removal of all on-Site soil in exceedance of Track 1 Unrestricted Use Soil Cleanup Objectives (SCOs). It is expected that a Track 1 alternative will require excavation across the Site to depths varying between 0 to 4 ft below the existing building slab and parking area and up to depths as great as 10 ft (Lot 9 and Lot 35). To remove all CVOC impacted soil with parameters above Protection of Groundwater SCOs and Unrestricted Use SCOs, excavation across the majority of the Site will be required to a depth of at least 6ft. All CVOC impacted soil and fill material will be removed from the Site and properly disposed of at off-site facilities. The Track 1 alternative also includes remediation of groundwater through dewatering during excavation activities. Over-excavated areas and portions of the Site that require grade to be raised will be backfilled with either virgin mined materials, recycled materials, or certified fill which meet Unrestricted Use SCOs.

1. Excavation of CVOC impacted soil exceeding Protection of Groundwater SCOs and Track 1 Unrestricted Use SCOs to depths approaching 6 feet below grade (Lot 9 and Lot 35) as listed in Table 1;
2. Excavation of historic fill material exceeding Track 1 Unrestricted Use SCOs as listed in

Table 1 to depths varying between 0 to 4 ft below the existing building slab and parking area and up to depths as great as 10 ft (Lot 9 and Lot 35), with additional excavation as needed to meet Track 1 Unrestricted Use SCOs;

3. Screening for indications of contamination (by visual means, odor, and monitoring with PID) of all excavated soil during any intrusive Site work;
4. Collection and analysis of end-point samples to evaluate the performance of the remedy with respect to attainment of Track 1 Unrestricted Use SCOs;
5. 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;
6. Installation of SOE and a dewatering system to allow for excavation/removal of CVOC impacted soil and historic fill material at/below the groundwater table, and treatment (if needed) and discharge of groundwater to the NYC sewer system under a NYCDEP sewer discharge permit;
7. Installation of two down gradient monitoring wells to collect pre and post-dewatering groundwater samples for VOC (EPA Method 8260) analysis to demonstrate dewatering effectively addressed the pre-remedy groundwater conditions;
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. Perform a post-construction soil vapor intrusion evaluation, including a provision for implementing actions recommended to address exposures related to soil vapor intrusion within the new building;
10. If Track 1 SCOs are not achieved, and Track 2 Restricted Residential SCOs are also not achieved, a composite cover system consisting of the concrete building slab will be constructed.
11. If Track 1 cleanup is not achieved, implementation of a Site Management Plan (SMP) for long term maintenance of the Engineering Controls.
12. If Track 1 cleanup is not achieved, an Environmental Easement will be filed against the Site to ensure implementation of the SMP.

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 are not achieved including achievement of groundwater and soil vapor remedial objectives, then a Track 2 or Track 4 remedy may result as described above.

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.

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 Volunteer 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 Mr. Thomas 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 gases. 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 Citizen Participation Plan prepared for this project is provided in Attachment E. 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:

Queens Public Library – Astoria Branch
14-01 Astoria Boulevard, Astoria, NY 11102, Ph: 718.278.2220

Hours

Mon	12:00 PM - 8:00 PM	Thu	12:00 PM - 8:00 PM	Sun - Closed
Tue	1:00 PM - 6:00 PM	Fri	10:00 AM - 6:00 PM	
Wed	10:00 AM - 6:00 PM	Sat	10:00 AM - 5:30 PM	

Queens Public Library
Astoria Branch
14-01 Astoria Boulevard
Astoria, New York 11102
Phone: 718-278-2220

Queens Community Board 1
45-02 Ditmars Blvd., LL Suite 1025
Astoria, NY, 11106
Phone: 718-626-1021 Email: qn01@cb.nyc.gov

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 backfill 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 2 weeks 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 8 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 will be 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 Volunteer'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 Wythe Avenue. Traffic related to on-going remedial activity will require the staging of 10-wheel dump trucks on 4th Street on a daily basis during soil excavation activity. The soil disposal transport route will be as follows:

- ENTERING SITE From 4th Street - from the Brooklyn-Queens Expressway (I-278) heading west/north; take Exit 45 (31st Street) – Last Exit Before Toll – merge onto Astoria Boulevard North. Astoria Boulevard North will become Hoyt Avenue North to 21st Street. Turn Left (south) onto 21st Street. Continue on 21st Street to 27th Avenue. Turn Right (west) onto 27th Avenue. Continue on 27th Avenue to 4th Street. Turn Right (north) onto 4th Street. Continue to the Site entrance on the left.
- EXITING SITE From 3rd Street – Turn Left toward 27th Avenue. Turn Right (west) onto 27th Avenue and continue to 14th Street. Turn Right (south) onto 14th Street. Turn Left (east) onto Astoria Boulevard. Continue east on Astoria Boulevard until the on ramp for the Brooklyn-Queens Expressway (I-278) on ramp.

A map showing the truck routes is included as Figure 10.

4.2.7 Worker Training and Monitoring

An excavation contractor with appropriate experience, personnel and training (minimum 24 hr OSHA) is required to perform the removal of the petroleum impacted soil and 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 17. 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 **17**. 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 $ 1,967,420. An itemized and detailed summary of estimated costs for all remedial activity is attached as Attachment G. This will be revised based on actual costs and submitted as an Appendix to the Final Remediation Report.

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 1 to 7-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 1 to 7-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 will be constructed around the perimeter of the Site. 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. tons 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. Any public health-related complaints will be reported to the NYS Department of Health (DOH) via email or telephone call, depending on the nature of the complaint, on the same day that 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: UST / SOIL REMOVAL FROM SITE

5.1 UST REMOVAL

5.1.1 UST Removal Methods

The underground storage tank located below the mezzanine near the 4th Street property line, 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).

5.2 SOIL EXCAVATION

Excavation work includes the following; removal of CVOC impacted soil to achieve Protection of Groundwater SCOs and Unrestricted Use SCOs (majority of the Site to a depth of at least 6ft), and removal of historic fill material to depths varying between 0 to 4 ft below the existing building slab and parking area and up to depths as great as 10 ft (Lot 9 and Lot 35) to meet Track 1 Unrestricted Use SCOs. 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 an unknown 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 CVOC will be performed by an excavation contractor using appropriately trained personnel (40 hr HAZWOPER).

Any over excavated areas, and areas that need to be raised to meet the final elevation proposed for the new building will be backfilled using clean native soil, recycled materials, and/or imported material meeting Unrestricted Use SCOs. An excavation plan showing the excavation depths to achieve the Track 1 remedy is provided in Figure 11. A grid map is provided as Figure 13.

5.2.1 Soil Cleanup Objectives

The Soil Cleanup Objectives for this Site are listed in Table 1. Table 15 summarizes all soil samples that exceed the SCOs proposed for this Remedial Action. Spider maps showing all soil samples that exceed the SCOs proposed for this Remedial Action are shown in Figure 7.

5.3 REMEDIAL PERFORMANCE EVALUATION (POST EXCAVATION END-POINT SAMPLING

Post excavation (endpoint) soil samples will be collected 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 for remedial/construction purposes to verify that remedial goals have been achieved (Figure 12). The Site-wide endpoint soil samples will be analyzed for the following:

- Volatile organic Compounds (VOCs) by EPA Method 8260;
- Per- and Polyfluoroalkyl Substances (PFAS) compounds by EPA Method 537 modified;
- Semi-volatile organic compounds (SVOCs) (soil, groundwater) and 1,4-dioxane by EPA Method 8270 and 8270 SIM;
- Target Analyte List (TAL) metals, and;
- Pesticides/PCBs by Method 8081/8082.

(2) Sidewall endpoint soil samples will be collected from any CVOC hotspot areas in which the excavation extends beyond the site-wide excavation depth of 5 ft proposed to remove the historic fill material. Sidewall samples will be analyzed for the following:

- Volatile organic Compounds (VOCs) by EPA Method 8260;
- Per- and Polyfluoroalkyl Substances (PFAS) compounds by EPA Method 537 modified;
- Semi-volatile organic compounds (SVOCs) and 1,4-dioxane by EPA Method 8270 and 8270 SIM;
- Target Analyte List (TAL) metals, and;
- Pesticides/PCBs by Method 8081/8082.

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 only be collected if a CVOC hotspot excavation extends beyond the proposed site-wide excavation depth of 4 ft to remove the historic fill material.

5.3.2 Methodology

Collected samples 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 the following:

- Volatile organic Compounds (VOCs) by EPA Method 8260;
- Per- and Polyfluoroalkyl Substances (PFAS) compounds by EPA Method 537 modified;
- Semi-volatile organic compounds (SVOCs) and 1,4-dioxane by EPA Method 8270 and 8270 SIM;
- Target Analyte List (TAL) metals, and;
- Pesticides/PCBs by Method 8081/8082.

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

Historic fill material and/or CVOC impacted soil was documented throughout the Site to depths as great as 6 foot below grade. Soil and/or fill with exceedences of Unrestricted Use SCOs was also noted in several locations to a depth of 10 ft below grade. An estimated 6,000 cubic yards (9,000 tons) of non-hazardous CVOC impacted soil and historic fill is expected to be excavated and disposed of as non-hazardous under a contained-in determination.

5.5 SOIL/MATERIALS MANAGEMENT PLAN

Pre-characterization samples will be collected to allow the soil to be loaded directly on to trucks for transport to the disposal facility. This will include the CVOC impacted soil and historic fill material. Based on the levels of CVOCs reported in soil during the Remedial Investigation, it is anticipated that DEC will make a contained-in determination allowing this soil to be disposed of as non-hazardous. The remaining historic fill that will require excavation/disposal 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 as described in **Section 5.3** of this document.

5.5.2 Excavation of CVOC Impacted Soil and Historic Fill Material

CVOC impacted soil is likely present to at least the groundwater table (5ft below grade), and evidence of historic fill material was noted to depths between 0 ft to 4 ft below grade, and in some areas to depths as great as 10 ft below grade. The historic fill material contains SVOCs, metals, PCBs and pesticides above Unrestricted Use and/or Restricted Residential and/or Restricted Commercial SCOs. Historic fill material and CVOC impacted soil will be segregated from non-contaminated native soils and disposed of off-Site at a permitted disposal facility.

Historic fill soil with lead levels above 1,500 mg/kg 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. Excavation of CVOC impacted soil and historic fill material will be performed by the excavation contractor for the construction project using trained personnel (40 hr HAZWOPER).

5.5.3 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.

5.5.4 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.

5.5.5 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 Volunteer 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 tarped, 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 Volunteer 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.

5.5.6 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:

- ENTERING SITE From 4th Street - from the Brooklyn-Queens Expressway (I-278) heading west/north; take Exit 45 (31st Street) – Last Exit Before Toll – merge onto Astoria Boulevard North. Astoria Boulevard North will become Hoyt Avenue North to 21st Street. Turn Left (south) onto 21st Street. Continue on 21st Street to 27th Avenue. Turn Right (west) onto 27th Avenue. Continue on 27th Avenue to 4th Street. Turn Right (north) onto 4th Street. Continue to the Site entrance on the left.
- EXITING SITE From 3rd Street – Turn Left toward 27th Avenue. Turn Right (west) onto 27th Avenue and continue to 14th Street. Turn Right (south) onto 14th Street. Turn Left (east) onto Astoria Boulevard. Continue east on Astoria Boulevard until the on ramp for the Brooklyn-Queens Expressway (I-278) on ramp.

These routes are shown in Figure 10.

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.

5.5.7 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 2 different facilities, based on the following classification:

- Non Hazardous - Contaminated (historic fill / CVOC) Low Lead < 1,500 mg/kg
- Non Hazardous - Contaminated (historic fill / CVOC) High Lead > 1,500 mg/kg

The total quantity of material expected to be disposed off-Site for remedial purposes is 6,000 cubic yards.

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 CVOC impacted 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 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. There was no evidence of former basement areas identified during previous investigations performed at the Site.

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.

5.5.8 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 areas) or Restricted Residential Use SCOs (for Track 4 area) through the verification testing program detailed above. Based on the proposed remedial excavation plan, reuse of on-Site clean native soil is not anticipated.

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.

5.5.9 Construction Fluids Management

As the depth to groundwater at the Site is approximately 5 feet below the existing building's concrete slab. Therefore, dewatering operations will be required to excavate at/below the groundwater table.

5.5.10 Backfill from Off-Site Sources

Off-site aggregate 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. RCA can only be used beneath a cover and cannot be placed at or below the water table.

Fill material may also consist of 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 from 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;
- 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.

5.5.11 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.

5.5.12 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, etc. Chemical analytical work will be for full scan parameters (TAL metals; TCL volatiles and semi-volatiles, TCL pesticides and PCBs). These analyses will not be limited to STARS parameters where tanks are identified without prior approval by NYSDEC. Analyses will not be otherwise limited without NYSDEC approval.

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.

5.5.13 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 primary concerns for this site are odors associated with groundwater purging and sampling. 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.

5.5.14 Odor, Dust and Nuisance Control Plan

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.

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.

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 soil remaining on this portion of the Site after completion of remediation will meet Track 1 Unrestricted Use SCOs 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.

Long-term management of ICs/ECs on the Track 4 portion of the Site, and of residual contamination, will be executed under a site-specific Site Management Plan (SMP) that will be developed and submitted to DEC. 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, Institutional Controls (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 Site Management Plan (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, then 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 FER 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 FER 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 FER 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 3 weeks following RAWP approval and within 10 days of the distribution of the Construction Fact Sheet. Mobilization will be followed by removal and disposal of the USTs (if present), excavation and disposal of CVOC impacted soil, historic fill materials and native soil, and 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 3 weeks of RAWP approval
Mobilize equipment to the site and construct truck pad and other designated areas	Within 3 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 excavation of UST	Within 3 weeks following mobilization of the excavation contractor
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 for Track 4 area of the Site	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: Residential	Protection of Public Health: Restricted-Residential	Protection of Public Health: Commercial	Protection of Public Health: Industrial	Protection of Ecological Resources	Protection of Ground-water	Unrestricted Use
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				Protection of Ecological Resources	Protection of Ground-water	Unrestricted Use
		Residential	Restricted-Residential	Commercial	Industrial			
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.

TABLE 2
SUMMARY OF
SAMPLING PROGRAM RATIONALE AND ANALYSIS

Matrix	Location	Number of Samples	Rationale for Sampling	Laboratory Analysis
Subsurface soil (0 to 2 feet bgs)	From soil borings SB1 through SB10 performed across the Site.	10	To evaluate historic fill material with respect to SCOs	VOCs EPA Method 8260B, PFAS Compounds EPA Method 537, SVOCs EPA Method 8270 plus 1,4-dioxane, pesticide / PCBs EPA Method 8081/8082, TAL metals EPA 6010.
Subsurface soil (8 to 10 feet bgs)	From soil borings SB1 through SB10 performed across the Site.	10	To evaluate native soil with respect to SCOs	VOCs EPA Method 8260B, PFAS Compounds EPA Method 537, SVOCs EPA Method 8270 plus 1,4-dioxane, pesticide / PCBs EPA Method 8081/8082, TAL metals EPA 6010.
Subsurface soil (12 feet bgs)	From soil borings SB9.	1	To evaluate native soil with respect to SCOs	VOCs EPA Method 8260B, PFAS Compounds EPA Method 537, SVOCs EPA Method 8270 plus 1,4-dioxane, pesticide / PCBs EPA Method 8081/8082, TAL metals EPA 6010.
Total (Soils)		21		
Groundwater (water table)	From 6 monitoring well installed across the Site.	7	To assess groundwater quality at the Site.	VOCs EPA Method 8260B, PFAS Compounds EPA Method 537, SVOCs EPA Method 8270 plus 1,4-dioxane, pesticide / PCBs EPA Method 8081/8082, TAL (total and dissolved) metals EPA 6010.
Total (Groundwater)		7		
Soil Vapor (Sub-Slab)	8 subslab sampling points installed below the existing building's slab and within the parking area.	8	Evaluate soil gas across the Site.	VOCs EPA Method TO15
Total (Soil Gas)		8		
MS/MSD	Matrix spike and Matrix spike duplicates at the rate 5%	2	To meet requirements of QA / QC program	1 soil and 1 groundwater MS/MSD for VOCs EPA Method 8260B, PFAS Compounds EPA Method 537, SVOCs EPA Method 8270 plus 1,4-dioxane, pesticide / PCBs EPA Method 8081/8082, TAL (total and dissolved) metals EPA 6010.
Field Equipment Blanks	Groundwater pump rinsate samples at a rate of 1 per eight samples.	1	To meet requirements of QA / QC program	VOCs EPA Method 8260B, PFAS Compounds EPA Method 537
Trip Blanks	One laboratory prepared trip blank to accompany samples each time they are delivered to the laboratory.	4	To meet requirements of QA / QC program	VOCs EPA Method 8260B, PFAS Compounds EPA Method 537
Total (QA / QC Samples)		7		

Table 3
26-22 4th Street
Queens, New York
2018 Phase II and 2019/2020 Remedial Investigation
Soil Analytical Results
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	B-1		B-3		B-4		B-6		B-7		B-9	
				(6-8')		(2-4')		(2-4')		(2-4')		(2-4')		(2-4')	
				9/20/2018		9/20/2018		9/20/2018		9/20/2018		9/20/2018		9/20/2018	
				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
1,1,1,2-Tetrachlorothane				-	-	-	-	-	-	-	-	-	-	-	-
1,1,1-Trichloroethane	680	100,000	500,000	<4.7	4.7	<4.4	4.4	<7.4	7.4	<5.2	5.2	<9.9	9.9	< 5.7	5.7
1,1,2,2-Tetrachloroethane				<4.7	4.7	<4.4	4.4	<7.4	7.4	<5.2	5.2	<9.9	9.9	< 5.7	5.7
1,1,2-Trichloroethane				<4.7	4.7	<4.4	4.4	<7.4	7.4	<5.2	5.2	<9.9	9.9	< 5.7	5.7
1,1-Dichloroethane	270	26,000	240,000	<4.7	4.7	<4.4	4.4	<7.4	7.4	<5.2	5.2	<9.9	9.9	< 5.7	5.7
1,1-Dichloroethene	330	100,000	500,000	<4.7	4.7	<4.4	4.4	<7.4	7.4	<5.2	5.2	<9.9	9.9	< 5.7	5.7
1,1-Dichloropropene				<4.7	4.7	<4.4	4.4	<7.4	7.4	<5.2	5.2	<9.9	9.9	< 5.7	5.7
1,2,3-Trichlorobenzene				<4.7	4.7	<4.4	4.4	<7.4	7.4	<5.2	5.2	<9.9	9.9	< 5.7	5.7
1,2,3-Trichloropropane				<4.7	4.7	<4.4	4.4	<7.4	7.4	<5.2	5.2	<9.9	9.9	< 5.7	5.7
1,2,4-Trichlorobenzene				<4.7	4.7	<4.4	4.4	<7.4	7.4	<5.2	5.2	<9.9	9.9	< 5.7	5.7
1,2,4-Trimethylbenzene	3,600	52,000	190,000	<4.7	4.7	<4.4	4.4	<7.4	7.4	<5.2	5.2	<9.9	9.9	< 5.7	5.7
1,2-Dibromo-3-chloropropane				<4.7	4.7	<4.4	4.4	<7.4	7.4	<5.2	5.2	<9.9	9.9	< 5.7	5.7
1,2-Dibromoethane				<4.7	4.7	<4.4	4.4	<7.4	7.4	<5.2	5.2	<9.9	9.9	< 5.7	5.7
1,2-Dichlorobenzene	1,100	100,000	500,000	<4.7	4.7	<4.4	4.4	<7.4	7.4	<5.2	5.2	<9.9	9.9	< 5.7	5.7
1,2-Dichloroethane	20	3,100	30,000	<4.7	4.7	<4.4	4.4	<7.4	7.4	<5.2	5.2	<9.9	9.9	< 5.7	5.7
1,2-Dichloropropane				<4.7	4.7	<4.4	4.4	<7.4	7.4	<5.2	5.2	<9.9	9.9	< 5.7	5.7
1,3,5-Trimethylbenzene	8,400	52,000	190,000	<4.7	4.7	<4.4	4.4	<7.4	7.4	<5.2	5.2	<9.9	9.9	< 5.7	5.7
1,3-Dichlorobenzene	2,400	4,900	280,000	<4.7	4.7	<4.4	4.4	<7.4	7.4	<5.2	5.2	<9.9	9.9	< 5.7	5.7
1,3-Dichloropropane				<4.7	4.7	<4.4	4.4	<7.4	7.4	<5.2	5.2	<9.9	9.9	< 5.7	5.7
1,4-Dichlorobenzene	1,800	13,000	130,000	<4.7	4.7	<4.4	4.4	<7.4	7.4	<5.2	5.2	<9.9	9.9	< 5.7	5.7
1,4-Dioxane	100	13,000	130,000	-	-	-	-	-	-	-	-	-	-	-	-
2,2-Dichloropropane				<4.7	4.7	<4.4	4.4	<7.4	7.4	<5.2	5.2	<9.9	9.9	< 5.7	5.7
2-Chlorotoluene				<4.7	4.7	<4.4	4.4	<7.4	7.4	<5.2	5.2	<9.9	9.9	< 5.7	5.7
2-Hexanone (Methyl Butyl Ketone)				<23	23.0	<22	22.0	<37	37.0	<26	26.0	<49	49.0	< 29	29.0
2-Isopropyltoluene				<4.7	4.7	<4.4	4.4	<7.4	7.4	<5.2	5.2	<9.9	9.9	< 5.7	5.7
4-Chlorotoluene				<4.7	4.7	<4.7	4.7	<7.4	7.4	<5.2	5.2	<9.9	9.9	< 5.7	5.7
4-Methyl-2-Pentanone				<23	23.0	<22	22.0	<37	37.0	<26	26.0	<49	49.0	< 29	29.0
Acetone	50	100,000	500,000	<23	23.0	**790**	530	<37	37.0	<26	26.0	<49	49.0	< 29	29.0
Acrolein				-	-	-	-	-	-	-	-	-	-	-	-
Acrylonitrile				<9.3	9.3	<8.9	8.9	<15	15.0	<10	10.0	<20	20.0	< 11	11.0
Benzene	60	4,800	44,000	<4.7	4.7	<4.4	4.4	<7.4	7.4	<5.2	5.2	<9.9	9.9	< 5.7	5.7
Bromobenzene				<4.7	4.7	<4.4	4.4	<7.4	7.4	<5.2	5.2	<9.9	9.9	< 5.7	5.7
Bromochloromethane				<4.7	4.7	<4.4	4.4	<7.4	7.4	<5.2	5.2	<9.9	9.9	< 5.7	5.7
Bromodichloromethane				<4.7	4.7	<4.4	4.4	<7.4	7.4	<5.2	5.2	<9.9	9.9	< 5.7	5.7
Bromoform				<4.7	4.7	<4.4	4.4	<7.4	7.4	<5.2	5.2	<9.9	9.9	< 5.7	5.7
Bromomethane				<4.7	4.7	<4.4	4.4	<7.4	7.4	<5.2	5.2	<9.9	9.9	< 5.7	5.7
Carbon Disulfide				<4.7	4.7	<4.4	4.4	<7.4	7.4	<5.2	5.2	<9.9	9.9	< 5.7	5.7
Carbon tetrachloride	760	2,400	22	<4.7	4.7	<4.4	4.4	<7.4	7.4	<5.2	5.2	<9.9	9.9	< 5.7	5.7
Chlorobenzene	1,100	100,000	500,000	<4.7	4.7	<4.4	4.4	<7.4	7.4	<5.2	5.2	<9.9	9.9	< 5.7	5.7
Chloroethane				<4.7	4.7	<4.4	4.4	<7.4	7.4	<5.2	5.2	<9.9	9.9	< 5.7	5.7
Chloroform	370	49,000	350,000	<4.7	4.7	<4.4	4.4	<7.4	7.4	<5.2	5.2	<9.9	9.9	< 5.7	5.7
Chloromethane				<4.7	4.7	<4.4	4.4	<7.4	7.4	<5.2	5.2	<9.9	9.9	< 5.7	5.7
cis-1,2-Dichloroethene	250	100,000	500,000	<4.7	4.7	<4.4	4.4	**18**	7.4	<5.2	5.2	**320**	250	< 5.7	5.7
cis-1,3-Dichloropropene				<4.7	4.7	<4.4	4.4	<7.4	7.4	<5.2	5.2	<9.9	9.9	< 5.7	5.7
Dibromochloromethane				<4.7	4.7	<4.4	4.4	<7.4	7.4	<5.2	5.2	<9.9	9.9	< 5.7	5.7
Dibromomethane				<4.7	4.7	<4.4	4.4	<7.4	7.4	<5.2	5.2	<9.9	9.9	< 5.7	5.7
Dichlorodifluoromethane				<4.7	4.7	<4.4	4.4	<7.4	7.4	<5.2	5.2	<9.9	9.9	< 5.7	5.7
Ethylbenzene	1,000	41,000	390,000	<4.7	4.7	<4.4	4.4	<7.4	7.4	<5.2	5.2	<9.9	9.9	< 5.7	5.7
Hexachlorobutadiene				<4.7	4.7	<4.4	4.4	<7.4	7.4	<5.2	5.2	<9.9	9.9	< 5.7	5.7
Isopropylbenzene				<4.7	4.7	<4.4	4.4	<7.4	7.4	<5.2	5.2	<9.9	9.9	< 5.7	5.7
m&p-Xylenes	260	100,000	500,000	<4.7	4.7	<4.4	4.4	<7.4	7.4	<5.2	5.2	<9.9	9.9	< 5.7	5.7
Methyl Ethyl Ketone (2-Butanone)	120	100,000	500,000	<23	23.0	<22	22.0	<37	37.0	<26	26.0	<49	49.0	< 29	29.0
Methyl t-butyl ether (MTBE)	930	100,000	500,000	<9.3	9.3	<8.9	8.9	<15	15.0	<10	10.0	<20	20.0	< 11	11.0
Methylene chloride	50	100,000	500,000	<9.3	9.3	<8.9	8.9	<15	15.0	<10	10.0	<20	20.0	< 11	11.0
Naphthalene	12,000	100,000	500,000	<4.7	4.7	<4.4	4.4	<7.4	7.4	<5.2	5.2	<9.9	9.9	< 5.7	5.7
n-Butylbenzene	12,000	100,000	500,000	<4.7	4.7	<4.4	4.4	<7.4	7.4	<5.2	5.2	<9.9	9.9	< 5.7	5.7
n-Propylbenzene	3,900	100,000	500,000	<4.7	4.7	<4.4	4.4	<7.4	7.4	<5.2	5.2	<9.9	9.9	< 5.7	5.7
o-Xylene	260	100,000	500,000	<4.7	4.7	<4.4	4.4	<7.4	7.4	<5.2	5.2	<9.9	9.9	< 5.7	5.7
p-Isopropyltoluene				<4.7	4.7	<4.4	4.4	<7.4	7.4	<5.2	5.2	<9.9	9.9	< 5.7	5.7
sec-Butylbenzene	11,000	100,000	500,000	<4.7	4.7	<4.4	4.4	<7.4	7.4	<5.2	5.2	<9.9	9.9	< 5.7	5.7
Styrene				<4.7	4.7	<4.4	4.4	<7.4	7.4	<5.2	5.2	<9.9	9.9	< 5.7	5.7
tert-Butly alcohol				-	-	-	-	-	-	-	-	-	-	-	-
tert-Butylbenzene	5,900	100,000	500,000	<4.7	4.7	<4.4	4.4	<7.4	7.4	<5.2	5.2	<9.9	9.9	< 5.7	5.7
Tetrachloroethene	1,300	19,000	150,000	**25**	4.7	**2,700**	530	**2,000**	490	**2,300**	720	**5,000**	820	< 5.7	5.7
Tetrahydrofuran (THF)				<9.3	9.3	<8.9	8.9	<15	15.0	<10	10.0	<20	20.0	< 11	11.0
Toluene	700	100,000	500,000	<4.7	4.7	<4.4	4.4	<7.4	7.4	<5.2	5.2	<9.9	9.9	< 5.7	5.7
trans-1,2-Dichloroethene	190	100,000	500,000	<4.7	4.7	<4.4	4.4	<7.4	7.4	<5.2	5.2	<9.9	9.9	< 5.7	5.7
trans-1,3-Dichloropropene				<4.7	4.7	<4.4	4.4	<7.4	7.4	<5.2	5.2	<9.9	9.9	< 5.7	5.7
trans-1,4-dichloro-2-butene				<9.3	9.3	<8.9	8.9	<15	15.0	<10	10.0	<20	20.0	< 11	11.0
Trichloroethene	470	21,000	200,000	<4.7	4.7	**7.9**	4.4	**430**	390	**6.5**	5.2	**1,400**	470	< 5.7	5.7
Trichlorofluoromethane				<4.7	4.7	<4.4	4.4	<7.4	7.4	<5.2	5.2	<9.9	9.9	< 5.7	5.7
Trichlorotrifluoroethane				<4.7	4.7	<4.4	4.4	<7.4	7.4	<5.2	5.2	<9.9	9.9	< 5.7	5.7
Vinyl Chloride	20	900	13,000	<4.7	4.7	<4.4	4.4	<7.4	7.4	<5.2	5.2	<9.9	9.9	< 5.7	5.7
Total BTEX Concentration				**0.0**		**0.0**		**0.0**		**0.0**		**0.0**		**0.0**	
Total VOCs Concentration				**25**		**3497.9**		**2448**		**2306.5**		**6720**		**0**	

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 3
26-22 4th Street
Queens, New York
2018 Phase II and 2019/2020 Remedial Investigation
Soil Analytical Results
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	19B1				19B2				19B3				19B4			
				(0-2')		(8-10')		(0-2')		(8-10')		(0-2')		(8-10')		(0-2')		(8-10')	
				12/10/2019		12/10/2019		12/10/2019		12/10/2019		12/10/2019		12/10/2019		12/10/2019		12/10/2019	
				µg/Kg		µg/Kg		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
1,1,1,2-Tetrachlorothane				< 3.5	3.5	< 6.7	6.7	< 6.4	6.4	< 12	12	< 3.4	3.4	< 8.1	8.1	< 5.2	5.2	< 5.6	5.6
1,1,1-Trichloroethane	680	100,000	500,000	< 14	14	< 27	27	< 6.4	6.4	< 49	49	< 14	14	< 32	32	< 21	21	< 22	22
1,1,2,2-Tetrachloroethane				< 3.5	3.5	< 6.7	6.7	< 6.4	6.4	< 12	12	< 3.4	3.4	< 8.1	8.1	< 5.2	5.2	< 5.6	5.6
1,1,2-Trichloroethane				< 3.5	3.5	< 6.7	6.7	< 6.4	6.4	< 12	12	< 3.4	3.4	< 8.1	8.1	< 5.2	5.2	< 5.6	5.6
1,1-Dichloroethane	270	26,000	240,000	< 3.5	3.5	< 6.7	6.7	< 6.4	6.4	< 12	12	< 3.4	3.4	< 8.1	8.1	< 5.2	5.2	< 5.6	5.6
1,1-Dichloroethene	330	100,000	500,000	< 3.5	3.5	< 6.7	6.7	< 6.4	6.4	< 12	12	< 3.4	3.4	< 8.1	8.1	< 5.2	5.2	< 5.6	5.6
1,1-Dichloropropene				< 3.5	3.5	< 6.7	6.7	< 6.4	6.4	< 12	12	< 3.4	3.4	< 8.1	8.1	< 5.2	5.2	< 5.6	5.6
1,2,3-Trichlorobenzene				< 3.5	3.5	< 6.7	6.7	< 6.4	6.4	< 12	12	< 3.4	3.4	< 8.1	8.1	< 5.2	5.2	< 5.6	5.6
1,2,3-Trichloropropane				< 3.5	3.5	< 6.7	6.7	< 6.4	6.4	< 12	12	< 3.4	3.4	< 8.1	8.1	< 5.2	5.2	< 5.6	5.6
1,2,4-Trichlorobenzene				< 3.5	3.5	< 6.7	6.7	< 6.4	6.4	< 12	12	< 3.4	3.4	< 8.1	8.1	< 5.2	5.2	< 5.6	5.6
1,2,4-Trimethylbenzene	3,600	52,000	190,000	< 3.5	3.5	< 6.7	6.7	< 6.4	6.4	< 12	12	< 3.4	3.4	< 8.1	8.1	< 5.2	5.2	< 5.6	5.6
1,2-Dibromo-3-chloropropane				< 3.5	3.5	< 6.7	6.7	< 6.4	6.4	< 12	12	< 3.4	3.4	< 8.1	8.1	< 5.2	5.2	< 5.6	5.6
1,2-Dibromoethane				< 3.5	3.5	< 6.7	6.7	< 6.4	6.4	< 12	12	< 3.4	3.4	< 8.1	8.1	< 5.2	5.2	< 5.6	5.6
1,2-Dichlorobenzene	1,100	100,000	500,000	< 3.5	3.5	< 6.7	6.7	< 6.4	6.4	< 12	12	< 3.4	3.4	< 8.1	8.1	< 5.2	5.2	< 5.6	5.6
1,2-Dichloroethane	20	3,100	30,000	< 3.5	3.5	< 6.7	6.7	< 6.4	6.4	< 12	12	< 3.4	3.4	< 8.1	8.1	< 5.2	5.2	< 5.6	5.6
1,2-Dichloropropane				< 3.5	3.5	< 6.7	6.7	< 6.4	6.4	< 12	12	< 3.4	3.4	< 8.1	8.1	< 5.2	5.2	< 5.6	5.6
1,3,5-Trimethylbenzene	8,400	52,000	190,000	< 3.5	3.5	< 6.7	6.7	< 6.4	6.4	< 12	12	< 3.4	3.4	< 8.1	8.1	< 5.2	5.2	< 5.6	5.6
1,3-Dichlorobenzene	2,400	4,900	280,000	< 3.5	3.5	< 6.7	6.7	< 6.4	6.4	< 12	12	< 3.4	3.4	< 8.1	8.1	< 5.2	5.2	< 5.6	5.6
1,3-Dichloropropane				< 3.5	3.5	< 6.7	6.7	< 6.4	6.4	< 12	12	< 3.4	3.4	< 8.1	8.1	< 5.2	5.2	< 5.6	5.6
1,4-Dichlorobenzene	1,800	13,000	130,000	< 3.5	3.5	< 6.7	6.7	< 6.4	6.4	< 12	12	< 3.4	3.4	< 8.1	8.1	< 5.2	5.2	< 5.6	5.6
1,4-Dioxane	100	13,000	130,000	< 73	73	< 81	81	< 73	73	< 73	73	< 75	75	< 79	79	< 73	73	< 80	80
2,2-Dichloropropane				< 3.5	3.5	< 6.7	6.7	< 6.4	6.4	< 12	12	< 3.4	3.4	< 8.1	8.1	< 5.2	5.2	< 5.6	5.6
2-Chlorotoluene				< 3.5	3.5	< 6.7	6.7	< 6.4	6.4	< 12	12	< 3.4	3.4	< 8.1	8.1	< 5.2	5.2	< 5.6	5.6
2-Hexanone (Methyl Butyl Ketone)				< 18	18	< 34	34	< 32	32	< 61	61	< 17	17	< 40	40	< 26	26	< 28	28
2-Isopropyltoluene				< 3.5	3.5	< 6.7	6.7	< 6.4	6.4	< 12	12	< 3.4	3.4	< 8.1	8.1	< 5.2	5.2	< 5.6	5.6
4-Chlorotoluene				< 3.5	3.5	< 6.7	6.7	< 6.4	6.4	< 12	12	< 3.4	3.4	< 8.1	8.1	< 5.2	5.2	< 5.6	5.6
4-Methyl-2-Pentanone				< 18	18	< 34	34	< 32	32	< 61	61	< 17	17	< 40	40	< 26	26	< 28	28
Acetone	50	100,000	500,000	**3.7**	18	**9.1**	34	**6.6**	32	< 50	50	**5.2**	17	**43.0**	40	**91.0**	26	< 28	28
Acrolein				< 3.5	3.5	< 6.7	6.7	< 6.4	6.4	< 12	12	< 3.4	3.4	< 8.1	8.1	< 5.2	5.2	< 5.6	5.6
Acrylonitrile				< 14	14	< 27	27	< 13	13	< 49	49	< 14	14	< 32	32	< 21	21	< 22	22
Benzene	60	4,800	44,000	< 3.5	3.5	< 6.7	6.7	< 6.4	6.4	< 12	12	< 3.4	3.4	< 8.1	8.1	< 5.2	5.2	< 5.6	5.6
Bromobenzene				< 3.5	3.5	< 6.7	6.7	< 6.4	6.4	< 12	12	< 3.4	3.4	< 8.1	8.1	< 5.2	5.2	< 5.6	5.6
Bromochloromethane				< 3.5	3.5	< 6.7	6.7	< 6.4	6.4	< 12	12	< 3.4	3.4	< 8.1	8.1	< 5.2	5.2	< 5.6	5.6
Bromodichloromethane				< 3.5	3.5	< 6.7	6.7	< 6.4	6.4	< 12	12	< 3.4	3.4	< 8.1	8.1	< 5.2	5.2	< 5.6	5.6
Bromoform				< 3.5	3.5	< 6.7	6.7	< 6.4	6.4	< 12	12	< 3.4	3.4	< 8.1	8.1	< 5.2	5.2	< 5.6	5.6
Bromomethane				< 3.5	3.5	< 6.7	6.7	< 6.4	6.4	< 12	12	< 3.4	3.4	< 8.1	8.1	< 5.2	5.2	< 5.6	5.6
Carbon Disulfide				< 3.5	3.5	< 6.7	6.7	< 6.4	6.4	< 12	12	< 3.4	3.4	**21.0**	8.1	< 5.2	5.2	< 5.6	5.6
Carbon tetrachloride	760	2,400	22	< 3.5	3.5	< 6.7	6.7	< 6.4	6.4	< 12	12	< 3.4	3.4	< 8.1	8.1	< 5.2	5.2	< 5.6	5.6
Chlorobenzene	1,100	100,000	500,000	< 3.5	3.5	< 6.7	6.7	< 6.4	6.4	< 12	12	< 3.4	3.4	< 8.1	8.1	< 5.2	5.2	< 5.6	5.6
Chloroethane				< 3.5	3.5	< 6.7	6.7	< 6.4	6.4	< 12	12	< 3.4	3.4	< 8.1	8.1	< 5.2	5.2	< 5.6	5.6
Chloroform	370	49,000	350,000	< 3.5	3.5	< 6.7	6.7	< 6.4	6.4	< 12	12	< 3.4	3.4	< 8.1	8.1	< 5.2	5.2	< 5.6	5.6
Chloromethane				< 3.5	3.5	< 6.7	6.7	< 6.4	6.4	< 12	12	< 3.4	3.4	< 8.1	8.1	< 5.2	5.2	< 5.6	5.6
cis-1,2-Dichloroethene	250	100,000	500,000	< 3.5	3.5	< 6.7	6.7	< 6.4	6.4	< 12	12	**61.0**	250	**9.2**	8.1	**0.6**	5.2	< 5.6	5.6
cis-1,3-Dichloropropene				< 3.5	3.5	< 6.7	6.7	< 6.4	6.4	< 12	12	< 3.4	3.4	< 8.1	8.1	< 5.2	5.2	< 5.6	5.6
Dibromochloromethane				< 3.5	3.5	< 6.7	6.7	< 6.4	6.4	< 12	12	< 3.4	3.4	< 8.1	8.1	< 5.2	5.2	< 5.6	5.6
Dibromomethane				< 3.5	3.5	< 6.7	6.7	< 6.4	6.4	< 12	12	< 3.4	3.4	< 8.1	8.1	< 5.2	5.2	< 5.6	5.6
Dichlorodifluoromethane				< 3.5	3.5	< 6.7	6.7	< 6.4	6.4	< 12	12	< 3.4	3.4	< 8.1	8.1	< 5.2	5.2	< 5.6	5.6
Ethylbenzene	1,000	41,000	390,000	< 3.5	3.5	< 6.7	6.7	< 6.4	6.4	< 12	12	< 3.4	3.4	< 8.1	8.1	< 5.2	5.2	< 5.6	5.6
Hexachlorobutadiene				< 3.5	3.5	< 6.7	6.7	< 6.4	6.4	< 12	12	< 3.4	3.4	< 8.1	8.1	< 5.2	5.2	< 5.6	5.6
Isopropylbenzene				< 3.5	3.5	< 6.7	6.7	< 6.4	6.4	< 12	12	< 3.4	3.4	< 8.1	8.1	< 5.2	5.2	< 5.6	5.6
m&p-Xylenes	260	100,000	500,000	< 3.5	3.5	< 6.7	6.7	< 6.4	6.4	< 12	12	< 3.4	3.4	< 8.1	8.1	< 5.2	5.2	< 5.6	5.6
Methyl Ethyl Ketone (2-Butanone)	120	100,000	500,000	< 21	21	< 40	40	< 38	38	< 73	73	< 20	20	< 49	49	**19.0**	31	< 34	34
Methyl t-butyl ether (MTBE)	930	100,000	500,000	< 7.1	7.1	< 13	13	< 13	13	< 24	24	< 6.8	6.8	< 16	16	< 10	10	< 11	11
Methylene chloride	50	100,000	500,000	< 3.5	3.5	< 6.7	6.7	< 6.4	6.4	< 12	12	< 3.4	3.4	< 8.1	8.1	< 5.2	5.2	< 5.6	5.6
Naphthalene	12,000	100,000	500,000	< 3.5	3.5	< 6.7	6.7	< 6.4	6.4	< 12	12	**1,100.0**	290	**18.0**	8.1	< 5.2	5.2	< 5.6	5.6
n-Butylbenzene	12,000	100,000	500,000	< 3.5	3.5	< 6.7	6.7	< 6.4	6.4	< 12	12	< 3.4	3.4	< 8.1	8.1	< 5.2	5.2	< 5.6	5.6
n-Propylbenzene	3,900	100,000	500,000	< 3.5	3.5	< 6.7	6.7	< 6.4	6.4	< 12	12	< 3.4	3.4	< 8.1	8.1	< 5.2	5.2	< 5.6	5.6
o-Xylene	260	100,000	500,000	< 3.5	3.5	< 6.7	6.7	< 6.4	6.4	< 12	12	< 3.4	3.4	< 8.1	8.1	< 5.2	5.2	< 5.6	5.6
p-Isopropyltoluene				< 3.5	3.5	< 6.7	6.7	< 6.4	6.4	< 12	12	< 3.4	3.4	< 8.1	8.1	< 5.2	5.2	< 5.6	5.6
sec-Butylbenzene	11,000	100,000	500,000	< 3.5	3.5	< 6.7	6.7	< 6.4	6.4	< 12	12	< 3.4	3.4	< 8.1	8.1	< 5.2	5.2	< 5.6	5.6
Styrene				< 3.5	3.5	< 6.7	6.7	< 6.4	6.4	< 12	12	< 3.4	3.4	< 8.1	8.1	< 5.2	5.2	< 5.6	5.6
tert-Butly alcohol				< 71	71	< 130	130	< 130	130	< 240	240	< 68	68	< 160	160	< 100	100	< 110	110
tert-Butylbenzene	5,900	100,000	500,000	< 3.5	3.5	< 6.7	6.7	< 6.4	6.4	< 12	12	< 3.4	3.4	< 8.1	8.1	< 5.2	5.2	< 5.6	5.6
Tetrachloroethene	1,300	19,000	150,000	**1.7**	3.5	< 6.7	6.7	**2.8**	6.4	**150.0**	120	**5,600.0**	290	**21.0**	8.1	< 5.2	5.2	< 5.6	5.6
Tetrahydrofuran (THF)				< 7.1	7.1	< 13	13	< 13	13	< 24	24	< 6.8	6.8	< 16	16	< 10	10	< 11	11
Toluene	700	100,000	500,000	< 3.5	3.5	< 6.7	6.7	< 6.4	6.4	< 12	12	< 3.4	3.4	< 8.1	8.1	< 5.2	5.2	< 5.6	5.6
trans-1,2-Dichloroethene	190	100,000	500,000	< 3.5	3.5	< 6.7	6.7	< 6.4	6.4	< 12	12	< 3.4	3.4	< 8.1	8.1	< 5.2	5.2	< 5.6	5.6
trans-1,3-Dichloropropene				< 3.5	3.5	< 6.7	6.7	< 6.4	6.4	< 12	12	< 3.4	3.4	< 8.1	8.1	< 5.2	5.2	< 5.6	5.6
trans-1,4-dichloro-2-butene				< 7.1	7.1	< 13	13	< 13	13	< 24	24	< 6.8	6.8	< 16	16	< 10	10	< 11	11
Trichloroethene	470	21,000	200,000	< 3.5	3.5	< 6.7	6.7	< 6.4	6.4	< 12	12	**180.0**	170	**5.5**	8.1	**1.2**	5.2	< 5.6	5.6
Trichlorofluoromethane				< 3.5	3.5	< 6.7	6.7	< 6.4	6.4	< 12	12	< 3.4	3.4	< 8.1	8.1	< 5.2	5.2	< 5.6	5.6
Trichlorotrifluoroethane				< 3.5	3.5	< 6.7	6.7	< 6.4	6.4	< 12	12	< 3.4	3.4	< 8.1	8.1	< 5.2	5.2	< 5.6	5.6
Vinyl Chloride	20	900	13,000	< 3.5	3.5	< 6.7	6.7	< 6.4	6.4	< 12	12	< 3.4	3.4	**3.3**	8.1	< 5.2	5.2	< 5.6	5.6
Total BTEX Concentration				**0.0**		**0.0**		**0.0**		**0.0**		**0.0**		**0.0**		**0.0**		**0.0**	
Total VOCs Concentration				**5.4**		**9.1**		**9.4**		**150.0**		**6946.2**		**121.0**		**111.8**		**0.0**	

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 3
26-22 4th Street
Queens, New York
2018 Phase II and 2019/2020 Remedial Investigation
Soil Analytical Results
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	19B5				19B6				19B7			
				(0-2')		(8-10')		(0-2')		(8-10')		(0-2')		(8-10')	
				12/10/2019		12/10/2019		12/10/2019		12/10/2019		12/10/2019		12/10/2019	
				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
1,1,1,2-Tetrachlorothane				< 5.8	5.8	< 7.1	7.1	< 5.2	5.2	< 4.6	4.6	< 4.0	4.0	< 4.2	4.2
1,1,1-Trichloroethane	680	100,000	500,000	< 23	23	< 7.1	7.1	< 21	21	< 18	18	< 16	16	< 4.2	4.2
1,1,2,2-Tetrachloroethane				< 5.8	5.8	< 7.1	7.1	< 5.2	5.2	< 4.6	4.6	< 4.0	4.0	< 4.2	4.2
1,1,2-Trichloroethane				< 5.8	5.8	< 7.1	7.1	< 5.2	5.2	< 4.6	4.6	< 4.0	4.0	< 4.2	4.2
1,1-Dichloroethane	270	26,000	240,000	< 5.8	5.8	< 7.1	7.1	< 5.2	5.2	< 4.6	4.6	< 4.0	4.0	< 4.2	4.2
1,1-Dichloroethene	330	100,000	500,000	< 5.8	5.8	< 7.1	7.1	< 5.2	5.2	< 4.6	4.6	< 4.0	4.0	< 4.2	4.2
1,1-Dichloropropene				< 5.8	5.8	< 7.1	7.1	< 5.2	5.2	< 4.6	4.6	< 4.0	4.0	< 4.2	4.2
1,2,3-Trichlorobenzene				< 5.8	5.8	< 7.1	7.1	< 5.2	5.2	< 4.6	4.6	< 4.0	4.0	< 4.2	4.2
1,2,3-Trichloropropane				< 5.8	5.8	< 7.1	7.1	< 5.2	5.2	< 4.6	4.6	< 4.0	4.0	< 4.2	4.2
1,2,4-Trichlorobenzene				< 5.8	5.8	< 7.1	7.1	< 5.2	5.2	< 4.6	4.6	< 4.0	4.0	< 4.2	4.2
1,2,4-Trimethylbenzene	3,600	52,000	190,000	< 5.8	5.8	< 7.1	7.1	< 5.2	5.2	< 4.6	4.6	< 4.0	4.0	< 4.2	4.2
1,2-Dibromo-3-chloropropane				< 5.8	5.8	< 7.1	7.1	< 5.2	5.2	< 4.6	4.6	< 4.0	4.0	< 4.2	4.2
1,2-Dibromoethane				< 5.8	5.8	< 7.1	7.1	< 5.2	5.2	< 4.6	4.6	< 4.0	4.0	< 4.2	4.2
1,2-Dichlorobenzene	1,100	100,000	500,000	< 5.8	5.8	< 7.1	7.1	< 5.2	5.2	< 4.6	4.6	< 4.0	4.0	< 4.2	4.2
1,2-Dichloroethane	20	3,100	30,000	< 5.8	5.8	< 7.1	7.1	< 5.2	5.2	< 4.6	4.6	< 4.0	4.0	< 4.2	4.2
1,2-Dichloropropane				< 5.8	5.8	< 7.1	7.1	< 5.2	5.2	< 4.6	4.6	< 4.0	4.0	< 4.2	4.2
1,3,5-Trimethylbenzene	8,400	52,000	190,000	< 5.8	5.8	< 7.1	7.1	< 5.2	5.2	< 4.6	4.6	< 4.0	4.0	< 4.2	4.2
1,3-Dichlorobenzene	2,400	4,900	280,000	< 5.8	5.8	< 7.1	7.1	< 5.2	5.2	< 4.6	4.6	< 4.0	4.0	< 4.2	4.2
1,3-Dichloropropane				< 5.8	5.8	< 7.1	7.1	< 5.2	5.2	< 4.6	4.6	< 4.0	4.0	< 4.2	4.2
1,4-Dichlorobenzene	1,800	13,000	130,000	< 5.8	5.8	< 7.1	7.1	< 5.2	5.2	< 4.6	4.6	< 4.0	4.0	< 4.2	4.2
1,4-Dioxane	100	13,000	130,000	< 74	74	< 77	77	< 73	73	< 73	73	< 78	78	< 75	75
2,2-Dichloropropane				< 5.8	5.8	< 7.1	7.1	< 5.2	5.2	< 4.6	4.6	< 4.0	4.0	< 4.2	4.2
2-Chlorotoluene				< 5.8	5.8	< 7.1	7.1	< 5.2	5.2	< 4.6	4.6	< 4.0	4.0	< 4.2	4.2
2-Hexanone (Methyl Butyl Ketone)				< 29	29	< 36	36	< 26	26	< 23	23	< 20	20	< 21	21
2-Isopropyltoluene				< 5.8	5.8	< 7.1	7.1	< 5.2	5.2	< 4.6	4.6	< 4.0	4.0	< 4.2	4.2
4-Chlorotoluene				< 5.8	5.8	< 7.1	7.1	< 5.2	5.2	< 4.6	4.6	< 4.0	4.0	< 4.2	4.2
4-Methyl-2-Pentanone				< 29	29	< 36	36	< 26	26	< 23	23	< 20	20	< 21	21
Acetone	50	100,000	500,000	**12.0**	29	< 36	36	**73.0**	26	< 23	23	**34.0**	20	**5.0**	21
Acrolein				< 5.8	5.8	< 7.1	7.1	< 5.2	5.2	< 4.6	4.6	< 4.0	4.0	< 4.2	4.2
Acrylonitrile				< 23	23	< 14	14	< 10	10	< 18	18	< 16	16	< 17	17
Benzene	60	4,800	44,000	< 5.8	5.8	< 7.1	7.1	< 5.2	5.2	< 4.6	4.6	< 4.0	4.0	< 4.2	4.2
Bromobenzene				< 5.8	5.8	< 7.1	7.1	< 5.2	5.2	< 4.6	4.6	< 4.0	4.0	< 4.2	4.2
Bromochloromethane				< 5.8	5.8	< 7.1	7.1	< 5.2	5.2	< 4.6	4.6	< 4.0	4.0	< 4.2	4.2
Bromodichloromethane				< 5.8	5.8	< 7.1	7.1	< 5.2	5.2	< 4.6	4.6	< 4.0	4.0	< 4.2	4.2
Bromoform				< 5.8	5.8	< 7.1	7.1	< 5.2	5.2	< 4.6	4.6	< 4.0	4.0	< 4.2	4.2
Bromomethane				< 5.8	5.8	< 7.1	7.1	< 5.2	5.2	< 4.6	4.6	< 4.0	4.0	< 4.2	4.2
Carbon Disulfide				< 5.8	5.8	< 7.1	7.1	< 5.2	5.2	< 4.6	4.6	< 4.0	4.0	< 4.2	4.2
Carbon tetrachloride	760	2,400	22	< 5.8	5.8	< 7.1	7.1	< 5.2	5.2	< 4.6	4.6	< 4.0	4.0	< 4.2	4.2
Chlorobenzene	1,100	100,000	500,000	< 5.8	5.8	< 7.1	7.1	< 5.2	5.2	< 4.6	4.6	< 4.0	4.0	< 4.2	4.2
Chloroethane				< 5.8	5.8	< 7.1	7.1	< 5.2	5.2	< 4.6	4.6	< 4.0	4.0	< 4.2	4.2
Chloroform	370	49,000	350,000	< 5.8	5.8	< 7.1	7.1	< 5.2	5.2	< 4.6	4.6	< 4.0	4.0	< 4.2	4.2
Chloromethane				< 5.8	5.8	< 7.1	7.1	< 5.2	5.2	< 4.6	4.6	< 4.0	4.0	< 4.2	4.2
cis-1,2-Dichloroethene	250	100,000	500,000	< 5.8	5.8	< 7.1	7.1	< 5.2	5.2	< 4.6	4.6	< 4.0	4.0	< 4.2	4.2
cis-1,3-Dichloropropene				< 5.8	5.8	< 7.1	7.1	< 5.2	5.2	< 4.6	4.6	< 4.0	4.0	< 4.2	4.2
Dibromochloromethane				< 5.8	5.8	< 7.1	7.1	< 5.2	5.2	< 4.6	4.6	< 4.0	4.0	< 4.2	4.2
Dibromomethane				< 5.8	5.8	< 7.1	7.1	< 5.2	5.2	< 4.6	4.6	< 4.0	4.0	< 4.2	4.2
Dichlorodifluoromethane				< 5.8	5.8	< 7.1	7.1	< 5.2	5.2	< 4.6	4.6	< 4.0	4.0	< 4.2	4.2
Ethylbenzene	1,000	41,000	390,000	< 5.8	5.8	< 7.1	7.1	< 5.2	5.2	< 4.6	4.6	< 4.0	4.0	< 4.2	4.2
Hexachlorobutadiene				< 5.8	5.8	< 7.1	7.1	< 5.2	5.2	< 4.6	4.6	< 4.0	4.0	< 4.2	4.2
Isopropylbenzene				< 5.8	5.8	< 7.1	7.1	< 5.2	5.2	< 4.6	4.6	< 4.0	4.0	< 4.2	4.2
m&p-Xylenes	260	100,000	500,000	< 5.8	5.8	< 7.1	7.1	< 5.2	5.2	< 4.6	4.6	< 4.0	4.0	< 4.2	4.2
Methyl Ethyl Ketone (2-Butanone)	120	100,000	500,000	< 35	35	< 43	43	**16.0**	31	< 28	28	**6.3**	24	< 25	25
Methyl t-butyl ether (MTBE)	930	100,000	500,000	< 12	12	< 14	14	< 10	10	< 9.2	9.2	< 8.0	8.0	< 8.4	8.4
Methylene chloride	50	100,000	500,000	< 5.8	5.8	< 7.1	7.1	< 5.2	5.2	< 4.6	4.6	< 4.0	4.0	< 4.2	4.2
Naphthalene	12,000	100,000	500,000	< 5.8	5.8	< 7.1	7.1	< 5.2	5.2	< 4.6	4.6	**1.3**	4.0	< 4.2	4.2
n-Butylbenzene	12,000	100,000	500,000	< 5.8	5.8	< 7.1	7.1	< 5.2	5.2	< 4.6	4.6	< 4.0	4.0	< 4.2	4.2
n-Propylbenzene	3,900	100,000	500,000	< 5.8	5.8	< 7.1	7.1	< 5.2	5.2	< 4.6	4.6	< 4.0	4.0	< 4.2	4.2
o-Xylene	260	100,000	500,000	< 5.8	5.8	< 7.1	7.1	< 5.2	5.2	< 4.6	4.6	< 4.0	4.0	< 4.2	4.2
p-Isopropyltoluene				< 5.8	5.8	< 7.1	7.1	< 5.2	5.2	< 4.6	4.6	< 4.0	4.0	< 4.2	4.2
sec-Butylbenzene	11,000	100,000	500,000	< 5.8	5.8	< 7.1	7.1	< 5.2	5.2	< 4.6	4.6	< 4.0	4.0	< 4.2	4.2
Styrene				< 5.8	5.8	< 7.1	7.1	< 5.2	5.2	< 4.6	4.6	< 4.0	4.0	< 4.2	4.2
tert-Butly alcohol				< 120	120	< 140	140	< 100	100	< 92	92	< 80	80	< 84	84
tert-Butylbenzene	5,900	100,000	500,000	< 5.8	5.8	< 7.1	7.1	< 5.2	5.2	< 4.6	4.6	< 4.0	4.0	< 4.2	4.2
Tetrachloroethene	1,300	19,000	150,000	**760.0**	310	< 7.1	7.1	< 5.2	5.2	< 4.6	4.6	**110.0**	100	< 4.2	4.2
Tetrahydrofuran (THF)				< 12	12	< 14	14	< 10	10	< 9.2	9.2	< 8.0	8.0	< 8.4	8.4
Toluene	700	100,000	500,000	< 5.8	5.8	< 7.1	7.1	< 5.2	5.2	< 4.6	4.6	< 4.0	4.0	< 4.2	4.2
trans-1,2-Dichloroethene	190	100,000	500,000	< 5.8	5.8	< 7.1	7.1	< 5.2	5.2	< 4.6	4.6	< 4.0	4.0	< 4.2	4.2
trans-1,3-Dichloropropene				< 5.8	5.8	< 7.1	7.1	< 5.2	5.2	< 4.6	4.6	< 4.0	4.0	< 4.2	4.2
trans-1,4-dichloro-2-butene				< 12	12	< 14	14	< 10	10	< 9.2	9.2	< 8.0	8.0	< 8.4	8.4
Trichloroethene	470	21,000	200,000	< 5.8	5.8	< 7.1	7.1	< 5.2	5.2	< 4.6	4.6	**83.0**	250	< 4.2	4.2
Trichlorofluoromethane				< 5.8	5.8	< 7.1	7.1	< 5.2	5.2	< 4.6	4.6	< 4.0	4.0	< 4.2	4.2
Trichlorotrifluoroethane				< 5.8	5.8	< 7.1	7.1	< 5.2	5.2	< 4.6	4.6	< 4.0	4.0	< 4.2	4.2
Vinyl Chloride	20	900	13,000	< 5.8	5.8	< 7.1	7.1	< 5.2	5.2	< 4.6	4.6	< 4.0	4.0	< 4.2	4.2
Total BTEX Concentration				**0.0**		**0.0**		**0.0**		**0.0**		**0.0**		**0.0**	
Total VOCs Concentration				**772.0**		**0.0**		**89.0**		**0.0**		**234.6**		**5.0**	

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 3
26-22 4th Street
Queens, New York
2018 Phase II and 2019/2020 Remedial Investigation
Soil Analytical Results
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	19B8				19B9						19B10			
				(0-2')		(8-10')		(0-2')		(8-10')		(12')		(0-2')		(8-10')	
				12/10/2019		12/10/2019		12/10/2019		12/10/2019		12/10/2019		12/10/2019		12/10/2019	
				µg/Kg		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
1,1,1,2-Tetrachlorothane				< 8.2	8.2	< 4.6	4.6	< 7.3	7.3	< 6.3	6.3	< 4.3	4.3	< 4.9	4.9	< 9.2	9.2
1,1,1-Trichloroethane	680	100,000	500,000	< 33	33	< 18	18	< 7.3	7.3	< 25	25	< 17	17	< 20	20	< 37	37
1,1,2,2-Tetrachloroethane				< 230	230	< 4.6	4.6	< 380	380	< 6.3	6.3	< 4.3	4.3	< 4.9	4.9	< 9.2	9.2
1,1,2-Trichloroethane				< 8.2	8.2	< 4.6	4.6	< 7.3	7.3	< 6.3	6.3	< 4.3	4.3	< 4.9	4.9	< 9.2	9.2
1,1-Dichloroethane	270	26,000	240,000	< 8.2	8.2	< 4.6	4.6	< 7.3	7.3	< 6.3	6.3	< 4.3	4.3	< 4.9	4.9	< 9.2	9.2
1,1-Dichloroethene	330	100,000	500,000	< 8.2	8.2	< 4.6	4.6	< 7.3	7.3	< 6.3	6.3	< 4.3	4.3	< 4.9	4.9	< 9.2	9.2
1,1-Dichloropropene				< 8.2	8.2	< 4.6	4.6	< 7.3	7.3	< 6.3	6.3	< 4.3	4.3	< 4.9	4.9	< 9.2	9.2
1,2,3-Trichlorobenzene				< 230	230	< 4.6	4.6	< 380	380	< 6.3	6.3	< 4.3	4.3	< 4.9	4.9	< 9.2	9.2
1,2,3-Trichloropropane				< 230	230	< 4.6	4.6	< 380	380	< 6.3	6.3	< 4.3	4.3	< 4.9	4.9	< 9.2	9.2
1,2,4-Trichlorobenzene				< 230	230	< 4.6	4.6	< 380	380	< 6.3	6.3	< 4.3	4.3	< 4.9	4.9	< 9.2	9.2
1,2,4-Trimethylbenzene	3,600	52,000	190,000	< 230	230	< 4.6	4.6	< 380	380	< 6.3	6.3	< 4.3	4.3	< 4.9	4.9	< 9.2	9.2
1,2-Dibromo-3-chloropropane				< 230	230	< 4.6	4.6	< 380	380	< 6.3	6.3	< 4.3	4.3	< 4.9	4.9	< 9.2	9.2
1,2-Dibromoethane				< 8.2	8.2	< 4.6	4.6	< 7.3	7.3	< 6.3	6.3	< 4.3	4.3	< 4.9	4.9	< 9.2	9.2
1,2-Dichlorobenzene	1,100	100,000	500,000	< 230	230	< 4.6	4.6	< 380	380	< 6.3	6.3	< 4.3	4.3	< 4.9	4.9	< 9.2	9.2
1,2-Dichloroethane	20	3,100	30,000	< 8.2	8.2	< 4.6	4.6	< 7.3	7.3	< 6.3	6.3	< 4.3	4.3	< 4.9	4.9	< 9.2	9.2
1,2-Dichloropropane				< 8.2	8.2	< 4.6	4.6	< 7.3	7.3	< 6.3	6.3	< 4.3	4.3	< 4.9	4.9	< 9.2	9.2
1,3,5-Trimethylbenzene	8,400	52,000	190,000	< 230	230	< 4.6	4.6	< 380	380	< 6.3	6.3	< 4.3	4.3	< 4.9	4.9	< 9.2	9.2
1,3-Dichlorobenzene	2,400	4,900	280,000	< 230	230	< 4.6	4.6	< 380	380	< 6.3	6.3	< 4.3	4.3	< 4.9	4.9	< 9.2	9.2
1,3-Dichloropropane				< 8.2	8.2	< 4.6	4.6	< 7.3	7.3	< 6.3	6.3	< 4.3	4.3	< 4.9	4.9	< 9.2	9.2
1,4-Dichlorobenzene	1,800	13,000	130,000	< 230	230	< 4.6	4.6	< 380	380	< 6.3	6.3	< 4.3	4.3	< 4.9	4.9	< 9.2	9.2
1,4-Dioxane	100	13,000	130,000	< 77	77	< 75	75	< 75	75	< 75	75	< 73	73	< 81	81	< 82	82
2,2-Dichloropropane				< 8.2	8.2	< 4.6	4.6	< 7.3	7.3	< 6.3	6.3	< 4.3	4.3	< 4.9	4.9	< 9.2	9.2
2-Chlorotoluene				< 230	230	< 4.6	4.6	< 380	380	< 6.3	6.3	< 4.3	4.3	< 4.9	4.9	< 9.2	9.2
2-Hexanone (Methyl Butyl Ketone)				< 41	41	< 23	23	< 36	36	< 32	32	< 22	22	< 24	24	< 46	46
2-Isopropyltoluene				< 230	230	< 4.6	4.6	< 380	380	< 6.3	6.3	< 4.3	4.3	< 4.9	4.9	< 9.2	9.2
4-Chlorotoluene				< 230	230	< 4.6	4.6	< 380	380	< 6.3	6.3	< 4.3	4.3	< 4.9	4.9	< 9.2	9.2
4-Methyl-2-Pentanone				< 41	41	< 23	23	< 36	36	< 32	32	< 22	22	< 24	24	< 46	46
Acetone	50	100,000	500,000	**15.0**	41	**9.7**	23	**15.0**	36	**47.0**	32	< 22	22	**39.0**	24	**23.0**	46
Acrolein				< 8.2	8.2	< 4.6	4.6	< 7.3	7.3	< 6.3	6.3	< 4.3	4.3	< 4.9	4.9	< 9.2	9.2
Acrylonitrile				< 33	33	< 18	18	< 15	15	< 25	25	< 17	17	< 20	20	< 37	37
Benzene	60	4,800	44,000	< 8.2	8.2	< 4.6	4.6	< 7.3	7.3	< 6.3	6.3	< 4.3	4.3	< 4.9	4.9	< 9.2	9.2
Bromobenzene				< 230	230	< 4.6	4.6	< 380	380	< 6.3	6.3	< 4.3	4.3	< 4.9	4.9	< 9.2	9.2
Bromochloromethane				< 8.2	8.2	< 4.6	4.6	< 7.3	7.3	< 6.3	6.3	< 4.3	4.3	< 4.9	4.9	< 9.2	9.2
Bromodichloromethane				< 8.2	8.2	< 4.6	4.6	< 7.3	7.3	< 6.3	6.3	< 4.3	4.3	< 4.9	4.9	< 9.2	9.2
Bromoform				< 8.2	8.2	< 4.6	4.6	< 7.3	7.3	< 6.3	6.3	< 4.3	4.3	< 4.9	4.9	< 9.2	9.2
Bromomethane				< 8.2	8.2	< 4.6	4.6	< 7.3	7.3	< 6.3	6.3	< 4.3	4.3	< 4.9	4.9	< 9.2	9.2
Carbon Disulfide				< 8.2	8.2	< 4.6	4.6	< 7.3	7.3	**1.3**	6.3	< 4.3	4.3	< 4.9	4.9	< 9.2	9.2
Carbon tetrachloride	760	2,400	22	< 8.2	8.2	< 4.6	4.6	< 7.3	7.3	< 6.3	6.3	< 4.3	4.3	< 4.9	4.9	< 9.2	9.2
Chlorobenzene	1,100	100,000	500,000	< 8.2	8.2	< 4.6	4.6	< 7.3	7.3	< 6.3	6.3	< 4.3	4.3	< 4.9	4.9	< 9.2	9.2
Chloroethane				< 8.2	8.2	< 4.6	4.6	< 7.3	7.3	< 6.3	6.3	< 4.3	4.3	< 4.9	4.9	< 9.2	9.2
Chloroform	370	49,000	350,000	< 8.2	8.2	< 4.6	4.6	< 7.3	7.3	< 6.3	6.3	< 4.3	4.3	< 4.9	4.9	< 9.2	9.2
Chloromethane				< 8.2	8.2	< 4.6	4.6	< 7.3	7.3	< 6.3	6.3	< 4.3	4.3	< 4.9	4.9	< 9.2	9.2
cis-1,2-Dichloroethene	250	100,000	500,000	< 8.2	8.2	< 4.6	4.6	< 7.3	7.3	< 6.3	6.3	< 4.3	4.3	**1.8**	4.9	**7.1**	9.2
cis-1,3-Dichloropropene				< 8.2	8.2	< 4.6	4.6	< 7.3	7.3	< 6.3	6.3	< 4.3	4.3	< 4.9	4.9	< 9.2	9.2
Dibromochloromethane				< 8.2	8.2	< 4.6	4.6	< 7.3	7.3	< 6.3	6.3	< 4.3	4.3	< 4.9	4.9	< 9.2	9.2
Dibromomethane				< 8.2	8.2	< 4.6	4.6	< 7.3	7.3	< 6.3	6.3	< 4.3	4.3	< 4.9	4.9	< 9.2	9.2
Dichlorodifluoromethane				< 8.2	8.2	< 4.6	4.6	< 7.3	7.3	< 6.3	6.3	< 4.3	4.3	< 4.9	4.9	< 9.2	9.2
Ethylbenzene	1,000	41,000	390,000	< 8.2	8.2	< 4.6	4.6	< 7.3	7.3	< 6.3	6.3	< 4.3	4.3	< 4.9	4.9	< 9.2	9.2
Hexachlorobutadiene				< 230	230	< 4.6	4.6	< 380	380	< 6.3	6.3	< 4.3	4.3	< 4.9	4.9	< 9.2	9.2
Isopropylbenzene				< 230	230	< 4.6	4.6	< 380	380	< 6.3	6.3	< 4.3	4.3	< 4.9	4.9	< 9.2	9.2
m&p-Xylenes	260	100,000	500,000	< 8.2	8.2	< 4.6	4.6	< 7.3	7.3	< 6.3	6.3	< 4.3	4.3	< 4.9	4.9	< 9.2	9.2
Methyl Ethyl Ketone (2-Butanone)	120	100,000	500,000	< 49	49	< 28	28	< 44	44	**7.9**	38	< 26	26	**6.8**	29	< 55	55
Methyl t-butyl ether (MTBE)	930	100,000	500,000	< 16	16	< 9.2	9.2	< 15	15	< 13	13	< 8.7	8.7	< 9.8	9.8	< 18	18
Methylene chloride	50	100,000	500,000	< 8.2	8.2	< 4.6	4.6	< 7.3	7.3	< 6.3	6.3	< 4.3	4.3	< 4.9	4.9	< 9.2	9.2
Naphthalene	12,000	100,000	500,000	< 230	230	< 4.6	4.6	< 380	380	**2.9**	6.3	< 4.3	4.3	< 4.9	4.9	< 9.2	9.2
n-Butylbenzene	12,000	100,000	500,000	< 230	230	< 4.6	4.6	< 380	380	< 6.3	6.3	< 4.3	4.3	< 4.9	4.9	< 9.2	9.2
n-Propylbenzene	3,900	100,000	500,000	< 230	230	< 4.6	4.6	< 380	380	< 6.3	6.3	< 4.3	4.3	< 4.9	4.9	< 9.2	9.2
o-Xylene	260	100,000	500,000	< 8.2	8.2	< 4.6	4.6	< 7.3	7.3	< 6.3	6.3	< 4.3	4.3	< 4.9	4.9	< 9.2	9.2
p-Isopropyltoluene				< 230	230	< 4.6	4.6	< 380	380	< 6.3	6.3	< 4.3	4.3	< 4.9	4.9	< 9.2	9.2
sec-Butylbenzene	11,000	100,000	500,000	< 230	230	< 4.6	4.6	< 380	380	< 6.3	6.3	< 4.3	4.3	< 4.9	4.9	< 9.2	9.2
Styrene				< 8.2	8.2	< 4.6	4.6	< 7.3	7.3	< 6.3	6.3	< 4.3	4.3	< 4.9	4.9	< 9.2	9.2
tert-Butly alcohol				< 160	160	< 92	92	< 150	150	< 130	130	< 87	87	< 98	98	< 180	180
tert-Butylbenzene	5,900	100,000	500,000	< 230	230	< 4.6	4.6	< 380	380	< 6.3	6.3	< 4.3	4.3	< 4.9	4.9	< 9.2	9.2
Tetrachloroethene	1,300	19,000	150,000	**1,400.0**	230	< 4.6	4.6	**97.0**	380	< 6.3	6.3	< 4.3	4.3	< 4.9	4.9	**3.6**	9.2
Tetrahydrofuran (THF)				< 16	16	< 9.2	9.2	< 15	15	< 13	13	< 8.7	8.7	< 9.8	9.8	< 18	18
Toluene	700	100,000	500,000	< 8.2	8.2	< 4.6	4.6	**42.0**	380	< 6.3	6.3	< 4.3	4.3	< 4.9	4.9	< 9.2	9.2
trans-1,2-Dichloroethene	190	100,000	500,000	< 8.2	8.2	< 4.6	4.6	< 7.3	7.3	< 6.3	6.3	< 4.3	4.3	< 4.9	4.9	< 9.2	9.2
trans-1,3-Dichloropropene				< 8.2	8.2	< 4.6	4.6	< 7.3	7.3	< 6.3	6.3	< 4.3	4.3	< 4.9	4.9	< 9.2	9.2
trans-1,4-dichloro-2-butene				< 460	460	< 9.2	9.2	< 760	760	< 13	13	< 8.7	8.7	< 9.8	9.8	< 18	18
Trichloroethene	470	21,000	200,000	**13.0**	8.2	< 4.6	4.6	< 7.3	7.3	< 6.3	6.3	< 4.3	4.3	< 4.9	4.9	**1.2**	9.2
Trichlorofluoromethane				< 8.2	8.2	< 4.6	4.6	< 7.3	7.3	< 6.3	6.3	< 4.3	4.3	< 4.9	4.9	< 9.2	9.2
Trichlorotrifluoroethane				< 8.2	8.2	< 4.6	4.6	< 7.3	7.3	< 6.3	6.3	< 4.3	4.3	< 4.9	4.9	< 9.2	9.2
Vinyl Chloride	20	900	13,000	< 8.2	8.2	< 4.6	4.6	< 7.3	7.3	< 6.3	6.3	< 4.3	4.3	< 4.9	4.9	< 9.2	9.2
Total BTEX Concentration				**0.0**		**0.0**		**42.0**		**0.0**		**0.0**		**0.0**		**0.0**	
Total VOCs Concentration				**1428.0**		**9.7**		**154.0**		**59.1**		**0.0**		**47.6**		**34.9**	

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 4
26-22 4th Street
Queens, New York
2018 Phase II and 2019/2020 Remedial Investigation
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	B-1		B-3		B-4		B-6		B-7		B-9	
				(6-8')		(2-4')		(2-4')		(2-4')		(2-4')		(2-4')	
				9/20/2018		9/20/2018		9/20/2018		9/20/2018		9/20/2018		9/20/2018	
				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
1,2,4,5-Tetrachlorobenzene				< 230	230.0	< 260	260.0	< 260	260.0	< 270	270.0	< 260	260.0	< 270	270.0
1,2,4-Trichlorobenzene				< 230	230.0	< 260	260.0	< 260	260.0	< 270	270.0	< 260	260.0	< 270	270.0
1,2-Dichlorobenzene				< 230	230.0	< 260	260.0	< 260	260.0	< 270	270.0	< 260	260.0	< 270	270.0
1,2-Diphenylhydrazine				< 330	330.0	< 370	370.0	< 370	370.0	< 390	390.0	< 370	370.0	< 390	390.0
1,3-Dichlorobenzene				< 230	230.0	< 260	260.0	< 260	260.0	< 270	270.0	< 260	260.0	< 270	270.0
1,4-Dichlorobenzene				< 230	230.0	< 260	260.0	< 260	260.0	< 270	270.0	< 260	260.0	< 270	270.0
2,4,5-Trichlorophenol				< 230	230.0	< 260	260.0	< 260	260.0	< 270	270.0	< 260	260.0	< 270	270.0
2,4,6-Trichlorophenol				< 230	230.0	< 260	260.0	< 260	260.0	< 270	270.0	< 260	260.0	< 270	270.0
2,4-Dichlorophenol				< 230	230.0	< 260	260.0	< 260	260.0	< 270	270.0	< 260	260.0	< 270	270.0
2,4-Dimethylphenol				< 230	230.0	< 260	260.0	< 260	260.0	< 270	270.0	< 260	260.0	< 270	270.0
2,4-Dinitrophenol				< 330	330.0	< 370	370.0	< 370	370.0	< 390	390.0	< 370	370.0	< 390	390.0
2,4-Dinitrotoluene				< 230	230.0	< 260	260.0	< 260	260.0	< 270	270.0	< 260	260.0	< 270	270.0
2,6-Dinitrotoluene				< 230	230.0	< 260	260.0	< 260	260.0	< 270	270.0	< 260	260.0	< 270	270.0
2-Chloronaphthalene				< 230	230.0	< 260	260.0	< 260	260.0	< 270	270.0	< 260	260.0	< 270	270.0
2-Chlorophenol				< 230	230	< 260	260	< 260	260	< 270	270	< 260	260	< 270	270
2-Methylnaphthalene				< 230	230	< 260	260	**260**	260	< 270	270	< 260	260	**640**	270
2-Methylphenol (o-cresol)	330	100,000	500,000	< 230	230	< 260	260	< 260	260	< 270	270	< 260	260	< 270	270
2-Nitroaniline				< 330	330	< 370	370	< 370	370	< 390	390	< 370	370	< 390	390
2-Nitrophenol				< 230	230	< 260	260	< 260	260	< 270	270	< 260	260	< 270	270
3&4-Methylphenol (m&p-cresol)	330	100,000	500,000	< 330	330	< 370	370	< 370	370	< 390	390	< 370	370	< 390	390
3,3'-Dichlorobenzidine				< 230	230	< 260	260	< 260	260	< 270	270	< 260	260	< 270	270
3-Nitroaniline				< 330	330	< 370	370	< 370	370	< 390	390	< 370	370	< 390	390
4,6-Dinitro-2-methylphenol				< 330	330	< 370	370	< 370	370	< 390	390	< 370	370	< 390	390
4-Bromophenyl phenyl ether				< 330	330	< 370	370	< 370	370	< 390	390	< 370	370	< 390	390
4-Chloro-3-methylphenol				< 230	230	< 260	260	< 260	260	< 270	270	< 260	260	< 270	270
4-Chloroaniline				< 230	230	< 260	260	< 260	260	< 270	270	< 260	260	< 270	270
4-Chlorophenyl phenyl ether				< 230	230	< 260	260	< 260	260	< 270	270	< 260	260	< 270	270
4-Nitroaniline				< 520	520	< 590	590	< 590	590	< 630	630	< 600	600	< 630	630
4-Nitrophenol				< 230	230	< 260	260	< 260	260	< 270	270	< 260	260	< 270	270
Acenaphthene	20,000	100,000	500,000	< 230	230	< 260	260	**490**	260	**430**	270	**400**	260	**920**	270
Acenaphthylene	100,000	100,000	500,000	< 230	230	< 260	260	**430**	260	< 270	270	< 260	260	**1,900**	270
Acetophenone				< 230	230	< 260	260	< 260	260	< 270	270	< 260	260	< 270	270
Aniline				< 330	330	< 370	370	< 370	370	< 390	390	< 370	370	< 390	390
Anthracene	100,000	100,000	500,000	< 230	230	< 260	260	**1,800**	260	**1,100**	270	**930**	260	**2,900**	270
Benz(a)anthracene	1,000	1,000	5,600	< 230	230	**450**	260	**3,700**	260	**3,200**	270	**2,200**	260	**9,400**	1,000
Benzidine				< 230	230	< 260	260	< 260	260	< 270	270	< 260	260	< 270	270
Benzo(a)pyrene	1,000	1,000	1,000	< 230	230	**410**	260	**3,300**	260	**2,800**	270	**2,000**	260	**8,900**	1,000
Benzo(b)fluoranthene	1,000	1,000	5,600	< 230	230	**430**	260	**2,900**	260	**2,300**	270	**1,800**	260	**7,500**	1,000
Benzo(ghi)perylene	100,000	100,000	500,000	< 230	230	**320**	260	**1,900**	260	**1,700**	270	**1,300**	260	**4,700**	270
Benzo(k)fluoranthene	800	3,900	56,000	< 230	230	**430**	260	**2,700**	260	**2,300**	270	**1,700**	260	**4,300**	270
Benzoic acid				< 650	650	< 740	740	< 730	730	< 780	780	< 740	740	< 780	780
Benzyl butyl phthalate				< 230	230	< 260	260	< 260	260	< 270	270	< 260	260	< 270	270
Bis(2-chloroethoxy)methane				< 230	230	< 260	260	< 260	260	< 270	270	< 260	260	< 270	270
Bis(2-chloroethyl)ether				< 330	330	< 370	370	< 370	370	< 390	390	< 370	370	< 390	390
Bis(2-chloroisopropyl)ether				< 230	230	< 260	260	< 260	260	< 270	270	< 260	260	< 270	270
Bis(2-ethylhexyl)phthalate				< 230	230	< 260	260	< 260	260	< 270	270	< 260	260	< 270	270
Carbazole				< 330	330	< 370	370	**830**	370	**490**	390	**380**	370	**1,300**	390
Chrysene	1,000	3,900	56,000	< 230	230	**550**	260	**3,900**	260	**3,700**	270	**2,200**	260	**9,600**	1,000
Dibenz(a,h)anthracene	330	330	560	< 230	230	< 260	260	**490**	260	**440**	270	**340**	260	**2,100**	270
Dibenzofuran	7,000	59,000	59,000	< 230	230	< 260	260	**580**	260	< 270	270	< 260	260	**840**	270
Diethyl phthalate				< 230	230	< 260	260	< 260	260	< 270	270	< 260	260	< 270	270
Dimethylphthalate				< 230	230	< 260	260	< 260	260	< 270	270	< 260	260	< 270	270
Di-n-butylphthalate				< 330	330	< 370	370	< 370	370	< 390	390	< 370	370	< 390	390
Di-n-octylphthalate				< 230	230	< 260	260	< 260	260	< 270	270	< 260	260	< 270	270
Fluoranthene	100,000	100,000	500,000	**320.0**	230	**1,000**	260	**7,600**	1,300	**6,900**	270	**4,000**	260	**16,000**	1,400
Fluorene	30,000	100,000	500,000	< 230	230	< 260	260	**1,100**	260	**550**	270	**430**	260	**1,900**	270
Hexachlorobenzene				< 230	230	< 260	260	< 260	260	< 270	270	< 260	260	< 270	270
Hexachlorobutadiene				< 230	230	< 260	260	< 260	260	< 270	270	< 260	260	< 270	270
Hexachlorocyclopentadiene				< 230	230	< 260	260	< 260	260	< 270	270	< 260	260	< 270	270
Hexachloroethane				< 230	230	< 260	260	< 260	260	< 270	270	< 260	260	< 270	270
Indeno(1,2,3-cd)pyrene	500	500	5,600	< 230	230	**380**	260	**2,400**	260	**2,000**	270	**1,400**	260	**6,000**	270
Isophorone				< 230	230	< 260	260	< 260	260	< 270	270	< 260	260	< 270	270
Naphthalene	12,000	100,000	500,000	< 230	230	< 260	260	**460**	260	**440**	270	< 260	260	**860**	270
Nitrobenzene				< 230	230.0	< 260	260.0	< 260	260.0	< 270	270.0	< 260	260.0	< 270	270.0
N-Nitrosodimethylamine				< 330	330.0	< 370	370.0	< 370	370.0	< 390	390.0	< 370	370.0	< 390	390.0
N-Nitrosodi-n-propylamine				< 230	230.0	< 260	260.0	< 260	260.0	< 270	270.0	< 260	260.0	< 270	270.0
N-Nitrosodiphenylamine				< 330	330.0	< 370	370.0	< 370	370.0	< 390	390.0	< 370	370.0	< 390	390.0
Pentachloronitrobenzene				< 330	330	< 370	370	< 370	370	< 390	390	< 370	370	< 390	390
Pentachlorophenol	800	6,700	6,700	< 330	330	< 370	370	< 370	370	< 390	390	< 370	370	< 390	390
Phenanthrene	100,000	100,000	500,000	< 230	230	**400**	260	**9,200**	1,300	**7,000**	270	**3,500**	260	**14,000**	1,400
Phenol	330	100,000	500,000	< 230	230	< 260	260	< 260	260	< 270	270	< 260	260	< 270	270
Pyrene	100,000	100,000	500,000	**330**	230	**860**	260	**6,800**	1,300	**7,500**	270	**3,500**	260	**15,000**	1,400
Pyridine				< 330	330	< 370	370	< 370	370	< 390	390	< 370	370	< 390	390

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

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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	19B1				19B2				19B3				19B4			
				(0-2')		(8-10')		(0-2')		(8-10')		(0-2')		(8-10')		(0-2')		(8-10')	
				12/10/2019		12/10/2019		12/10/2019		12/10/2019		12/10/2019		12/10/2019		12/10/2019		12/10/2019	
				µg/Kg		µg/Kg		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
1,2,4,5-Tetrachlorobenzene				< 260	260	< 290	290	< 250	250	< 250	250	< 260	260	< 270	270	< 260	260	< 280	280
1,2,4-Trichlorobenzene				< 260	260	< 290	290	< 250	250	< 250	250	< 260	260	< 270	270	< 260	260	< 280	280
1,2-Dichlorobenzene				< 260	260	< 290	290	< 250	250	< 250	250	< 260	260	< 270	270	< 260	260	< 280	280
1,2-Diphenylhydrazine				< 260	260	< 290	290	< 250	250	< 250	250	< 260	260	< 270	270	< 260	260	< 280	280
1,3-Dichlorobenzene				< 260	260	< 290	290	< 250	250	< 250	250	< 260	260	< 270	270	< 260	260	< 280	280
1,4-Dichlorobenzene				< 260	260	< 290	290	< 250	250	< 250	250	< 260	260	< 270	270	< 260	260	< 280	280
2,4,5-Trichlorophenol				< 260	260	< 290	290	< 250	250	< 250	250	< 260	260	< 270	270	< 260	260	< 280	280
2,4,6-Trichlorophenol				< 190	190	< 200	200	< 180	180	< 180	180	< 190	190	< 190	190	< 180	180	< 200	200
2,4-Dichlorophenol				< 190	190	< 200	200	< 180	180	< 180	180	< 190	190	< 190	190	< 180	180	< 200	200
2,4-Dimethylphenol				< 260	260	< 290	290	< 250	250	< 250	250	< 260	260	< 270	270	< 260	260	< 280	280
2,4-Dinitrophenol				< 260	260	< 290	290	< 250	250	< 250	250	< 260	260	< 270	270	< 260	260	< 280	280
2,4-Dinitrotoluene				< 190	190	< 200	200	< 180	180	< 180	180	< 190	190	< 190	190	< 180	180	< 200	200
2,6-Dinitrotoluene				< 190	190	< 200	200	< 180	180	< 180	180	< 190	190	< 190	190	< 180	180	< 200	200
2-Chloronaphthalene				< 260	260	< 290	290	< 250	250	< 250	250	< 260	260	< 270	270	< 260	260	< 280	280
2-Chlorophenol				< 260	260	< 290	290	< 250	250	< 250	250	< 260	260	< 270	270	< 260	260	< 280	280
2-Methylnaphthalene				< 260	260	< 290	290	< 250	250	< 250	250	< 260	260	< 270	270	< 260	260	< 280	280
2-Methylphenol (o-cresol)	330	100,000	500,000	< 260	260	< 290	290	< 250	250	< 250	250	< 260	260	< 270	270	< 260	260	< 280	280
2-Nitroaniline				< 260	260	< 290	290	< 250	250	< 250	250	< 260	260	< 270	270	< 260	260	< 280	280
2-Nitrophenol				< 260	260	< 290	290	< 250	250	< 250	250	< 260	260	< 270	270	< 260	260	< 280	280
3&4-Methylphenol (m&p-cresol)	330	100,000	500,000	< 260	260	< 290	290	< 250	250	< 250	250	< 260	260	< 270	270	< 260	260	< 280	280
3,3'-Dichlorobenzidine				< 190	190	< 200	200	< 180	180	< 180	180	< 190	190	< 190	190	< 180	180	< 200	200
3-Nitroaniline				< 370	370	< 410	410	< 360	360	< 350	350	< 370	370	< 380	380	< 370	370	< 400	400
4,6-Dinitro-2-methylphenol				< 220	220	< 250	250	< 220	220	< 210	210	< 220	220	< 230	230	< 220	220	< 240	240
4-Bromophenyl phenyl ether				< 260	260	< 290	290	< 250	250	< 250	250	< 260	260	< 270	270	< 260	260	< 280	280
4-Chloro-3-methylphenol				< 260	260	< 290	290	< 250	250	< 250	250	< 260	260	< 270	270	< 260	260	< 280	280
4-Chloroaniline				< 300	300	< 330	330	< 290	290	< 280	280	< 300	300	< 310	310	< 290	290	< 320	320
4-Chlorophenyl phenyl ether				< 260	260	< 290	290	< 250	250	< 250	250	< 260	260	< 270	270	< 260	260	< 280	280
4-Nitroaniline				< 370	370	< 410	410	< 360	360	< 350	350	< 370	370	< 380	380	< 370	370	< 400	400
4-Nitrophenol				< 370	370	< 410	410	< 360	360	< 350	350	< 370	370	< 380	380	< 370	370	< 400	400
Acenaphthene	20,000	100,000	500,000	< 260	260	< 290	290	< 250	250	< 250	250	< 260	260	< 270	270	< 260	260	< 280	280
Acenaphthylene	100,000	100,000	500,000	< 260	260	< 290	290	< 250	250	< 250	250	< 260	260	< 270	270	< 260	260	< 280	280
Acetophenone				< 260	260	< 290	290	< 250	250	< 250	250	< 260	260	< 270	270	< 260	260	< 280	280
Aniline				< 300	300	< 330	330	< 290	290	< 280	280	< 300	300	< 310	310	< 290	290	< 320	320
Anthracene	100,000	100,000	500,000	< 260	260	< 290	290	< 250	250	< 250	250	**130**	260	< 270	270	< 260	260	< 280	280
Benz(a)anthracene	1,000	1,000	5,600	**510**	260	< 290	290	**220**	250	< 250	250	**630**	260	< 270	270	< 260	260	< 280	280
Benzidine				< 370	370	< 410	410	< 360	360	< 350	350	< 370	370	< 380	380	< 370	370	< 400	400
Benzo(a)pyrene	1,000	1,000	1,000	**470**	190	< 200	200	**230**	180	< 180	180	**650**	190	< 190	190	< 180	180	< 200	200
Benzo(b)fluoranthene	1,000	1,000	5,600	**460**	260	< 290	290	**240**	250	< 250	250	**610**	260	< 270	270	< 260	260	< 280	280
Benzo(ghi)perylene	100,000	100,000	500,000	**380**	260	< 290	290	**200**	250	< 250	250	**420**	260	< 270	270	< 260	260	< 280	280
Benzo(k)fluoranthene	800	3,900	56,000	**420**	260	< 290	290	**220**	250	< 250	250	**530**	260	< 270	270	< 260	260	< 280	280
Benzoic acid				< 1900	1,900	< 2000	2,000	< 1800	1,800	< 1800	1,800	< 1900	1,900	< 1900	1,900	< 1800	1,800	< 2000	2,000
Benzyl butyl phthalate				< 260	260	< 290	290	< 250	250	< 250	250	< 260	260	< 270	270	< 260	260	< 280	280
Bis(2-chloroethoxy)methane				< 260	260	< 290	290	< 250	250	< 250	250	< 260	260	< 270	270	< 260	260	< 280	280
Bis(2-chloroethyl)ether				< 190	190	< 200	200	< 180	180	< 180	180	< 190	190	< 190	190	< 180	180	< 200	200
Bis(2-chloroisopropyl)ether				< 260	260	< 290	290	< 250	250	< 250	250	< 260	260	< 270	270	< 260	260	< 280	280
Bis(2-ethylhexyl)phthalate				< 260	260	< 290	290	< 250	250	< 250	250	< 260	260	< 270	270	< 260	260	< 280	280
Carbazole				< 190	190	< 200	200	< 180	180	< 180	180	< 190	190	< 190	190	< 180	180	< 200	200
Chrysene	1,000	3,900	56,000	**740**	260	< 290	290	**310**	250	< 250	250	**710**	260	< 270	270	< 260	260	< 280	280
Dibenz(a,h)anthracene	330	330	560	< 190	190	< 200	200	< 180	180	< 180	180	< 190	190	< 190	190	< 180	180	< 200	200
Dibenzofuran	7,000	59,000	59,000	< 260	260	< 290	290	< 250	250	< 250	250	< 260	260	< 270	270	< 260	260	< 280	280
Diethyl phthalate				< 260	260	< 290	290	< 250	250	< 250	250	< 260	260	< 270	270	< 260	260	< 280	280
Dimethylphthalate				< 260	260	< 290	290	< 250	250	< 250	250	< 260	260	< 270	270	< 260	260	< 280	280
Di-n-butylphthalate				< 260	260	< 290	290	< 250	250	< 250	250	< 260	260	< 270	270	< 260	260	< 280	280
Di-n-octylphthalate				< 260	260	< 290	290	< 250	250	< 250	250	< 260	260	< 270	270	< 260	260	< 280	280
Fluoranthene	100,000	100,000	500,000	**1,200**	260	< 290	290	**530**	250	< 250	250	**1,400**	260	**190**	270	**190**	260	< 280	280
Fluorene	30,000	100,000	500,000	< 260	260	< 290	290	< 250	250	< 250	250	< 260	260	< 270	270	< 260	260	< 280	280
Hexachlorobenzene				< 190	190	< 200	200	< 180	180	< 180	180	< 190	190	< 190	190	< 180	180	< 200	200
Hexachlorobutadiene				< 260	260	< 290	290	< 250	250	< 250	250	< 260	260	< 270	270	< 260	260	< 280	280
Hexachlorocyclopentadiene				< 260	260	< 290	290	< 250	250	< 250	250	< 260	260	< 270	270	< 260	260	< 280	280
Hexachloroethane				< 190	190	< 200	200	< 180	180	< 180	180	< 190	190	< 190	190	< 180	180	< 200	200
Indeno(1,2,3-cd)pyrene	500	500	5,600	**310**	260	< 290	290	**120**	250	< 250	250	**250**	260	< 270	270	< 260	260	< 280	280
Isophorone				< 190	190	< 200	200	< 180	180	< 180	180	< 190	190	< 190	190	< 1800	1,800	< 200	200
Naphthalene	12,000	100,000	500,000	< 260	260	< 290	290	< 250	250	< 250	250	< 260	260	< 270	270	< 260	260	< 280	280
Nitrobenzene				< 190	190	< 200	200	< 180	180	< 180	180	< 190	190	< 190	190	< 180	180	< 200	200
N-Nitrosodimethylamine				< 260	260	< 290	290	< 250	250	< 250	250	< 260	260	< 270	270	< 260	260	< 280	280
N-Nitrosodi-n-propylamine				< 190	190	< 200	200	< 180	180	< 180	180	< 190	190	< 190	190	< 180	180	< 200	200
N-Nitrosodiphenylamine				< 260	260	< 290	290	< 250	250	< 250	250	< 260	260	< 270	270	< 260	260	< 280	280
Pentachloronitrobenzene				< 260	260	< 290	290	< 250	250	< 250	250	< 260	260	< 270	270	< 260	260	< 280	280
Pentachlorophenol	800	6,700	6,700	< 220	220	< 250	250	< 220	220	< 210	210	< 220	220	< 230	230	< 220	220	< 240	240
Phenanthrene	100,000	100,000	500,000	**470**	260	< 290	290	**290**	250	< 250	250	**760**	260	< 270	270	**120**	260	< 280	280
Phenol	330	100,000	500,000	< 260	260	< 290	290	< 250	250	< 250	250	< 260	260	< 270	270	< 260	260	< 280	280
Pyrene	100,000	100,000	500,000	**1,100**	260	< 290	290	**490**	250	< 250	250	**1,200**	260	**170**	270	**180**	260	< 280	280
Pyridine				< 260	260	< 290	290	< 250	250	< 250	250	< 260	260	< 270	270	< 260	260	< 280	280

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 4
26-22 4th Street
Queens, New York
2018 Phase II and 2019/2020 Remedial Investigation
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	19B5				19B6				19B7			
				(0-2')		(8-10')		(0-2')		(8-10')		(0-2')		(8-10')	
				12/10/2019		12/10/2019		12/10/2019		12/10/2019		12/10/2019		12/10/2019	
				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
1,2,4,5-Tetrachlorobenzene				< 260	260	< 270	270	< 260	260	< 260	260	< 270	270	< 270	270
1,2,4-Trichlorobenzene				< 260	260	< 270	270	< 260	260	< 260	260	< 270	270	< 270	270
1,2-Dichlorobenzene				< 260	260	< 270	270	< 260	260	< 260	260	< 270	270	< 270	270
1,2-Diphenylhydrazine				< 260	260	< 270	270	< 260	260	< 260	260	< 270	270	< 270	270
1,3-Dichlorobenzene				< 260	260	< 270	270	< 260	260	< 260	260	< 270	270	< 270	270
1,4-Dichlorobenzene				< 260	260	< 270	270	< 260	260	< 260	260	< 270	270	< 270	270
2,4,5-Trichlorophenol				< 260	260	< 270	270	< 260	260	< 260	260	< 270	270	< 270	270
2,4,6-Trichlorophenol				< 180	180	< 190	190	< 190	190	< 180	180	< 200	200	< 190	190
2,4-Dichlorophenol				< 180	180	< 190	190	< 190	190	< 180	180	< 200	200	< 190	190
2,4-Dimethylphenol				< 260	260	< 270	270	< 260	260	< 260	260	< 270	270	< 270	270
2,4-Dinitrophenol				< 260	260	< 270	270	< 260	260	< 260	260	< 270	270	< 270	270
2,4-Dinitrotoluene				< 180	180	< 190	190	< 190	190	< 180	180	< 200	200	< 190	190
2,6-Dinitrotoluene				< 180	180	< 190	190	< 190	190	< 180	180	< 200	200	< 190	190
2-Chloronaphthalene				< 260	260	< 270	270	< 260	260	< 260	260	< 270	270	< 270	270
2-Chlorophenol				< 260	260	< 270	270	< 260	260	< 260	260	< 270	270	< 270	270
2-Methylnaphthalene				< 260	260	< 270	270	< 260	260	< 260	260	< 270	270	< 270	270
2-Methylphenol (o-cresol)	330	100,000	500,000	< 260	260	< 270	270	< 260	260	< 260	260	< 270	270	< 270	270
2-Nitroaniline				< 260	260	< 270	270	< 260	260	< 260	260	< 270	270	< 270	270
2-Nitrophenol				< 260	260	< 270	270	< 260	260	< 260	260	< 270	270	< 270	270
3&4-Methylphenol (m&p-cresol)	330	100,000	500,000	< 260	260	< 270	270	< 260	260	< 260	260	< 270	270	< 270	270
3,3'-Dichlorobenzidine				< 180	180	< 190	190	< 190	190	< 180	180	< 200	200	< 190	190
3-Nitroaniline				< 370	370	< 380	380	< 370	370	< 370	370	< 390	390	< 380	380
4,6-Dinitro-2-methylphenol				< 220	220	< 230	230	< 220	220	< 220	220	< 230	230	< 230	230
4-Bromophenyl phenyl ether				< 260	260	< 270	270	< 260	260	< 260	260	< 270	270	< 270	270
4-Chloro-3-methylphenol				< 260	260	< 270	270	< 260	260	< 260	260	< 270	270	< 270	270
4-Chloroaniline				< 290	290	< 310	310	< 300	300	< 290	290	< 310	310	< 300	300
4-Chlorophenyl phenyl ether				< 260	260	< 270	270	< 260	260	< 260	260	< 270	270	< 270	270
4-Nitroaniline				< 370	370	< 380	380	< 370	370	< 370	370	< 390	390	< 380	380
4-Nitrophenol				< 370	370	< 380	380	< 370	370	< 370	370	< 390	390	< 380	380
Acenaphthene	20,000	100,000	500,000	< 260	260	< 270	270	< 260	260	< 260	260	< 270	270	< 270	270
Acenaphthylene	100,000	100,000	500,000	< 260	260	< 270	270	< 260	260	< 260	260	< 270	270	< 270	270
Acetophenone				< 260	260	< 270	270	< 260	260	< 260	260	< 270	270	< 270	270
Aniline				< 290	290	< 310	310	< 300	300	< 290	290	< 310	310	< 300	300
Anthracene	100,000	100,000	500,000	< 260	260	< 270	270	< 260	260	< 260	260	**170**	270	< 270	270
Benz(a)anthracene	1,000	1,000	5,600	< 260	260	< 270	270	**420**	260	< 260	260	**850**	270	< 270	270
Benzidine				< 370	370	< 380	380	< 370	370	< 370	370	< 390	390	< 380	380
Benzo(a)pyrene	1,000	1,000	1,000	< 180	180	< 190	190	**420**	190	< 180	180	**810**	200	< 190	190
Benzo(b)fluoranthene	1,000	1,000	5,600	< 260	260	< 270	270	**360**	260	< 260	260	**610**	270	< 270	270
Benzo(ghi)perylene	100,000	100,000	500,000	< 260	260	< 270	270	**270**	260	< 260	260	**600**	270	< 270	270
Benzo(k)fluoranthene	800	3,900	56,000	< 260	260	< 270	270	**350**	260	< 260	260	**470**	270	< 270	270
Benzoic acid				< 1800	1,800	< 1900	1,900	< 1900	1,900	< 1800	1,800	< 2000	2,000	< 1900	1,900
Benzyl butyl phthalate				< 260	260	< 270	270	< 260	260	< 260	260	< 270	270	< 270	270
Bis(2-chloroethoxy)methane				< 260	260	< 270	270	< 260	260	< 260	260	< 270	270	< 270	270
Bis(2-chloroethyl)ether				< 180	180	< 190	190	< 190	190	< 180	180	< 200	200	< 190	190
Bis(2-chloroisopropyl)ether				< 260	260	< 270	270	< 260	260	< 260	260	< 270	270	< 270	270
Bis(2-ethylhexyl)phthalate				< 260	260	< 270	270	< 260	260	< 260	260	< 270	270	< 270	270
Carbazole				< 180	180	< 190	190	< 190	190	< 180	180	< 200	200	< 190	190
Chrysene	1,000	3,900	56,000	< 260	260	< 270	270	**460**	260	< 260	260	**1,000**	270	< 270	270
Dibenz(a,h)anthracene	330	330	560	< 180	180	< 190	190	< 190	190	< 180	180	< 200	200	< 190	190
Dibenzofuran	7,000	59,000	59,000	< 260	260	< 270	270	< 260	260	< 260	260	< 270	270	< 270	270
Diethyl phthalate				< 260	260	< 270	270	< 260	260	< 260	260	< 270	270	< 270	270
Dimethylphthalate				< 260	260	< 270	270	< 260	260	< 260	260	< 270	270	< 270	270
Di-n-butylphthalate				< 260	260	< 270	270	< 260	260	< 260	260	< 270	270	< 270	270
Di-n-octylphthalate				< 260	260	< 270	270	< 260	260	< 260	260	< 270	270	< 270	270
Fluoranthene	100,000	100,000	500,000	< 260	260	< 270	270	**760**	260	< 260	260	**1,300**	270	< 270	270
Fluorene	30,000	100,000	500,000	< 260	260	< 270	270	< 260	260	< 260	260	< 270	270	< 270	270
Hexachlorobenzene				< 180	180	< 190	190	< 190	190	< 180	180	< 200	200	< 190	190
Hexachlorobutadiene				< 260	260	< 270	270	< 260	260	< 260	260	< 270	270	< 270	270
Hexachlorocyclopentadiene				< 260	260	< 270	270	< 260	260	< 260	260	< 270	270	< 270	270
Hexachloroethane				< 180	180	< 190	190	< 190	190	< 180	180	< 200	200	< 190	190
Indeno(1,2,3-cd)pyrene	500	500	5,600	< 260	260	< 270	270	**300**	260	< 260	260	**410**	270	< 270	270
Isophorone				< 180	180	< 190	190	< 190	190	< 180	180	< 200	200	< 190	190
Naphthalene	12,000	100,000	500,000	< 260	260	< 270	270	< 260	260	< 260	260	< 270	270	< 270	270
Nitrobenzene				< 180	180	< 190	190	< 190	190	< 180	180	< 200	200	< 190	190
N-Nitrosodimethylamine				< 260	260	< 270	270	< 260	260	< 260	260	< 270	270	< 270	270
N-Nitrosodi-n-propylamine				< 180	180	< 190	190	< 190	190	< 180	180	< 200	200	< 190	190
N-Nitrosodiphenylamine				< 260	260	< 270	270	< 260	260	< 260	260	< 270	270	< 270	270
Pentachloronitrobenzene				< 260	260	< 270	270	< 260	260	< 260	260	< 270	270	< 270	270
Pentachlorophenol	800	6,700	6,700	< 220	220	< 230	230	< 220	220	< 220	220	< 230	230	< 230	230
Phenanthrene	100,000	100,000	500,000	< 260	260	< 270	270	**430**	260	< 260	260	**1,000**	270	< 270	270
Phenol	330	100,000	500,000	< 260	260	< 270	270	< 260	260	< 260	260	< 270	270	< 270	270
Pyrene	100,000	100,000	500,000	< 260	260	< 270	270	**710**	260	< 260	260	**1,300**	270	< 270	270
Pyridine				< 260	260	< 270	270	< 260	260	< 260	260	< 270	270	< 270	270

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 4
26-22 4th Street
Queens, New York
2018 Phase II and 2019/2020 Remedial Investigation
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	19B8				19B9						19B10			
				(0-2')		(8-10')		(0-2')		(8-10')		(12')		(0-2')		(8-10')	
				12/10/2019		12/10/2019		12/10/2019		12/10/2019		12/10/2019		12/10/2019		12/10/2019	
				µg/Kg		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
1,2,4,5-Tetrachlorobenzene				< 270	270	< 270	270	< 260	260	< 260	260	< 250	250	< 280	280	< 280	280
1,2,4-Trichlorobenzene				< 270	270	< 270	270	< 260	260	< 260	260	< 250	250	< 280	280	< 280	280
1,2-Dichlorobenzene				< 270	270	< 270	270	< 260	260	< 260	260	< 250	250	< 280	280	< 280	280
1,2-Diphenylhydrazine				< 270	270	< 270	270	< 260	260	< 260	260	< 250	250	< 280	280	< 280	280
1,3-Dichlorobenzene				< 270	270	< 270	270	< 260	260	< 260	260	< 250	250	< 280	280	< 280	280
1,4-Dichlorobenzene				< 270	270	< 270	270	< 260	260	< 260	260	< 250	250	< 280	280	< 280	280
2,4,5-Trichlorophenol				< 270	270	< 270	270	< 260	260	< 260	260	< 250	250	< 280	280	< 280	280
2,4,6-Trichlorophenol				< 190	190	< 190	190	< 190	190	< 180	180	< 180	180	< 200	200	< 200	200
2,4-Dichlorophenol				< 190	190	< 190	190	< 190	190	< 180	180	< 180	180	< 200	200	< 200	200
2,4-Dimethylphenol				< 270	270	< 270	270	< 260	260	< 260	260	< 250	250	< 280	280	< 280	280
2,4-Dinitrophenol				< 270	270	< 270	270	< 260	260	< 260	260	< 250	250	< 280	280	< 280	280
2,4-Dinitrotoluene				< 190	190	< 190	190	< 190	190	< 180	180	< 180	180	< 200	200	< 200	200
2,6-Dinitrotoluene				< 190	190	< 190	190	< 190	190	< 180	180	< 180	180	< 200	200	< 200	200
2-Chloronaphthalene				< 270	270	< 270	270	< 260	260	< 260	260	< 250	250	< 280	280	< 280	280
2-Chlorophenol				< 270	270	< 270	270	< 260	260	< 260	260	< 250	250	< 280	280	< 280	280
2-Methylnaphthalene				< 270	270	< 270	270	< 260	260	< 260	260	< 250	250	< 280	280	< 280	280
2-Methylphenol (o-cresol)	330	100,000	500,000	< 270	270	< 270	270	< 260	260	< 260	260	< 250	250	< 280	280	< 280	280
2-Nitroaniline				< 270	270	< 270	270	< 260	260	< 260	260	< 250	250	< 280	280	< 280	280
2-Nitrophenol				< 270	270	< 270	270	< 260	260	< 260	260	< 250	250	< 280	280	< 280	280
3&4-Methylphenol (m&p-cresol)	330	100,000	500,000	< 270	270	< 270	270	< 260	260	< 260	260	< 250	250	< 280	280	< 280	280
3,3'-Dichlorobenzidine				< 190	190	< 190	190	< 190	190	< 180	180	< 180	180	< 200	200	< 200	200
3-Nitroaniline				< 390	390	< 380	380	< 380	380	< 370	370	< 360	360	< 410	410	< 400	400
4,6-Dinitro-2-methylphenol				< 230	230	< 230	230	< 230	230	< 220	220	< 220	220	< 240	240	< 240	240
4-Bromophenyl phenyl ether				< 270	270	< 270	270	< 260	260	< 260	260	< 250	250	< 280	280	< 280	280
4-Chloro-3-methylphenol				< 270	270	< 270	270	< 260	260	< 260	260	< 250	250	< 280	280	< 280	280
4-Chloroaniline				< 310	310	< 310	310	< 300	300	< 290	290	< 290	290	< 320	320	< 320	320
4-Chlorophenyl phenyl ether				< 270	270	< 270	270	< 260	260	< 260	260	< 250	250	< 280	280	< 280	280
4-Nitroaniline				< 390	390	< 380	380	< 380	380	< 370	370	< 360	360	< 410	410	< 400	400
4-Nitrophenol				< 390	390	< 380	380	< 380	380	< 370	370	< 360	360	< 410	410	< 400	400
Acenaphthene	20,000	100,000	500,000	< 270	270	< 270	270	< 260	260	< 260	260	< 250	250	< 280	280	< 280	280
Acenaphthylene	100,000	100,000	500,000	< 270	270	< 270	270	< 260	260	< 260	260	< 250	250	< 280	280	< 280	280
Acetophenone				< 270	270	< 270	270	< 260	260	< 260	260	< 250	250	< 280	280	< 280	280
Aniline				< 310	310	< 310	310	< 300	300	< 290	290	< 290	290	< 320	320	< 320	320
Anthracene	100,000	100,000	500,000	< 270	270	< 270	270	< 260	260	< 260	260	< 250	250	**200**	280	< 280	280
Benz(a)anthracene	1,000	1,000	5,600	**460**	270	< 270	270	**150**	260	< 260	260	< 250	250	**830**	280	< 280	280
Benzidine				< 390	390	< 380	380	< 380	380	< 370	370	< 360	360	< 410	410	< 400	400
Benzo(a)pyrene	1,000	1,000	1,000	**440**	190	< 190	190	**130**	190	< 180	180	< 180	180	**760**	200	< 200	200
Benzo(b)fluoranthene	1,000	1,000	5,600	**440**	270	< 270	270	< 260	260	< 260	260	< 250	250	**700**	280	< 280	280
Benzo(ghi)perylene	100,000	100,000	500,000	**300**	270	< 270	270	< 260	260	< 260	260	< 250	250	**490**	280	< 280	280
Benzo(k)fluoranthene	800	3,900	56,000	**420**	270	< 270	270	< 260	260	< 260	260	< 250	250	**620**	280	< 280	280
Benzoic acid				< 1900	1,900	< 1900	1,900	< 1900	1,900	< 1800	1,800	< 1800	1,800	< 2000	2,000	< 2000	2,000
Benzyl butyl phthalate				< 270	270	< 270	270	< 260	260	< 260	260	< 250	250	< 280	280	< 280	280
Bis(2-chloroethoxy)methane				< 270	270	< 270	270	< 260	260	< 260	260	< 250	250	< 280	280	< 280	280
Bis(2-chloroethyl)ether				< 190	190	< 190	190	< 190	190	< 180	180	< 180	180	< 200	200	< 200	200
Bis(2-chloroisopropyl)ether				< 270	270	< 270	270	< 260	260	< 260	260	< 250	250	< 280	280	< 280	280
Bis(2-ethylhexyl)phthalate				< 270	270	< 270	270	< 260	260	< 260	260	< 250	250	< 280	280	< 280	280
Carbazole				< 190	190	< 190	190	< 190	190	< 180	180	< 180	180	< 200	200	< 200	200
Chrysene	1,000	3,900	56,000	**520**	270	< 270	270	**160**	260	< 260	260	< 250	250	**860**	280	< 280	280
Dibenz(a,h)anthracene	330	330	560	< 190	190	< 190	190	< 190	190	< 180	180	< 180	180	< 200	200	< 200	200
Dibenzofuran	7,000	59,000	59,000	< 270	270	< 270	270	< 260	260	< 260	260	< 250	250	< 280	280	< 280	280
Diethyl phthalate				< 270	270	< 270	270	< 260	260	< 260	260	< 250	250	< 280	280	< 280	280
Dimethylphthalate				< 270	270	< 270	270	< 260	260	< 260	260	< 250	250	< 280	280	< 280	280
Di-n-butylphthalate				< 270	270	< 270	270	< 260	260	< 260	260	< 250	250	< 280	280	< 280	280
Di-n-octylphthalate				< 270	270	< 270	270	< 260	260	< 260	260	< 250	250	< 280	280	< 280	280
Fluoranthene	100,000	100,000	500,000	**950**	270	< 270	270	**270**	260	< 260	260	< 250	250	**1,800**	280	< 280	280
Fluorene	30,000	100,000	500,000	< 270	270	< 270	270	< 260	260	< 260	260	< 250	250	< 280	280	< 280	280
Hexachlorobenzene				< 190	190	< 190	190	< 190	190	< 180	180	< 180	180	< 200	200	< 200	200
Hexachlorobutadiene				< 270	270	< 270	270	< 260	260	< 260	260	< 250	250	< 280	280	< 280	280
Hexachlorocyclopentadiene				< 270	270	< 270	270	< 260	260	< 260	260	< 250	250	< 280	280	< 280	280
Hexachloroethane				< 190	190	< 190	190	< 190	190	< 180	180	< 180	180	< 200	200	< 200	200
Indeno(1,2,3-cd)pyrene	500	500	5,600	**310**	270	< 270	270	< 260	260	< 260	260	< 250	250	**560**	280	< 280	280
Isophorone				< 190	190	< 190	190	< 190	190	< 180	180	< 180	180	< 200	200	< 200	200
Naphthalene	12,000	100,000	500,000	< 270	270	< 270	270	< 260	260	< 260	260	< 250	250	< 280	280	< 280	280
Nitrobenzene				< 190	190	< 190	190	< 190	190	< 180	180	< 180	180	< 200	200	< 200	200
N-Nitrosodimethylamine				< 270	270	< 270	270	< 260	260	< 260	260	< 250	250	< 280	280	< 280	280
N-Nitrosodi-n-propylamine				< 190	190	< 190	190	< 190	190	< 180	180	< 180	180	< 200	200	< 200	200
N-Nitrosodiphenylamine				< 270	270	< 270	270	< 260	260	< 260	260	< 250	250	< 280	280	< 280	280
Pentachloronitrobenzene				< 270	270	< 270	270	< 260	260	< 260	260	< 250	250	< 280	280	< 280	280
Pentachlorophenol	800	6,700	6,700	< 230	230	< 230	230	< 230	230	< 220	220	< 220	220	< 240	240	< 240	240
Phenanthrene	100,000	100,000	500,000	**480**	270	< 270	270	**190**	260	< 260	260	< 250	250	**1,200**	280	< 280	280
Phenol	330	100,000	500,000	< 270	270	< 270	270	< 260	260	< 260	260	< 250	250	< 280	280	< 280	280
Pyrene	100,000	100,000	500,000	**840**	270	< 270	270	**270**	260	< 260	260	< 250	250	**1,500**	280	< 280	280
Pyridine				< 270	270	< 270	270	< 260	260	< 260	260	< 250	250	< 280	280	< 280	280

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 5
26-22 4th Street
Queens, New York
2018 Phase II and 2019/2020 Remedial Investigation
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	B-1		B-1		B-3		B-4		B-6		B-7		B-9	
					(0-2')		(6-8')		(2-4')		(2-4')		(2-4')		(2-4')		(2-4')	
					9/20/2018		9/20/2018		9/20/2018		9/20/2018		9/20/2018		9/20/2018		9/20/2018	
					µg/Kg		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
Pesticides	4,4' -DDD	3.3	13,000	92,000	<2.1	2.1	<2.0	2.0	<2.3	2.3	<2.2	2.2	<2.4	2.4	<2.3	2.3	<2.3	2.3
	4,4' -DDE	3.3	8,900	62,000	<2.1	2.1	<2.0	2.0	<2.3	2.3	<3.0	3.0	<2.4	2.4	**5.8**	2.3	<3.0	3.0
	4,4' -DDT	3.3	7,900	47,000	<2.1	2.1	<2.0	2.0	<2.3	2.3	<2.2	2.2	<2.4	2.4	<3.0	3.0	<2.3	2.3
	a-BHC	20	480	3,400	<7.1	7.1	<6.6	6.6	<7.5	7.5	<7.4	7.4	<7.9	7.9	<7.6	7.6	<7.7	7.7
	a-Chlordane	94	4,200	24,000	<3.6	3.6	<3.3	3.3	<3.8	3.8	<3.7	3.7	<3.9	3.9	<3.8	3.8	<3.9	3.9
	Aldrin	5	97	680	<3.6	3.6	<3.3	3.3	<3.8	3.8	<3.7	3.7	<3.9	3.9	<3.8	3.8	<3.9	3.9
	b-BHC	36	360	3,000	<7.1	7.1	<6.6	6.6	<7.5	7.5	<7.4	7.4	<7.9	7.9	<7.6	7.6	<7.7	7.7
	Chlordane				<36	36	<33	33	<38	38	<37	37	<39	39	<38	38	<39	39
	d-BHC	40	100,000	500,000	<7.1	7.1	<6.6	6.6	<7.5	7.5	<7.4	7.4	<7.9	7.9	<7.6	7.6	<7.7	7.7
	Dieldrin	5	200	1,400	<3.6	3.6	<3.3	3.3	<3.8	3.8	<3.7	3.7	<3.9	3.9	<3.8	3.8	<3.9	3.9
	Endosulfan I	2,400	24,000	200,000	<7.1	7.1	<6.6	6.6	<7.5	7.5	<7.4	7.4	<7.9	7.9	<7.6	7.6	<7.7	7.7
	Endosulfan II	2,400	24,000	200,000	<7.1	7.1	<6.6	6.6	<7.5	7.5	<7.4	7.4	<7.9	7.9	<7.6	7.6	<7.7	7.7
	Endosulfan sulfate	2,400	24,000	200,000	<7.1	7.1	<6.6	6.6	<7.5	7.5	<7.4	7.4	<7.9	7.9	<7.6	7.6	<7.7	7.7
	Endrin	14	11,000	89,000	<7.1	7.1	<6.6	6.6	<7.5	7.5	<7.4	7.4	<7.9	7.9	<7.6	7.6	<7.7	7.7
	Endrin aldehyde				<7.1	7.1	<6.6	6.6	<7.5	7.5	<7.4	7.4	<7.9	7.9	<7.6	7.6	<7.7	7.7
	Endrin ketone				<7.1	7.1	<6.6	6.6	<7.5	7.5	<7.4	7.4	<7.9	7.9	<7.6	7.6	<7.7	7.7
	g-BHC				<1.4	1.4	<1.3	1.3	<1.5	1.5	<1.5	1.5	<1.6	1.6	<1.5	1.5	<1.5	1.5
	g-Chlordane				<3.6	3.6	<3.3	3.3	<3.8	3.8	<3.7	3.7	<3.9	3.9	<3.8	3.8	<3.9	3.9
	Heptachlor	42	2,100	15,000	<7.1	7.1	<6.6	6.6	<7.5	7.5	<7.4	7.4	<7.9	7.9	<7.6	7.6	<7.7	7.7
	Heptachlor epoxide				<7.1	7.1	<6.6	6.6	<7.5	7.5	<7.4	7.4	<7.9	7.9	<7.6	7.6	<7.7	7.7
	Methoxychlor				<36	36	<33	33	<38	38	<37	37	<39	39	<38	38	<39	39
	Toxaphene				<140	140	<130	130	<150	150	<150	150	<160	160	<150	150	<150	150
PCBs	PCB-1016	100	1,000	1,000	<71	71	<66	66	<75	75	<74	74	<79	79	<76	76	<77	77
	PCB-1221	100	1,000	1,000	<71	71	<66	66	<75	75	<74	74	<79	79	<76	76	<77	77
	PCB-1232	100	1,000	1,000	<71	71	<66	66	<75	75	<74	74	<79	79	<76	76	<77	77
	PCB-1242	100	1,000	1,000	<71	71	<66	66	<75	75	<74	74	<79	79	<76	76	<77	77
	PCB-1248	100	1,000	1,000	<71	71	<66	66	<75	75	<74	74	<79	79	<76	76	<77	77
	PCB-1254	100	1,000	1,000	<71	71	<66	66	<75	75	<74	74	<79	79	<76	76	**190**	77
	PCB-1260	100	1,000	1,000	<71	71	<66	66	<75	75	<74	74	<79	79	<76	76	<77	77
	PCB-1262	100		1,000	<71	71	<66	66	<75	75	<74	74	<79	79	<76	76	<77	77
	PCB-1268	100		1,000	<71	71	<66	66	<75	75	<74	74	<79	79	<76	76	<77	77

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 5
26-22 4th Street
Queens, New York
2018 Phase II and 2019/2020 Remedial Investigation
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	19B1				19B2				19B3				19B4			
					(0-2')		(8-10')		(0-2')		(8-10')		(0-2')		(8-10')		(0-2')		(8-10')	
					12/10/2019		12/10/2019		12/10/2019		12/10/2019		12/10/2019		12/10/2019		12/10/2019		12/10/2019	
					µg/Kg		µg/Kg		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
Pesticides	4,4' -DDD	3.3	13,000	92,000	< 2.2	2.2	< 2.4	2.4	**3.2**	2.2	< 2.2	2.2	< 2.3	2.3	< 2.3	2.3	**5.8**	2.2	**8.1**	2.4
	4,4' -DDE	3.3	8,900	62,000	< 2.2	2.2	< 2.4	2.4	< 2.2	2.2	< 2.2	2.2	< 2.3	2.3	< 2.3	2.3	< 2.2	2.2	< 2.4	2.4
	4,4' -DDT	3.3	7,900	47,000	< 2.2	2.2	< 2.4	2.4	**3.6**	2.2	< 2.2	2.2	< 2.3	2.3	< 2.3	2.3	**2.5**	2.2	< 3.3	3.3
	a-BHC	20	480	3,400	< 7.5	7.5	< 8.1	8.1	< 7.3	7.3	< 7.2	7.2	< 7.5	7.5	< 7.7	7.7	< 7.3	7.3	< 7.9	7.9
	a-Chlordane	94	4,200	24,000	< 3.7	3.7	< 4.1	4.1	< 3.6	3.6	< 3.6	3.6	< 3.8	3.8	< 3.9	3.9	< 3.7	3.7	< 3.9	3.9
	Aldrin	5	97	680	< 3.7	3.7	< 4.1	4.1	< 3.6	3.6	< 3.6	3.6	< 3.8	3.8	< 3.9	3.9	< 3.7	3.7	< 3.9	3.9
	b-BHC	36	360	3,000	< 7.5	7.5	< 8.1	8.1	< 7.3	7.3	< 7.2	7.2	< 7.5	7.5	< 7.7	7.7	< 7.3	7.3	< 7.9	7.9
	Chlordane				< 37	37	< 41	41	< 36	36	< 36	36	< 38	38	< 39	39	< 37	37	< 39	39
	d-BHC	40	100,000	500,000	< 7.5	7.5	< 8.1	8.1	< 7.3	7.3	< 7.2	7.2	< 7.5	7.5	< 7.7	7.7	< 7.3	7.3	< 7.9	7.9
	Dieldrin	5	200	1,400	< 3.7	3.7	< 4.1	4.1	< 3.6	3.6	< 3.6	3.6	< 3.8	3.8	< 3.9	3.9	< 3.7	3.7	< 3.9	3.9
	Endosulfan I	2,400	24,000	200,000	< 7.5	7.5	< 8.1	8.1	< 7.3	7.3	< 7.2	7.2	< 7.5	7.5	< 7.7	7.7	< 7.3	7.3	< 7.9	7.9
	Endosulfan II	2,400	24,000	200,000	< 7.5	7.5	< 8.1	8.1	< 7.3	7.3	< 7.2	7.2	< 7.5	7.5	< 7.7	7.7	< 7.3	7.3	< 7.9	7.9
	Endosulfan sulfate	2,400	24,000	200,000	< 7.5	7.5	< 8.1	8.1	< 7.3	7.3	< 7.2	7.2	< 7.5	7.5	< 7.7	7.7	< 7.3	7.3	< 7.9	7.9
	Endrin	14	11,000	89,000	< 7.5	7.5	< 8.1	8.1	< 7.3	7.3	< 7.2	7.2	< 7.5	7.5	< 7.7	7.7	< 7.3	7.3	< 7.9	7.9
	Endrin aldehyde				< 7.5	7.5	< 8.1	8.1	< 7.3	7.3	< 7.2	7.2	< 7.5	7.5	< 7.7	7.7	< 7.3	7.3	< 7.9	7.9
	Endrin ketone				< 7.5	7.5	< 8.1	8.1	< 7.3	7.3	< 7.2	7.2	< 7.5	7.5	< 7.7	7.7	< 7.3	7.3	< 7.9	7.9
	g-BHC				< 1.5	1.5	< 1.6	1.6	< 1.5	1.5	< 1.4	1.4	< 1.5	1.5	< 1.5	1.5	< 1.5	1.5	< 1.6	1.6
	g-Chlordane				< 3.7	3.7	< 4.1	4.1	< 3.6	3.6	< 3.6	3.6	< 3.8	3.8	< 3.9	3.9	< 3.7	3.7	< 3.9	3.9
	Heptachlor	42	2,100	15,000	< 7.5	7.5	< 8.1	8.1	< 7.3	7.3	< 7.2	7.2	< 7.5	7.5	< 7.7	7.7	< 7.3	7.3	< 7.9	7.9
	Heptachlor epoxide				< 7.5	7.5	< 8.1	8.1	< 7.3	7.3	< 7.2	7.2	< 7.5	7.5	< 7.7	7.7	< 7.3	7.3	< 7.9	7.9
	Methoxychlor				< 37	37	< 41	41	< 36	36	< 36	36	< 38	38	< 39	39	< 37	37	< 39	39
	Toxaphene				< 150	150	< 160	160	< 150	150	< 140	140	< 150	150	< 150	150	< 150	150	< 160	160
PCBs	PCB-1016	100	1,000	1,000	< 75	75	< 81	81	< 73	73	< 72	72	< 75	75	< 77	77	< 73	73	< 79	79
	PCB-1221	100	1,000	1,000	< 75	75	< 81	81	< 73	73	< 72	72	< 75	75	< 77	77	< 73	73	< 79	79
	PCB-1232	100	1,000	1,000	< 75	75	< 81	81	< 73	73	< 72	72	< 75	75	< 77	77	< 73	73	< 79	79
	PCB-1242	100	1,000	1,000	< 75	75	< 81	81	< 73	73	< 72	72	< 75	75	< 77	77	< 73	73	< 79	79
	PCB-1248	100	1,000	1,000	< 75	75	< 81	81	< 73	73	< 72	72	< 75	75	< 77	77	< 73	73	< 79	79
	PCB-1254	100	1,000	1,000	< 75	75	< 81	81	< 73	73	< 72	72	< 75	75	< 77	77	< 73	73	< 79	79
	PCB-1260	100	1,000	1,000	< 75	75	< 81	81	< 73	73	< 72	72	< 75	75	< 77	77	< 73	73	< 79	79
	PCB-1262	100		1,000	< 75	75	< 81	81	< 73	73	< 72	72	< 75	75	< 77	77	< 73	73	< 79	79
	PCB-1268	100		1,000	< 75	75	< 81	81	< 73	73	< 72	72	< 75	75	< 77	77	< 73	73	< 79	79

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 5
26-22 4th Street
Queens, New York
2018 Phase II and 2019/2020 Remedial Investigation
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	19B5				19B6				19B7				19B8			
					(0-2')		(8-10')		(0-2')		(8-10')		(0-2')		(8-10')		(0-2')		(8-10')	
					12/10/2019		12/10/2019		12/10/2019		12/10/2019		12/10/2019		12/10/2019		12/10/2019		12/10/2019	
					µg/Kg		µg/Kg		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
Pesticides	4,4' -DDD	3.3	13,000	92,000	< 2.2	2.2	< 2.3	2.3	< 2.2	2.2	< 2.2	2.2	**17**	2.3	< 2.3	2.3	**6.5**	2.4	< 2.2	2.2
	4,4' -DDE	3.3	8,900	62,000	< 2.2	2.2	< 2.3	2.3	< 2.2	2.2	< 2.2	2.2	< 3.0	3.0	< 2.3	2.3	< 2.4	2.4	< 2.2	2.2
	4,4' -DDT	3.3	7,900	47,000	< 2.2	2.2	< 2.3	2.3	< 2.2	2.2	< 2.2	2.2	**6.4**	2.3	< 2.3	2.3	**5.9**	2.4	< 2.2	2.2
	a-BHC	20	480	3,400	< 7.3	7.3	< 7.7	7.7	< 7.3	7.3	< 7.2	7.2	< 7.7	7.7	< 7.7	7.7	< 7.9	7.9	< 7.5	7.5
	a-Chlordane	94	4,200	24,000	< 3.7	3.7	< 3.9	3.9	< 3.7	3.7	< 3.6	3.6	< 3.8	3.8	< 3.8	3.8	< 3.9	3.9	< 3.7	3.7
	Aldrin	5	97	680	< 3.7	3.7	< 3.9	3.9	< 3.7	3.7	< 3.6	3.6	< 3.8	3.8	< 3.8	3.8	< 3.9	3.9	< 3.7	3.7
	b-BHC	36	360	3,000	< 7.3	7.3	< 7.7	7.7	< 7.3	7.3	< 7.2	7.2	< 7.7	7.7	< 7.7	7.7	< 7.9	7.9	< 7.5	7.5
	Chlordane				< 37	37	< 39	39	< 37	37	< 36	36	< 38	38	< 38	38	< 39	39	< 37	37
	d-BHC	40	100,000	500,000	< 7.3	7.3	< 7.7	7.7	< 7.3	7.3	< 7.2	7.2	< 7.7	7.7	< 7.7	7.7	< 7.9	7.9	< 7.5	7.5
	Dieldrin	5	200	1,400	< 3.7	3.7	< 3.9	3.9	< 3.7	3.7	< 3.6	3.6	< 3.8	3.8	< 3.8	3.8	< 3.9	3.9	< 3.7	3.7
	Endosulfan I	2,400	24,000	200,000	< 7.3	7.3	< 7.7	7.7	< 7.3	7.3	< 7.2	7.2	< 7.7	7.7	< 7.7	7.7	< 7.9	7.9	< 7.5	7.5
	Endosulfan II	2,400	24,000	200,000	< 7.3	7.3	< 7.7	7.7	< 7.3	7.3	< 7.2	7.2	< 7.7	7.7	< 7.7	7.7	< 7.9	7.9	< 7.5	7.5
	Endosulfan sulfate	2,400	24,000	200,000	< 7.3	7.3	< 7.7	7.7	< 7.3	7.3	< 7.2	7.2	< 7.7	7.7	< 7.7	7.7	< 7.9	7.9	< 7.5	7.5
	Endrin	14	11,000	89,000	< 7.3	7.3	< 7.7	7.7	< 7.3	7.3	< 7.2	7.2	< 7.7	7.7	< 7.7	7.7	< 7.9	7.9	< 7.5	7.5
	Endrin aldehyde				< 7.3	7.3	< 7.7	7.7	< 7.3	7.3	< 7.2	7.2	< 7.7	7.7	< 7.7	7.7	< 7.9	7.9	< 7.5	7.5
	Endrin ketone				< 7.3	7.3	< 7.7	7.7	< 7.3	7.3	< 7.2	7.2	< 7.7	7.7	< 7.7	7.7	< 7.9	7.9	< 7.5	7.5
	g-BHC				< 1.5	1.5	< 1.5	1.5	< 1.5	1.5	< 1.4	1.4	< 1.5	1.5	< 1.5	1.5	< 1.6	1.6	< 1.5	1.5
	g-Chlordane				< 3.7	3.7	< 3.9	3.9	< 3.7	3.7	< 3.6	3.6	< 3.8	3.8	< 3.8	3.8	< 3.9	3.9	< 3.7	3.7
	Heptachlor	42	2,100	15,000	< 7.3	7.3	< 7.7	7.7	< 7.3	7.3	< 7.2	7.2	< 7.7	7.7	< 7.7	7.7	< 7.9	7.9	< 7.5	7.5
	Heptachlor epoxide				< 7.3	7.3	< 7.7	7.7	< 7.3	7.3	< 7.2	7.2	< 7.7	7.7	< 7.7	7.7	< 7.9	7.9	< 7.5	7.5
	Methoxychlor				< 37	37	< 39	39	< 37	37	< 36	36	< 38	38	< 38	38	< 39	39	< 37	37
	Toxaphene				< 150	150	< 150	150	< 150	150	< 140	140	< 150	150	< 150	150	< 160	160	< 150	150
PCBs	PCB-1016	100	1,000	1,000	< 73	73	< 77	77	< 73	73	< 72	72	< 77	77	< 77	77	< 78	78	< 75	75
	PCB-1221	100	1,000	1,000	< 73	73	< 77	77	< 73	73	< 72	72	< 77	77	< 77	77	< 78	78	< 75	75
	PCB-1232	100	1,000	1,000	< 73	73	< 77	77	< 73	73	< 72	72	< 77	77	< 77	77	< 78	78	< 75	75
	PCB-1242	100	1,000	1,000	< 73	73	< 77	77	< 73	73	< 72	72	< 77	77	< 77	77	< 78	78	< 75	75
	PCB-1248	100	1,000	1,000	< 73	73	< 77	77	< 73	73	< 72	72	< 77	77	< 77	77	< 78	78	< 75	75
	PCB-1254	100	1,000	1,000	< 73	73	< 77	77	< 73	73	< 72	72	< 77	77	< 77	77	< 78	78	< 75	75
	PCB-1260	100	1,000	1,000	< 73	73	< 77	77	< 73	73	< 72	72	**110**	77	< 77	77	**130**	78	< 75	75
	PCB-1262	100		1,000	< 73	73	< 77	77	< 73	73	< 72	72	< 77	77	< 77	77	< 78	78	< 75	75
	PCB-1268	100		1,000	< 73	73	< 77	77	< 73	73	< 72	72	< 77	77	< 77	77	< 78	78	< 75	75

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 5
26-22 4th Street
Queens, New York
2018 Phase II and 2019/2020 Remedial Investigation
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	19B9						19B10			
					(0-2')		(8-10')		(12')		(0-2')		(8-10')	
					12/10/2019		12/10/2019		12/10/2019		12/10/2019		12/10/2019	
					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	< 2.4	2.4	< 2.2	2.2	< 2.2	2.2	< 2.4	2.4	< 2.5	2.5
	4,4' -DDE	3.3	8,900	62,000	< 2.4	2.4	< 2.2	2.2	< 2.2	2.2	< 2.4	2.4	< 2.5	2.5
	4,4' -DDT	3.3	7,900	47,000	< 2.4	2.4	< 2.2	2.2	< 2.2	2.2	< 2.4	2.4	< 2.5	2.5
	a-BHC	20	480	3,400	< 7.8	7.8	< 7.5	7.5	< 7.3	7.3	< 8.1	8.1	< 8.2	8.2
	a-Chlordane	94	4,200	24,000	< 3.9	3.9	< 3.7	3.7	< 3.6	3.6	< 4.0	4.0	< 4.1	4.1
	Aldrin	5	97	680	< 3.9	3.9	< 3.7	3.7	< 3.6	3.6	< 4.0	4.0	< 4.1	4.1
	b-BHC	36	360	3,000	< 7.8	7.8	< 7.5	7.5	< 7.3	7.3	< 8.1	8.1	< 8.2	8.2
	Chlordane				< 39	39	< 37	37	< 36	36	< 40	40	< 41	41
	d-BHC	40	100,000	500,000	< 7.8	7.8	< 7.5	7.5	< 7.3	7.3	< 8.1	8.1	< 8.2	8.2
	Dieldrin	5	200	1,400	< 3.9	3.9	< 3.7	3.7	< 3.6	3.6	< 4.0	4.0	< 4.1	4.1
	Endosulfan I	2,400	24,000	200,000	< 7.8	7.8	< 7.5	7.5	< 7.3	7.3	< 8.1	8.1	< 8.2	8.2
	Endosulfan II	2,400	24,000	200,000	< 7.8	7.8	< 7.5	7.5	< 7.3	7.3	< 8.1	8.1	< 8.2	8.2
	Endosulfan sulfate	2,400	24,000	200,000	< 7.8	7.8	< 7.5	7.5	< 7.3	7.3	< 8.1	8.1	< 8.2	8.2
	Endrin	14	11,000	89,000	< 7.8	7.8	< 7.5	7.5	< 7.3	7.3	< 8.1	8.1	< 8.2	8.2
	Endrin aldehyde				< 7.8	7.8	< 7.5	7.5	< 7.3	7.3	< 8.1	8.1	< 8.2	8.2
	Endrin ketone				< 7.8	7.8	< 7.5	7.5	< 7.3	7.3	< 8.1	8.1	< 8.2	8.2
	g-BHC				< 1.6	1.6	< 1.5	1.5	< 1.5	1.5	< 1.6	1.6	< 1.6	1.6
	g-Chlordane				< 3.9	3.9	< 3.7	3.7	< 3.6	3.6	< 4.0	4.0	< 4.1	4.1
	Heptachlor	42	2,100	15,000	< 7.8	7.8	< 7.5	7.5	< 7.3	7.3	< 8.1	8.1	< 8.2	8.2
	Heptachlor epoxide				< 7.8	7.8	< 7.5	7.5	< 7.3	7.3	< 8.1	8.1	< 8.2	8.2
	Methoxychlor				< 39	39	< 37	37	< 36	36	< 40	40	< 41	41
	Toxaphene				< 160	160	< 150	150	< 150	150	< 160	160	< 160	160
PCBs	PCB-1016	100	1,000	1,000	< 78	78	< 75	75	< 73	73	< 81	81	< 82	82
	PCB-1221	100	1,000	1,000	< 78	78	< 75	75	< 73	73	< 81	81	< 82	82
	PCB-1232	100	1,000	1,000	< 78	78	< 75	75	< 73	73	< 81	81	< 82	82
	PCB-1242	100	1,000	1,000	< 78	78	< 75	75	< 73	73	< 81	81	< 82	82
	PCB-1248	100	1,000	1,000	< 78	78	< 75	75	< 73	73	< 81	81	< 82	82
	PCB-1254	100	1,000	1,000	< 78	78	< 75	75	< 73	73	< 81	81	< 82	82
	PCB-1260	100	1,000	1,000	< 78	78	< 75	75	< 73	73	< 81	81	< 82	82
	PCB-1262	100		1,000	< 78	78	< 75	75	< 73	73	< 81	81	< 82	82
	PCB-1268	100		1,000	< 78	78	< 75	75	< 73	73	< 81	81	< 82	82

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 6
26-22 4th Street
Queens, New York
2018 Phase II and 2019/2020 Remedial Investigation
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	B-1		B-1		B-3		B-4		B-6		B-7		B-9	
				(0-2')		(6-8')		(2-4')		(2-4')		(2-4')		(2-4')		(2-4')	
				9/20/2018		9/20/2018		9/20/2018		9/20/2018		9/20/2018		9/20/2018		9/20/2018	
				mg/Kg		mg/Kg		mg/Kg		mg/Kg		mg/Kg		mg/Kg		mg/Kg	
	mg/Kg	mg/Kg	mg/Kg	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL
Aluminum				-	-	-	-	-	-	-	-	-	-	-	-	-	-
Antimony				-	-	-	-	-	-	-	-	-	-	-	-	-	-
Arsenic	13	16	16	**1.76**	0.65	**2.55**	0.65	**12.5**	0.70	**5.73**	0.73	**6.35**	0.73	**9.68**	0.71	**4.63**	0.78
Barium	350	400	400	**121**	0.33	**60**	0.32	**78**	0.35	**252**	0.36	**199**	0.36	**934**	0.35	**143**	0.39
Beryllium	7.2	72	590	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium	2.5	4.3	9.3	<0.33	0.33	<0.32	0.32	**1.5**	0.35	**0.92**	0.36	**0.96**	0.36	**0.93**	0.35	**0.76**	0.39
Calcium						-	-	-	-	-	-	-	-	-	-	-	-
Chromium	30	180	1500	**4.48**	0.33	**14.6**	0.32	**29.4**	0.35	**22.2**	0.36	**24.6**	0.36	**29.8**	0.35	**19.4**	0.39
Cobalt				-	-	-	-	-	-	-	-	-	-	-	-	-	-
Copper	50	270	270	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Iron				-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lead	63	400	1000	**22.9**	0.33	**27.3**	0.32	**257**	3.5	**327**	3.6	**300**	3.6	**8,430**	35	**173**	3.9
Magnesium				-	-	-	-	-	-	-	-	-	-	-	-	-	-
Manganese	1,600	2,000	10,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mercury	0.18	0.81	2.8	<0.14	0.14	**0.15**	0.13	**0.17**	0.12	**0.28**	0.14	**0.51**	0.14	**0.45**	0.14	**0.45**	0.14
Nickel	30	310	310	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Potassium				-	-	-	-	-	-	-	-	-	-	-	-	-	-
Selenium	3.9	180	1500	<1.3	1.3	<1.3	1.3	<1.4	1.4	<1.5	1.5	<1.5	1.5	<1.4	1.4	<1.6	1.6
Silver	2	180	1500	<0.33	0.33	<0.32	0.32	<0.35	0.35	<0.36	0.36	<0.36	0.36	<0.35	0.35	<0.35	0.35
Sodium				-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thallium				-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vanadium				-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zinc	109	10,000	10,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:

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

RL - Reporting Limit

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Table 6
26-22 4th Street
Queens, New York
2018 Phase II and 2019/2020 Remedial Investigation
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	19B1				19B2				19B3				19B4			
				(0-2')		(8-10')		(0-2')		(8-10')		(0-2')		(8-10')		(0-2')		(8-10')	
				12/10/2019		12/10/2019		12/10/2019		12/10/2019		12/10/2019		12/10/2019		12/10/2019		12/10/2019	
				mg/Kg		mg/Kg		mg/Kg		mg/Kg		mg/Kg		mg/Kg		mg/Kg		mg/Kg	
	mg/Kg	mg/Kg	mg/Kg	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL
Aluminum				**12,500**	33	**14,900**	37	**11,100**	36	**17,300**	34	**9,830**	35	**7,460**	38	**10,400**	35	**8,480**	38
Antimony				< 3.3	3.3	< 3.7	3.7	< 3.6	3.6	< 3.4	3.4	< 3.5	3.5	< 3.8	3.8	< 3.5	3.5	< 3.8	3.8
Arsenic	13	16	16	**3.91**	0.67	**2.37**	0.74	**3.89**	0.71	**1.44**	0.68	**9.64**	0.69	< 0.76	0.76	**4.18**	0.70	< 0.76	0.76
Barium	350	400	400	**106**	0.7	**54.4**	0.7	**86.3**	0.7	**195**	0.7	**370**	0.7	**39.4**	0.8	**103**	0.7	**55.9**	0.8
Beryllium	7.2	72	590	**0.6**	0.27	**0.42**	0.30	**0.49**	0.28	**0.54**	0.27	**0.47**	0.28	**0.2**	0.31	**0.46**	0.28	**0.27**	0.31
Cadmium	2.5	4.3	9.3	**0.4**	0.33	**0.41**	0.37	**0.54**	0.36	< 0.34	0.34	**1.06**	0.35	< 0.38	0.38	**0.71**	0.35	**0.41**	0.38
Calcium				**4,400**	33	**996**	37	**14,300**	36	**2,180**	34	**6,340**	3.5	**1,490**	38	**7,310**	3.5	**1,180**	38
Chromium	30	180	1500	**17.6**	0.33	**25.3**	0.37	**18.4**	0.36	**40.7**	0.34	**18.8**	0.35	**16.7**	0.38	**19.8**	0.35	**19.3**	0.38
Cobalt				**6.06**	0.33	**6.88**	0.37	**5.84**	0.36	**2.05**	0.34	**5.42**	0.35	**3.4**	0.38	**5.2**	0.35	**4.68**	0.38
Copper	50	270	270	**20.2**	0.7	**11.9**	0.7	**35.7**	0.7	**7.1**	0.7	**79.1**	0.7	**14.9**	0.8	**34.2**	0.7	**26.7**	0.8
Iron				**17,900**	33	**20,500**	37	**17,400**	36	**22,000**	34	**18,800**	35	**10,200**	38	**17,200**	35	**16,200**	38
Lead	63	400	1000	**56**	0.7	**8.9**	0.7	**93**	0.7	**5.8**	0.7	**783**	6.9	**8.1**	0.8	**169**	0.7	**4.1**	0.8
Magnesium				**3,810**	33	**2,930**	37	**8,540**	36	**6,310**	34	**3,630**	3.5	**2,550**	38	**4,250**	3.5	**3,870**	3.8
Manganese	1,600	2,000	10,000	**449**	3.3	**384**	3.7	**314**	3.6	**821**	3.4	**323**	3.5	**78.1**	3.8	**285**	3.5	**416**	3.8
Mercury	0.18	0.81	2.8	**0.43**	0.07	< 0.03	0.03	**0.24**	0.07	< 0.07	0.07	**0.83**	0.07	**0.17**	0.03	**0.35**	0.07	< 0.03	0.03
Nickel	30	310	310	**12.7**	0.33	**13.8**	0.37	**15.6**	0.36	**25**	0.34	**16.2**	0.35	**12.2**	0.38	**14.2**	0.35	**13.9**	0.38
Potassium				**1,370**	7	**918**	7	**1,030**	7	**8,070**	68	**1,020**	7	**675**	8	**1,290**	7	**1,520**	8
Selenium	3.9	180	1500	< 1.3	1.3	< 1.5	1.5	< 1.4	1.4	< 1.4	1.4	< 1.4	1.4	< 1.5	1.5	< 1.4	1.4	< 1.5	1.5
Silver	2	180	1500	< 0.33	0.33	< 0.37	0.37	< 0.36	0.36	< 0.34	0.34	< 0.35	0.35	< 0.38	0.38	< 0.35	0.35	< 0.38	0.38
Sodium				**449**	7	**251**	7	**528**	7	**290**	7	**214**	7	**139**	8	**159**	7	**250**	8
Thallium				< 1.3	1.3	< 1.5	1.5	< 1.4	1.4	< 1.4	1.4	< 1.4	1.4	< 1.5	1.5	< 1.4	1.4	< 1.5	1.5
Vanadium				**29.9**	0.33	**34**	0.37	**31.7**	0.36	**45.6**	0.34	**31.3**	0.35	**20.2**	0.38	**26.6**	0.35	**31.1**	0.38
Zinc	109	10,000	10,000	**64.4**	0.7	**47.7**	0.7	**128**	0.7	**69.6**	0.7	**316**	0.7	**31.8**	0.8	**175**	0.7	**32.9**	0.8

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 RCSCO Guidance Value

Table 6
26-22 4th Street
Queens, New York
2018 Phase II and 2019/2020 Remedial Investigation
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	19B5				19B6				19B7				19B8			
				(0-2')		(8-10')		(0-2')		(8-10')		(0-2')		(8-10')		(0-2')		(8-10')	
				12/10/2019		12/10/2019		12/10/2019		12/10/2019		12/10/2019		12/10/2019		12/10/2019		12/10/2019	
				mg/Kg		mg/Kg		mg/Kg		mg/Kg		mg/Kg		mg/Kg		mg/Kg		mg/Kg	
	mg/Kg	mg/Kg	mg/Kg	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL
Aluminum				**9,630**	33	**6,600**	39	**9,470**	36	**17,000**	33	**8,640**	37	**11,400**	35	**5,140**	36	**15,500**	35
Antimony				< 3.3	3.3	< 3.9	3.9	< 3.6	3.6	< 3.3	3.3	**4.3**	3.7	< 3.5	3.5	**4.3**	3.6	< 3.5	3.5
Arsenic	13	16	16	**2.37**	0.66	< 0.77	0.77	**11.6**	0.71	< 0.66	0.66	**12.4**	0.74	**1.61**	0.70	**14.2**	0.73	**1.06**	0.71
Barium	350	400	400	**59.7**	0.7	**40.4**	0.8	**180**	0.7	**407**	0.7	**233**	0.7	**51.1**	0.7	**179**	0.7	**104**	0.7
Beryllium	7.2	72	590	**0.39**	0.26	**0.2**	0.31	**0.47**	0.28	**0.31**	0.26	**0.4**	0.30	**0.44**	0.28	**0.41**	0.29	**0.36**	0.28
Cadmium	2.5	4.3	9.3	**0.37**	0.33	< 0.39	0.39	**1.33**	0.36	**0.59**	0.33	**1.36**	0.37	**0.41**	0.35	**1.82**	0.36	**0.5**	0.35
Calcium				**12,400**	33	**1,290**	39	**7,350**	36	**2,820**	33	**14,500**	37	**975**	35	**3,000**	36	**1,430**	35
Chromium	30	180	1500	**21.7**	0.33	**12.3**	0.39	**23.9**	0.36	**23.5**	0.33	**22**	0.37	**23.9**	0.35	**17**	0.36	**38.5**	0.35
Cobalt				**4.73**	0.33	**2.97**	0.39	**5.13**	0.36	**4.33**	0.33	**7.74**	0.37	**6.48**	0.35	**5.27**	0.36	**5.67**	0.35
Copper	50	270	270	**25.8**	0.7	**16.4**	0.8	**85**	0.7	**41.7**	0.7	**83.1**	0.7	**19.1**	0.7	**73.6**	0.7	**34.9**	0.7
Iron				**15,900**	33	**9,300**	39	**20,500**	36	**33,000**	33	**29,300**	37	**18,600**	35	**32,600**	36	**24,700**	35
Lead	63	400	1000	**77.3**	0.7	**2.8**	0.8	**343**	0.7	**3.3**	0.7	**885**	7.4	**6.4**	0.7	**412**	0.7	**5.2**	0.7
Magnesium				**8,310**	33	**2,920**	3.9	**3,070**	3.6	**8,170**	33	**6,140**	37	**4,460**	3.5	**1,370**	3.6	**7,340**	35
Manganese	1,600	2,000	10,000	**224**	3.3	**128**	0.39	**300**	3.6	**358**	3.3	**370**	3.7	**509**	3.5	**126**	0.36	**248**	3.5
Mercury	0.18	0.81	2.8	**2.26**	0.14	< 0.03	0.03	**0.36**	0.14	< 0.03	0.03	**0.31**	0.07	< 0.03	0.03	**0.4**	0.08	< 0.03	0.03
Nickel	30	310	310	**14**	0.33	**9.63**	0.39	**19.2**	0.36	**20.2**	0.33	**22.2**	0.37	**21.4**	0.35	**18.4**	0.36	**31.7**	0.35
Potassium				**1,560**	7	**1,630**	8	**1,130**	7	**9,310**	66	**1,240**	7	**1,950**	7	**992**	7	**4,680**	71
Selenium	3.9	180	1500	< 1.3	1.3	< 1.5	1.5	< 1.4	1.4	< 1.3	1.3	< 1.5	1.5	< 1.4	1.4	< 1.5	1.5	< 1.4	1.4
Silver	2	180	1500	< 0.33	0.33	< 0.39	0.39	< 0.36	0.36	< 0.33	0.33	< 0.37	0.37	< 0.35	0.35	< 0.36	0.36	< 0.35	0.35
Sodium				**210**	7	**187**	8	**159**	7	**249**	7	**290**	7	**204**	7	**295**	7	**286**	7
Thallium				< 1.3	1.3	< 1.5	1.5	< 1.4	1.4	< 1.3	1.3	< 1.5	1.5	< 1.4	1.4	< 1.5	1.5	< 1.4	1.4
Vanadium				**31**	0.33	**15.7**	0.39	**32.8**	0.36	**65.6**	0.33	**34.2**	0.37	**30**	0.35	**21.2**	0.36	**47**	0.35
Zinc	109	10,000	10,000	**44.2**	0.7	**25.9**	0.8	**284**	0.7	**69.6**	0.7	**261**	0.7	**37.4**	0.7	**262**	0.7	**57.4**	0.7

Notes:
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Table 6
26-22 4th Street
Queens, New York
2018 Phase II and 2019/2020 Remedial Investigation
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	19B9						19B10			
				(0-2')		(8-10')		(12')		(0-2')		(8-10')	
				12/10/2019		12/10/2019		12/10/2019		12/10/2019		12/10/2019	
				mg/Kg		mg/Kg		mg/Kg		mg/Kg		mg/Kg	
	mg/Kg	mg/Kg	mg/Kg	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL
Aluminum				**7,490**	36	**11,300**	36	**12,800**	33	**8,530**	39	**6,770**	37
Antimony				< 3.6	3.6	< 3.6	3.6	< 3.3	3.3	< 3.9	3.9	< 3.7	3.7
Arsenic	13	16	16	**3.32**	0.72	**1.8**	0.71	**0.79**	0.66	**9.29**	0.78	**0.86**	0.74
Barium	350	400	400	**88.5**	0.7	**82.5**	0.7	**231**	0.7	**401**	0.8	**29.5**	0.7
Beryllium	7.2	72	590	**0.31**	0.29	**0.42**	0.28	**0.2**	0.26	**0.43**	0.31	**0.19**	0.30
Cadmium	2.5	4.3	9.3	**0.45**	0.36	**0.47**	0.36	**0.49**	0.33	**1.79**	0.39	**0.38**	0.37
Calcium				**41,000**	36	**1,820**	3.6	**2,610**	33	**6,480**	3.9	**1,650**	3.7
Chromium	30	180	1500	**14.6**	0.36	**28.6**	0.36	**21.3**	0.33	**25.8**	0.39	**18.6**	0.37
Cobalt				**3.45**	0.36	**6.31**	0.36	**4.87**	0.33	**5.2**	0.39	**4.64**	0.37
Copper	50	270	270	**22.3**	0.7	**38.8**	0.7	**48**	0.7	**97.5**	0.8	**29.1**	0.7
Iron				**12,400**	36	**19,700**	36	**25,100**	33	**16,700**	39	**13,100**	37
Lead	63	400	1000	**384**	0.7	**9.1**	0.7	**2.4**	0.7	**655**	0.8	**8.4**	0.7
Magnesium				**4,020**	3.6	**4,450**	3.6	**6,960**	33	**3,330**	3.9	**3,240**	3.7
Manganese	1,600	2,000	10,000	**206**	3.6	**269**	3.6	**368**	3.3	**230**	3.9	**158**	3.7
Mercury	0.18	0.81	2.8	**0.04**	0.03	**0.06**	0.03	< 0.03	0.03	**0.22**	0.08	< 0.03	0.03
Nickel	30	310	310	**12.8**	0.36	**21.3**	0.36	**20.6**	0.33	**16.5**	0.39	**15.2**	0.37
Potassium				**1,490**	7	**1,780**	7	**7,080**	66	**1,130**	8	**1,210**	7
Selenium	3.9	180	1500	< 1.4	1.4	< 1.4	1.4	< 1.3	1.3	< 1.6	1.6	< 1.5	1.5
Silver	2	180	1500	< 0.36	0.36	< 0.36	0.36	< 0.33	0.33	< 0.39	0.39	< 0.37	0.37
Sodium				**439**	7	**238**	7	**250**	7	**149**	8	**145**	7
Thallium				< 1.4	1.4	< 1.4	1.4	< 1.3	1.3	< 1.6	1.6	< 1.5	1.5
Vanadium				**26.3**	0.36	**33.5**	0.36	**49.7**	0.33	**28.8**	0.39	**27.7**	0.37
Zinc	109	10,000	10,000	**426**	7.2	**41.5**	0.7	**40.1**	0.7	**555**	7.8	**36.1**	0.7

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 7
26-22 4th Street
Queens, New York
2018 Phase II and 2019/2020 Remedial Investigation
Soil Analytical Results
Emerging Contaminants

Compound	19B1				19B2				19B3				19B4			
	(0-2')		(8-10')		(0-2')		(8-10')		(0-2')		(8-10')		(0-2')		(8-10')	
	12/10/2019		12/10/2019		12/10/2019		12/10/2019		12/10/2019		12/10/2019		12/10/2019		12/10/2019	
	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
Perfluorobutanoic Acid (PFBA)	ND	0.979	ND	1.07	ND	1	ND	0.998	ND	1.06	ND	1.07	ND	1.19	ND	1.19
Perfluoropentanoic Acid (PFPeA)	ND	0.979	ND	1.07	ND	1	ND	0.998	ND	1.06	ND	1.07	ND	1.19	ND	1.19
Perfluorobutanesulfonic Acid (PFBS)	ND	0.979	ND	1.07	ND	1	ND	0.998	ND	1.06	ND	1.07	ND	1.19	ND	1.19
Perfluorohexanoic Acid (PFHxA)	**0.083J**	0.979	**0.071J**	1.07	ND	1	ND	0.998	ND	1.06	**0.056J**	1.07	ND	1.19	ND	1.19
Perfluoroheptanoic Acid (PFHpA)	ND	0.979	ND	1.07	ND	1	ND	0.998	ND	1.06	ND	1.07	ND	1.19	ND	1.19
Perfluorohexanesulfonic Acid (PFHxS)	ND	0.979	ND	1.07	ND	1	ND	0.998	ND	1.06	ND	1.07	ND	1.19	ND	1.19
Perfluorooctanoic Acid (PFOA)	**0.078J**	0.979	**0.140J**	1.07	**0.376J**	1	**0.042J**	0.998	**0.060J**	1.06	**0.091J**	1.07	ND	1.19	ND	1.19
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND	0.979	ND	1.07	ND	1	ND	0.998	ND	1.06	ND	1.07	ND	1.19	ND	1.19
Perfluoroheptanesulfonic Acid (PFHpS)	ND	0.979	ND	1.07	ND	1	ND	0.998	ND	1.06	ND	1.07	ND	1.19	ND	1.19
Perfluorononanoic Acid (PFNA)	ND	0.979	ND	1.07	ND	1	ND	0.998	ND	1.06	ND	1.07	ND	1.19	ND	1.19
Perfluorooctanesulfonic Acid (PFOS)	ND	0.979	ND	1.07	**0.629J**	1	ND	0.998	ND	1.06	**0.214J**	1.07	ND	1.19	ND	1.19
Perfluorodecanoic Acid (PFDA)	ND	0.979	ND	1.07	ND	1	ND	0.998	ND	1.06	ND	1.07	ND	1.19	ND	1.19
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND	0.979	ND	1.07	ND	1	ND	0.998	ND	1.06	ND	1.07	ND	1.19	ND	1.19
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND	0.979	ND	1.07	ND	1	ND	0.998	ND	1.06	ND	1.07	ND	1.19	ND	1.19
Perfluoroundecanoic Acid (PFUnA)	ND	0.979	ND	1.07	ND	1	ND	0.998	ND	1.06	ND	1.07	ND	1.19	ND	1.19
Perfluorodecanesulfonic Acid (PFDS)	ND	0.979	ND	1.07	ND	1	ND	0.998	ND	1.06	ND	1.07	ND	1.19	ND	1.19
Perfluorooctanesulfonamide (FOSA)	ND	0.979	ND	1.07	ND	1	ND	0.998	ND	1.06	ND	1.07	ND	1.19	ND	1.19
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	**0.122J**	0.979	ND	1.07	ND	1	ND	0.998	ND	1.06	ND	1.07	ND	1.19	ND	1.19
Perfluorododecanoic Acid (PFDoA)	ND	0.979	ND	1.07	ND	1	ND	0.998	ND	1.06	ND	1.07	ND	1.19	ND	1.19
Perfluorotridecanoic Acid (PFTrDA)	ND	0.979	ND	1.07	ND	1	ND	0.998	ND	1.06	ND	1.07	ND	1.19	ND	1.19
Perfluorotetradecanoic Acid (PFTA)	ND	0.979	ND	1.07	ND	1	ND	0.998	ND	1.06	ND	1.07	ND	1.19	ND	1.19
Combined PFOA and PFOS	**0.078J**		**0.140**		**1.005**		**0.042**		**0.060**		**0.305**		**ND**		**ND**	
Combined Total Detections	**0.283**		**0.211**		**1.005**		**0.042**		**0.060**		**0.361**		**ND**		**ND**	

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 7
26-22 4th Street
Queens, New York
2018 Phase II and 2019/2020 Remedial Investigation
Soil Analytical Results
Emerging Contaminants

Compound	19B5				19B6				19B7			
	(0-2')		(8-10')		(0-2')		(8-10')		(0-2')		(8-10')	
	12/10/2019		12/10/2019		12/10/2019		12/10/2019		12/10/2019		12/10/2019	
	µg/Kg		µg/Kg		µg/Kg		µg/Kg		µg/Kg		µg/Kg	
	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL
Perfluorobutanoic Acid (PFBA)	ND	1.37	ND	1.06	ND	1.02	ND	1.13	ND	1.09	ND	1.08
Perfluoropentanoic Acid (PFPeA)	ND	1.37	ND	1.06	ND	1.02	ND	1.13	ND	1.09	ND	1.08
Perfluorobutanesulfonic Acid (PFBS)	ND	1.37	ND	1.06	ND	1.02	ND	1.13	ND	1.09	ND	1.08
Perfluorohexanoic Acid (PFHxA)	ND	1.37	ND	1.06	ND	1.02	ND	1.13	ND	1.09	**0.058J**	1.08
Perfluoroheptanoic Acid (PFHpA)	ND	1.37	ND	1.06	ND	1.02	ND	1.13	ND	1.09	ND	1.08
Perfluorohexanesulfonic Acid (PFHxS)	ND	1.37	ND	1.06	ND	1.02	ND	1.13	ND	1.09	ND	1.08
Perfluorooctanoic Acid (PFOA)	ND	1.37	ND	1.06	ND	1.02	ND	1.13	ND	1.09	**0.049J**	1.08
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND	1.37	ND	1.06	ND	1.02	ND	1.13	ND	1.09	ND	1.08
Perfluoroheptanesulfonic Acid (PFHpS)	ND	1.37	ND	1.06	ND	1.02	ND	1.13	ND	1.09	ND	1.08
Perfluorononanoic Acid (PFNA)	ND	1.37	ND	1.06	ND	1.02	ND	1.13	ND	1.09	ND	1.08
Perfluorooctanesulfonic Acid (PFOS)	ND	1.37	ND	1.06	ND	1.02	ND	1.13	ND	1.09	ND	1.08
Perfluorodecanoic Acid (PFDA)	ND	1.37	ND	1.06	ND	1.02	ND	1.13	ND	1.09	ND	1.08
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND	1.37	ND	1.06	ND	1.02	ND	1.13	ND	1.09	ND	1.08
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND	1.37	ND	1.06	ND	1.02	ND	1.13	ND	1.09	ND	1.08
Perfluoroundecanoic Acid (PFUnA)	ND	1.37	ND	1.06	ND	1.02	ND	1.13	ND	1.09	ND	1.08
Perfluorodecanesulfonic Acid (PFDS)	ND	1.37	ND	1.06	ND	1.02	ND	1.13	ND	1.09	ND	1.08
Perfluorooctanesulfonamide (FOSA)	ND	1.37	ND	1.06	ND	1.02	ND	1.13	ND	1.09	ND	1.08
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND	1.37	**0.188J**	1.06	ND	1.02	ND	1.13	ND	1.09	ND	1.08
Perfluorododecanoic Acid (PFDoA)	ND	1.37	ND	1.06	ND	1.02	ND	1.13	ND	1.09	ND	1.08
Perfluorotridecanoic Acid (PFTrDA)	ND	1.37	ND	1.06	ND	1.02	ND	1.13	ND	1.09	ND	1.08
Perfluorotetradecanoic Acid (PFTA)	ND	1.37	ND	1.06	ND	1.02	ND	1.13	ND	1.09	ND	1.08
Combined PFOA and PFOS	**ND**		**ND**		**ND**		**ND**		**ND**		**0.049**	
Combined Total Detections	**ND**		**0.188**		**ND**		**ND**		**ND**		**0.107**	

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 7
26-22 4th Street
Queens, New York
2018 Phase II and 2019/2020 Remedial Investigation
Soil Analytical Results
Emerging Contaminants

Compound	19B8				19B9				19B10			
	(0-2')		(8-10')		(0-2')		(8-10')		(0-2')		(8-10')	
	12/10/2019		12/10/2019		12/10/2019		12/10/2019		12/10/2019		12/10/2019	
	µg/Kg		µg/Kg		µg/Kg		µg/Kg		µg/Kg		µg/Kg	
	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL
Perfluorobutanoic Acid (PFBA)	ND	1.04	ND	1.11	ND	1	ND	1.09	ND	1.11	ND	1.15
Perfluoropentanoic Acid (PFPeA)	ND	1.04	ND	1.11	ND	1	ND	1.09	ND	1.11	ND	1.15
Perfluorobutanesulfonic Acid (PFBS)	ND	1.04	ND	1.11	ND	1	ND	1.09	ND	1.11	ND	1.15
Perfluorohexanoic Acid (PFHxA)	ND	1.04	ND	1.11	ND	1	ND	1.09	ND	1.11	ND	1.15
Perfluoroheptanoic Acid (PFHpA)	ND	1.04	ND	1.11	ND	1	ND	1.09	ND	1.11	ND	1.15
Perfluorohexanesulfonic Acid (PFHxS)	ND	1.04	ND	1.11	ND	1	ND	1.09	ND	1.11	ND	1.15
Perfluorooctanoic Acid (PFOA)	ND	1.04	ND	1.11	ND	1	ND	1.09	ND	1.11	ND	1.15
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND	1.04	ND	1.11	ND	1	ND	1.09	ND	1.11	ND	1.15
Perfluoroheptanesulfonic Acid (PFHpS)	ND	1.04	ND	1.11	ND	1	ND	1.09	ND	1.11	ND	1.15
Perfluorononanoic Acid (PFNA)	ND	1.04	ND	1.11	ND	1	ND	1.09	ND	1.11	ND	1.15
Perfluorooctanesulfonic Acid (PFOS)	ND	1.04	ND	1.11	ND	1	ND	1.09	ND	1.11	ND	1.15
Perfluorodecanoic Acid (PFDA)	ND	1.04	ND	1.11	ND	1	ND	1.09	ND	1.11	ND	1.15
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND	1.04	ND	1.11	ND	1	ND	1.09	ND	1.11	ND	1.15
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND	1.04	ND	1.11	ND	1	ND	1.09	ND	1.11	ND	1.15
Perfluoroundecanoic Acid (PFUnA)	ND	1.04	ND	1.11	ND	1	ND	1.09	ND	1.11	ND	1.15
Perfluorodecanesulfonic Acid (PFDS)	ND	1.04	ND	1.11	ND	1	ND	1.09	ND	1.11	ND	1.15
Perfluorooctanesulfonamide (FOSA)	ND	1.04	ND	1.11	ND	1	ND	1.09	ND	1.11	ND	11
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND	1.04	ND	1.11	ND	1	ND	1.09	ND	1.11	ND	1.15
Perfluorododecanoic Acid (PFDoA)	ND	1.04	ND	1.11	ND	1	ND	1.09	ND	1.11	ND	1.15
Perfluorotridecanoic Acid (PFTrDA)	ND	1.04	ND	1.11	ND	1	ND	1.09	ND	1.11	ND	1.15
Perfluorotetradecanoic Acid (PFTA)	ND	1.04	ND	1.11	ND	1	ND	1.09	ND	1.11	ND	1.15
Combined PFOA and PFOS	**ND**		**ND**		**ND**		**ND**		**ND**		**ND**	
Combined Total Detections	**ND**		**ND**		**ND**		**ND**		**ND**		**ND**	

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 8
26-22 4th Street
Queens, New York
2018 Phase II and 2019/2020 Remedial Investigation
Groundwater Analytical Results
Volatile Organic Compounds

Compound	NYSDEC Groundwater Quality Standards	Associated Phase II (2018)						EBC Remedial Investigation													
		GW-2		GW-5		GW-8		MW1		MW2		MW3				MW4		MW5		MW6	
		9/20/2018		9/20/2018		9/20/2018		12/17/2019		12/17/2019		12/17/2019		1/28/2020		12/17/2019		12/17/2019		12/17/2019	
		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L	
	µg/L	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL
1,1,1,2-Tetrachlorothane	5	< 1.0	1	< 1.0	1	< 1.0	1	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
1,1,1-Trichloroethane	5	< 1.0	1	< 1.0	1	< 1.0	1	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0
1,1,2,2-Tetrachloroethane	5	< 0.50	0.5	< 0.50	0.5	< 0.50	0.5	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
1,1,2-Trichloroethane	1	< 1.0	1	< 1.0	1	< 1.0	1	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
1,1-Dichloroethane	5	< 1.0	1	< 1.0	1	< 1.0	1	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0
1,1-Dichloroethene	5	< 1.0	1	< 1.0	1	< 1.0	1	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
1,1-Dichloropropene	5	< 1.0	1	< 1.0	1	< 1.0	1	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
1,2,3-Trichlorobenzene		< 1.0	1	< 1.0	1	< 1.0	1	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
1,2,3-Trichloropropane	0.04	< 1.0	1	< 1.0	1	< 1.0	1	< 0.25	0.25	< 0.25	0.25	< 0.25	0.25	< 0.25	0.25	< 0.25	0.25	< 0.25	0.25	< 0.25	0.25
1,2,4-Trichlorobenzene		< 1.0	1	< 1.0	1	< 1.0	1	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
1,2,4-Trimethylbenzene	5	< 1.0	1	< 1.0	1	< 1.0	1	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
1,2-Dibromo-3-chloropropane	0.04	< 1.0	1	< 1.0	1	< 1.0	1	< 0.50	0.50	< 0.50	0.50	< 0.50	0.50	< 0.50	0.50	< 0.50	0.50	< 0.50	0.50	< 0.50	0.50
1,2-Dibromoethane	0.0006	< 1.0	1	< 1.0	1	< 1.0	1	< 0.25	0.25	< 0.25	0.25	< 0.25	0.25	< 0.25	0.25	< 0.25	0.25	< 0.25	0.25	< 0.25	0.25
1,2-Dichlorobenzene		< 1.0	1	< 1.0	1	< 1.0	1	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
1,2-Dichloroethane	0.6	< 0.60	0.6	< 0.60	0.6	< 0.60	0.6	< 0.60	0.60	< 0.60	0.60	< 0.60	0.60	< 0.60	0.60	< 0.60	0.60	< 0.60	0.60	< 0.60	0.60
1,2-Dichloropropane	1	< 1.0	1	< 1.0	1	< 1.0	1	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
1,3,5-Trimethylbenzene	5	< 1.0	1	< 1.0	1	< 1.0	1	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
1,3-Dichlorobenzene	3	< 1.0	1	< 1.0	1	< 1.0	1	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
1,3-Dichloropropane	5	< 1.0	1	< 1.0	1	< 1.0	1	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
1,4-Dichlorobenzene		< 1.0	1	< 1.0	1	< 1.0	1	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 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	**0.25**	0.20	**0.96**	0.20
2,2-Dichloropropane	5	< 1.0	1	< 1.0	1	< 1.0	1	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
2-Chlorotoluene	5	< 1.0	1	< 1.0	1	< 1.0	1	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
2-Hexanone (Methyl Butyl Ketone)	50	< 5.0	5	< 5.0	5	< 5.0	5	< 2.5	2.5	< 2.5	2.5	< 2.5	2.5	< 2.5	2.5	< 2.5	2.5	< 2.5	2.5	< 2.5	2.5
2-Isopropyltoluene	5	< 1.0	1	< 1.0	1	< 1.0	1	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
4-Chlorotoluene	5	< 1.0	1	< 1.0	1	< 1.0	1	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
4-Methyl-2-Pentanone		< 5.0	5	< 5.0	5	< 5.0	5	< 2.5	2.5	< 2.5	2.5	< 2.5	2.5	< 2.5	2.5	< 2.5	2.5	< 2.5	2.5	< 2.5	2.5
Acetone	50	< 25	25	< 25	25	< 25	25	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	**4**	5.0	< 5.0	5.0	< 5.0	5.0
Acrolein	5	-	-	-	-	-	-	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0
Acrylonitrile	5	< 1.0	1	< 1.0	1	< 1.0	1	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0
Benzene	1	< 0.70	0.7	< 0.70	0.7	< 0.70	0.7	< 0.70	0.70	< 0.70	0.70	< 0.70	0.70	< 0.70	0.70	< 0.70	0.70	< 0.70	0.70	< 0.70	0.70
Bromobenzene	5	< 1.0	1	< 1.0	1	< 1.0	1	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
Bromochloromethane	5	< 1.0	1	< 1.0	1	< 1.0	1	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
Bromodichloromethane	50	< 0.50	0.5	< 0.50	0.5	< 0.50	0.5	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
Bromoform	50	< 1.0	1	< 1.0	1	< 1.0	1	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0
Bromomethane	5	< 1.0	1	< 1.0	1	< 1.0	1	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0
Carbon Disulfide		< 5.0	5	< 5.0	5	< 5.0	5	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
Carbon tetrachloride	5	< 1.0	1	< 1.0	1	< 1.0	1	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
Chlorobenzene	5	< 1.0	1	< 1.0	1	< 1.0	1	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0
Chloroethane	5	< 1.0	1	< 1.0	1	< 1.0	1	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0
Chloroform	7	< 1.0	1	< 1.0	1	< 1.0	1	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0
Chloromethane	5	< 1.0	1	< 1.0	1	< 1.0	1	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0
cis-1,2-Dichloroethene	5	**15**	1	**16**	1	**1.4**	1	**0.28**	1.0	**2.4**	1.0	< 1.0	1.0	< 1.0	1.0	**9.9**	1.0	< 1.0	1.0	**0.39**	1.0
cis-1,3-Dichloropropene	0.04	< 0.40	0.4	< 0.40	0.4	< 0.40	0.4	< 0.40	0.40	< 0.40	0.40	< 0.40	0.40	< 0.40	0.40	< 0.40	0.40	< 0.40	0.40	< 0.40	0.40
Dibromochloromethane	50	< 0.50	0.5	< 0.50	0.5	< 0.50	0.5	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
Dibromomethane	5	< 1.0	1	< 1.0	1	< 1.0	1	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
Dichlorodifluoromethane	5	< 1.0	1	< 1.0	1	< 1.0	1	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
Ethylbenzene	5	< 1.0	1	< 1.0	1	< 1.0	1	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
Hexachlorobutadiene	0.5	< 0.40	0.4	< 0.40	0.4	< 0.40	0.4	< 0.50	0.50	< 0.50	0.50	< 0.50	0.50	< 0.50	0.50	< 0.50	0.50	< 0.50	0.50	< 0.50	0.50
Isopropylbenzene	5	< 1.0	1	< 1.0	1	< 1.0	1	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
m&p-Xylenes		< 1.0	1	< 1.0	1	< 1.0	1	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
Methyl Ethyl Ketone (2-Butanone)	50	< 5.0	5	< 5.0	5	< 5.0	5	< 2.5	2.5	< 2.5	2.5	< 2.5	2.5	< 2.5	2.5	< 2.5	2.5	< 2.5	2.5	< 2.5	2.5
Methyl t-butyl ether (MTBE)		< 1.0	1	< 1.0	1	< 1.0	1	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
Methylene chloride	5	< 1.0	1	< 1.0	1	< 1.0	1	< 3.0	3.0	< 3.0	3.0	< 3.0	3.0	< 3.0	3.0	< 3.0	3.0	< 3.0	3.0	< 3.0	3.0
Naphthalene	10	< 1.0	1	< 1.0	1	< 1.0	1	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
n-Butylbenzene	5	< 1.0	1	< 1.0	1	< 1.0	1	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
n-Propylbenzene	5	< 1.0	1	< 1.0	1	< 1.0	1	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
o-Xylene	5	< 1.0	1	< 1.0	1	< 1.0	1	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
p-Isopropyltoluene	5	< 1.0	1	< 1.0	1	< 1.0	1	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
sec-Butylbenzene	5	< 1.0	1	< 1.0	1	< 1.0	1	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
Styrene	5	< 1.0	1	< 1.0	1	< 1.0	1	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 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	< 50	50	< 50	50	< 50	50
tert-Butylbenzene	5	< 1.0	1	< 1.0	1	< 1.0	1	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
Tetrachloroethene	5	**15**	1	**4.1**	1	**5.2**	1	**9.9**	1.0	**43**	5.0	**9.1**	1.0	**8.1**	1.0	**13**	1.0	< 1.0	1.0	**1.4**	1.0
Tetrahydrofuran (THF)	50	< 2.5	2.5	< 2.5	2.5	< 2.5	2.5	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0
Toluene	5	< 1.0	1	< 1.0	1	< 1.0	1	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
trans-1,2-Dichloroethene	5	< 1.0	1	< 1.0	1	< 1.0	1	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0
trans-1,3-Dichloropropene	0.4	< 0.40	0.4	< 0.40	0.4	< 0.40	0.4	< 0.40	0.40	< 0.40	0.40	< 0.40	0.40	< 0.40	0.40	< 0.40	0.40	< 0.40	0.40	< 0.40	0.40
trans-1,4-dichloro-2-butene	5	< 5.0	5	< 5.0	5	< 5.0	5	< 2.5	2.5	< 2.5	2.5	< 2.5	2.5	< 2.5	2.5	< 2.5	2.5	< 2.5	2.5	< 2.5	2.5
Trichloroethene	5	**10**	1	**4.5**	1	**1.6**	1	< 1.0	1.0	**1.4**	1.0	**0.65**	1.0	**0.76**	1.0	**3.1**	1.0	< 1.0	1.0	**0.28**	1.0
Trichlorofluoromethane	5	< 1.0	1	< 1.0	1	< 1.0	1	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
Trichlorotrifluoroethane	5	< 1.0	1	< 1.0	1	< 1.0	1	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0
Vinyl Chloride	2	< 1.0	1	< 1.0	1	< 1.0	1	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 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 9
26-22 4th Street
Queens, New York
2018 Phase II and 2019/2020 Remedial Investigation
Groundwater Analytical Results
Semi-Volatile Organic Compounds

Compound	NYSDEC Groundwater Quality Standards	Associated Phase II (2018)						EBC Remedial Investigation													
		GW-2		GW-5		GW-8		MW1		MW2		MW3				MW4		MW5		MW6	
		9/20/2018		9/20/2018		9/20/2018		12/17/2019		12/17/2019		12/17/2019		1/28/2020		12/17/2019		12/17/2019		12/17/2019	
		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L	
	µg/L	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL
1,2,4,5-Tetrachlorobenzene		< 0.47	0.47	< 0.47	0.47	< 0.47	0.47	< 3.3	3.3	< 3.3	3.3	< 3.6	3.6	< 3.5	3.5	< 3.5	3.5	< 3.6	3.6	< 3.7	3.7
1,2,4-Trichlorobenzene		< 4.7	4.7	< 5.4	5.4	< 4.8	4.8	< 4.7	4.7	< 4.7	4.7	< 5.1	5.1	< 5.0	5.0	< 5.1	5.1	< 5.2	5.2	< 5.4	5.4
1,2-Dichlorobenzene		< 2.4	2.4	< 2.7	2.7	< 2.4	2.4	< 0.94	0.94	< 0.94	0.94	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.1	1.1
1,2-Diphenylhydrazine		< 4.7	4.7	< 5.4	5.4	< 4.8	4.8	< 4.7	4.7	< 4.7	4.7	< 5.1	5.1	< 5.0	5.0	< 5.1	5.1	< 5.2	5.2	< 5.4	5.4
1,3-Dichlorobenzene	3	< 2.4	2.4	< 2.7	2.7	< 2.4	2.4	< 0.94	0.94	< 0.94	0.94	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.1	1.1
1,4-Dichlorobenzene		< 2.4	2.4	< 2.7	2.7	< 2.4	2.4	< 0.94	0.94	< 0.94	0.94	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.1	1.1
2,4-Dichlorophenol	5	< 0.94	0.94	< 1.1	1.1	< 0.95	0.95	< 0.94	0.94	< 0.94	0.94	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.1	1.1
2,4-Dimethylphenol	1	< 0.94	0.94	< 1.1	1.1	< 0.95	0.95	< 0.94	0.94	< 0.94	0.94	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.1	1.1
2,4-Dinitrophenol	5	< 0.94	0.94	< 1.1	1.1	< 0.95	0.95	< 0.94	0.94	< 0.94	0.94	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.1	1.1
2,4-Dinitrotoluene	5	< 4.7	4.7	< 5.4	5.4	< 4.8	4.8	< 0.94	0.94	< 0.94	0.94	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.1	1.1
2,4,5-Trichlorophenol	1	< 0.94	0.94	< 1.1	1.1	< 0.95	0.95	< 0.94	0.94	< 0.94	0.94	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.1	1.1
2,4,6-Trichlorophenol	1	< 0.94	0.94	< 1.1	1.1	< 0.95	0.95	< 4.7	4.7	< 4.7	4.7	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0
2,6-Dinitrotoluene	5	< 4.7	4.7	< 5.4	5.4	< 4.8	4.8	< 4.7	4.7	< 4.7	4.7	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0
2-Chloronaphthalene	10	< 4.7	4.7	< 5.4	5.4	< 4.8	4.8	< 4.7	4.7	< 4.7	4.7	< 5.1	5.1	< 5.0	5.0	< 5.1	5.1	< 5.2	5.2	< 5.4	5.4
2-Chlorophenol	1	< 0.94	0.94	< 1.1	1.1	< 0.95	0.95	< 0.94	0.94	< 0.94	0.94	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.1	1.1
2-Methylnaphthalene		< 0.94	0.94	< 0.94	0.94	< 0.94	0.94	< 4.7	4.7	< 4.7	4.7	< 5.1	5.1	< 5.0	5.0	< 5.1	5.1	< 5.2	5.2	< 5.4	5.4
2-Methylphenol (o-cresol)	1	< 0.94	0.94	< 1.1	1.1	< 0.95	0.95	< 0.94	0.94	< 0.94	0.94	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.1	1.1
2-Nitroaniline	5	< 4.7	4.7	< 5.4	5.4	< 4.8	4.8	< 4.7	4.7	< 4.7	4.7	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0
2-Nitrophenol	1	< 0.94	0.94	< 1.1	1.1	< 0.95	0.95	< 0.94	0.94	< 0.94	0.94	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.1	1.1
3&4-Methylphenol (m&p-cresol)		< 9.4	9.4	< 11	11	< 9.5	9.5	< 0.94	0.94	< 0.94	0.94	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.1	1.1
3,3'-Dichlorobenzidine	5	< 4.7	4.7	< 5.4	5.4	< 4.8	4.8	< 4.7	4.7	< 4.7	4.7	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0
3-Nitroaniline	5	< 4.7	4.7	< 5.4	5.4	< 4.8	4.8	< 4.7	4.7	< 4.7	4.7	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0
4,6-Dinitro-2-methylphenol	1	< 0.94	0.94	< 1.1	1.1	< 0.95	0.95	< 0.94	0.94	< 0.94	0.94	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.1	1.1
4-Bromophenyl phenyl ether		< 4.7	4.7	< 5.4	5.4	< 4.8	4.8	< 4.7	4.7	< 4.7	4.7	< 5.1	5.1	< 5.0	5.0	< 5.1	5.1	< 5.2	5.2	< 5.4	5.4
4-Chloro-3-methylphenol	1	< 0.94	0.94	< 1.1	1.1	< 0.95	0.95	< 0.94	0.94	< 0.94	0.94	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.1	1.1
4-Chloroaniline	5	< 4.7	4.7	< 5.4	5.4	< 4.8	4.8	< 3.3	3.3	< 3.3	3.3	< 3.6	3.6	< 3.5	3.5	< 3.5	3.5	< 3.6	3.6	< 3.7	3.7
4-Chlorophenyl phenyl ether		< 0.94	0.94	< 1.1	1.1	< 0.95	0.95	< 4.7	4.7	< 4.7	4.7	< 5.1	5.1	< 5.0	5.0	< 5.1	5.1	< 5.2	5.2	< 5.4	5.4
4-Nitroaniline	5	< 4.7	4.7	< 5.4	5.4	< 4.8	4.8	< 4.7	4.7	< 4.7	4.7	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0
4-Nitrophenol	1	< 0.94	0.94	< 1.1	1.1	< 0.95	0.95	< 0.94	0.94	< 0.94	0.94	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.1	1.1
Acenaphthene	20	< 0.05	0.05	< 0.05	0.05	< 0.05	0.05	< 4.7	4.7	< 4.7	4.7	< 5.1	5.1	< 5.0	5.0	< 5.1	5.1	< 5.2	5.2	< 5.4	5.4
Acenaphthylene		< 0.05	0.05	< 0.05	0.05	< 0.05	0.05	< 0.47	0.47	< 0.47	0.47	< 0.51	0.51	< 0.50	0.50	< 0.51	0.51	< 0.52	0.52	< 0.54	0.54
Acetophenone		< 4.7	4.7	< 5.4	5.4	< 4.8	4.8	< 4.7	4.7	< 4.7	4.7	< 5.1	5.1	< 5.0	5.0	< 5.1	5.1	< 5.2	5.2	< 5.4	5.4
Aniline	5	< 4.7	4.7	< 5.4	5.4	< 4.8	4.8	< 3.3	3.3	< 3.3	3.3	< 3.6	3.6	< 3.5	3.5	< 3.5	3.5	< 3.6	3.6	< 3.7	3.7
Anthracene	50	< 0.02	0.02	< 0.02	0.02	< 0.02	0.02	< 4.7	4.7	< 4.7	4.7	< 5.1	5.1	< 5.0	5.0	< 5.1	5.1	< 5.2	5.2	< 5.4	5.4
Benzo(a)anthracene	0.002	< 0.02	0.02	< 0.02	0.02	< 0.02	0.02	< 0.02	0.02	< 0.02	0.02	< 0.02	0.02	< 0.02	0.02	< 0.02	0.02	< 0.02	0.02	< 0.02	0.02
Benzidine	5	< 4.7	4.7	< 5.4	5.4	< 4.8	4.8	< 4.2	4.2	< 4.2	4.2	< 4.6	4.6	< 4.5	4.5	< 4.5	4.5	< 4.6	4.6	< 4.8	4.8
Benzo(a)pyrene		< 0.02	0.02	< 0.02	0.02	< 0.02	0.02	< 0.02	0.02	< 0.02	0.02	< 0.02	0.02	< 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	< 0.02	0.02	< 0.02	0.02	< 0.02	0.02	< 0.02	0.02	< 0.02	0.02	< 0.02	0.02
Benzo(g,h,i)perylene		< 0.47	0.47	< 0.47	0.47	< 0.47	0.47	< 0.47	0.47	< 0.47	0.47	< 0.51	0.51	< 0.50	0.50	< 0.51	0.51	< 0.52	0.52	< 0.54	0.54
Benzo(k)fluoranthene	0.002	< 0.02	0.02	< 0.02	0.02	< 0.02	0.02	< 0.02	0.02	< 0.02	0.02	< 0.02	0.02	< 0.02	0.02	< 0.02	0.02	< 0.02	0.02	< 0.02	0.02
Benzoic Acid		< 47	47	< 54	54	< 48	48	< 24	24	< 24	24	< 26	26	< 25	25	< 25	25	< 26	26	< 27	27
Butyl benzyl phthalate	50	< 4.7	4.7	< 5.4	5.4	< 4.8	4.8	< 4.7	4.7	< 4.7	4.7	< 5.1	5.1	< 5.0	5.0	< 5.1	5.1	< 5.2	5.2	< 5.4	5.4
Bis(2-chloroethoxy)methane	5	< 4.7	4.7	< 5.4	5.4	< 4.8	4.8	< 4.7	4.7	< 4.7	4.7	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0
Bis(2-chloroethyl)ether	1	< 0.94	0.94	< 1.1	1.1	< 0.95	0.95	< 0.94	0.94	< 0.94	0.94	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.1	1.1
Bis(2-chloroisopropyl)ether		< 4.7	4.7	< 5.4	5.4	< 4.8	4.8	< 4.7	4.7	< 4.7	4.7	< 5.1	5.1	< 5.0	5.0	< 5.1	5.1	< 5.2	5.2	< 5.4	5.4
Bis(2-ethylhexyl)phthalate	5	< 1.5	1.5	< 1.5	1.5	< 1.5	1.5	< 0.94	0.94	< 0.94	0.94	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.1	1.1
Carbazole		< 4.7	4.7	< 5.4	5.4	< 4.8	4.8	< 4.7	4.7	< 4.7	4.7	< 5.1	5.1	< 5.0	5.0	< 5.1	5.1	< 5.2	5.2	< 5.4	5.4
Chrysene	0.002	< 0.02	0.02	< 0.02	0.02	< 0.02	0.02	< 0.02	0.02	< 0.02	0.02	< 0.02	0.02	< 0.02	0.02	< 0.02	0.02	< 0.02	0.02	< 0.02	0.02
Dibenzo(a,h)anthracene		< 0.02	0.02	< 0.02	0.02	< 0.02	0.02	< 0.47	0.47	< 0.47	0.47	< 0.51	0.51	< 0.50	0.50	< 0.51	0.51	< 0.52	0.52	< 0.54	0.54
Dibenzofuran		< 4.7	4.7	< 5.4	5.4	< 4.8	4.8	< 4.7	4.7	< 4.7	4.7	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0
Diethylphthalate	50	< 4.7	4.7	< 5.4	5.4	< 4.8	4.8	< 4.7	4.7	< 4.7	4.7	< 5.1	5.1	< 5.0	5.0	< 5.1	5.1	< 5.2	5.2	< 5.4	5.4
Dimethylphthalate	50	< 4.7	4.7	< 5.4	5.4	< 4.8	4.8	< 4.7	4.7	< 4.7	4.7	< 5.1	5.1	< 5.0	5.0	< 5.1	5.1	< 5.2	5.2	< 5.4	5.4
Di-n-butylphthalate	50	< 4.7	4.7	< 5.4	5.4	< 4.8	4.8	< 4.7	4.7	< 4.7	4.7	< 5.1	5.1	< 5.0	5.0	< 5.1	5.1	< 5.2	5.2	< 5.4	5.4
Di-n-octylphthalate	50	< 4.7	4.7	< 5.4	5.4	< 4.8	4.8	< 4.7	4.7	< 4.7	4.7	< 5.1	5.1	< 5.0	5.0	< 5.1	5.1	< 5.2	5.2	< 5.4	5.4
Fluoranthene	50	< 0.04	0.04	< 0.04	0.04	< 0.04	0.04	< 4.7	4.7	< 4.7	4.7	< 5.1	5.1	< 5.0	5.0	< 5.1	5.1	< 5.2	5.2	< 5.4	5.4
Fluorene	50	< 0.09	0.09	< 0.09	0.09	< 0.09	0.09	< 4.7	4.7	< 4.7	4.7	< 5.1	5.1	< 5.0	5.0	< 5.1	5.1	< 5.2	5.2	< 5.4	5.4
Hexachlorobenzene	0.04	< 0.04	0.04	< 0.04	0.04	< 0.04	0.04	< 0.04	0.04	< 0.04	0.04	< 0.04	0.04	< 0.04	0.04	< 0.04	0.04	< 0.04	0.04	< 0.04	0.04
Hexachlorobutadiene	0.5	< 0.47	0.47	< 0.47	0.47	< 0.47	0.47	< 0.47	0.47	< 0.47	0.47	< 0.50	0.50	< 0.50	0.50	< 0.50	0.50	< 0.50	0.50	< 0.50	0.50
Hexachlorocyclopentadiene	5	< 0.09	0.09	< 0.09	0.09	< 0.09	0.09	< 4.7	4.7	< 4.7	4.7	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0
Hexachloroethane	5	< 0.47	0.47	< 0.47	0.47	< 0.47	0.47	< 0.94	0.94	< 0.94	0.94	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.1	1.1
Indeno(1,2,3-cd)pyrene	0.002	< 0.02	0.02	< 0.02	0.02	< 0.02	0.02	< 0.02	0.02	< 0.02	0.02	< 0.02	0.02	< 0.02	0.02	< 0.02	0.02	< 0.02	0.02	< 0.02	0.02
Isophorone	50	< 4.7	4.7	< 5.4	5.4	< 4.8	4.8	< 4.7	4.7	< 4.7	4.7	< 5.1	5.1	< 5.0	5.0	< 5.1	5.1	< 5.2	5.2	< 5.4	5.4
Naphthalene	10	< 0.09	0.09	< 0.09	0.09	< 0.09	0.09	< 4.7	4.7	< 4.7	4.7	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0
Nitrobenzene	0.4	< 0.09	0.09	< 0.09	0.09	< 0.09	0.09	< 0.38	0.38	< 0.38	0.38	< 0.40	0.40	< 0.40	0.40	< 0.40	0.40	< 0.40	0.40	< 0.40	0.40
N-Nitrosodimethylamine		< 0.47	0.47	< 0.47	0.47	< 0.47	0.47	< 0.09	0.09	< 0.09	0.09	< 0.10	0.10	< 0.10	0.10	< 0.10	0.10	< 0.10	0.10	< 0.11	0.11
N-Nitrosodi-n-propylamine		< 4.7	4.7	< 5.4	5.4	< 4.8	4.8	< 4.7	4.7	< 4.7	4.7	< 5.1	5.1	< 5.0	5.0	< 5.1	5.1	< 5.2	5.2	< 5.4	5.4
N-Nitrosodiphenylamine	50	< 4.7	4.7	< 5.4	5.4	< 4.8	4.8	< 4.7	4.7	< 4.7	4.7	< 5.1	5.1	< 5.0	5.0	< 5.1	5.1	< 5.2	5.2	< 5.4	5.4
Pentachloronitrobenzene		< 0.09	0.09	< 0.09	0.09	< 0.09	0.09	< 2.4	2.4	< 2.4	2.4	< 2.6	2.6	< 2.5	2.5	< 2.5	2.5	< 2.6	2.6	< 2.7	2.7
Pentachlorophenol	1	< 0.75	0.75	< 0.75	0.75	< 0.75	0.75	< 0.47	0.47	< 0.47	0.47	< 0.51	0.51	< 0.50	0.50	< 0.51	0.51	< 0.52	0.52	< 0.54	0.54
Phenanthrene	50	< 0.05	0.05	< 0.05	0.05	< 0.05	0.05	< 0.47	0.47	< 0.47	0.47	< 0.51	0.51	< 0.50	0.50	< 0.51	0.51	< 0.52	0.52	< 0.54	0.54
Phenol	1	< 0.94	0.94	< 1.1	1.1	< 0.95	0.95	< 0.94	0.94	< 0.94	0.94	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.0	1.0	< 1.1	1.1
Pyrene	50	< 0.02	0.02	< 0.02	0.02	< 0.02	0.02	< 4.7	4.7	< 4.7	4.7	< 5.1	5.1	< 5.0	5.0	< 5.1	5.1	< 5.2	5.2	< 5.4	5.4
Pyridine	50	< 0.47	0.47	< 0.47	0.47	< 0.47	0.47	< 9.4	9.4	< 9.4	9.4	< 10	10	< 10	10	< 10	10	< 10	10	< 11	11

Notes:

RL - Reporting Limit

Bold/highlighted- Indicated exceedance of the NYSDEC Groundwater Standard

Table 10
26-22 4th Street
Queens, New York
2018 Phase II and 2019/2020 Remedial Investigation
Groundwater Analytical Results
Pesticides/PCBs

	Compound	NYSDEC Groundwater Quality Standards	MW1		MW2		MW3				MW4		MW5		MW6	
			12/17/2019		12/17/2019		12/17/2019		1/28/2020		12/17/2019		12/17/2019		12/17/2019	
			µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L	
		µg/L	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL
Pesticides	4,4-DDD	0.3	< 0.005	0.005	< 0.005	0.005	< 0.005	0.005	< 0.005	0.005	< 0.005	0.005	< 0.010	0.010	< 0.005	0.005
	4,4-DDE	0.2	< 0.005	0.005	< 0.005	0.005	< 0.005	0.005	< 0.005	0.005	< 0.005	0.005	< 0.005	0.005	< 0.005	0.005
	4,4-DDT	0.2	< 0.005	0.005	< 0.005	0.005	< 0.005	0.005	< 0.005	0.005	**0.026**	0.005	**0.028**	0.005	< 0.010	0.010
	a-BHC	0.01	< 0.005	0.005	< 0.005	0.005	< 0.005	0.005	< 0.005	0.005	< 0.005	0.005	< 0.005	0.005	< 0.005	0.005
	a-chlordane		< 0.010	0.010	< 0.010	0.010	< 0.010	0.010	< 0.010	0.010	< 0.010	0.010	< 0.010	0.010	< 0.010	0.010
	Alachlor	0.5	< 0.076	0.076	< 0.075	0.075	< 0.074	0.074	< 0.073	0.073	< 0.075	0.075	< 0.075	0.075	< 0.076	0.076
	Aldrin		< 0.002	0.002	< 0.002	0.002	< 0.002	0.002	< 0.002	0.002	< 0.002	0.002	< 0.002	0.002	< 0.002	0.002
	b-BHC	0.04	< 0.005	0.005	< 0.005	0.005	< 0.005	0.005	< 0.005	0.005	< 0.005	0.005	< 0.005	0.005	< 0.005	0.005
	Chlordane	0.05	< 0.020	0.020	< 0.050	0.050	< 0.050	0.050	< 0.049	0.049	< 0.050	0.050	< 0.050	0.050	< 0.020	0.020
	d-BHC	0.04	< 0.005	0.005	< 0.005	0.005	< 0.005	0.005	< 0.040	0.040	< 0.005	0.005	< 0.005	0.005	< 0.005	0.005
	Dieldrin	0.004	< 0.002	0.002	< 0.002	0.002	< 0.002	0.002	< 0.002	0.002	< 0.002	0.002	< 0.002	0.002	< 0.004	0.004
	Endosulfan I		< 0.010	0.010	< 0.010	0.010	< 0.010	0.010	< 0.010	0.010	< 0.010	0.010	< 0.010	0.010	< 0.010	0.010
	Endosulfan II		< 0.010	0.010	< 0.010	0.010	< 0.010	0.010	< 0.010	0.010	< 0.010	0.010	< 0.010	0.010	< 0.010	0.010
	Endosulfan Sulfate		< 0.010	0.010	< 0.010	0.010	< 0.010	0.010	< 0.010	0.010	< 0.010	0.010	< 0.010	0.010	< 0.010	0.010
	Endrin		< 0.005	0.005	< 0.010	0.010	< 0.010	0.010	< 0.010	0.010	< 0.010	0.010	< 0.010	0.010	< 0.005	0.005
	Endrin aldehyde	5	< 0.010	0.010	< 0.010	0.010	< 0.010	0.010	< 0.010	0.010	< 0.010	0.010	< 0.010	0.010	< 0.010	0.010
	Endrin ketone	5	< 0.010	0.010	< 0.010	0.010	< 0.010	0.010	< 0.010	0.010	< 0.010	0.010	< 0.010	0.010	< 0.010	0.010
	gamma-BHC	0.05	< 0.005	0.005	< 0.005	0.005	< 0.005	0.005	< 0.005	0.005	< 0.005	0.005	< 0.005	0.005	< 0.005	0.005
	g-chlordane		< 0.010	0.010	< 0.010	0.010	< 0.010	0.010	< 0.010	0.010	< 0.010	0.010	< 0.010	0.010	< 0.010	0.010
	Heptachlor	0.04	< 0.005	0.005	< 0.010	0.010	< 0.010	0.010	< 0.010	0.010	< 0.010	0.010	< 0.010	0.010	< 0.005	0.005
	Heptachlor epoxide	0.03	< 0.005	0.005	< 0.010	0.010	< 0.010	0.010	< 0.010	0.010	< 0.010	0.010	< 0.010	0.010	< 0.005	0.005
	Methoxychlor	35	< 0.10	0.10	< 0.10	0.10	< 0.099	0.099	< 0.097	0.097	< 0.10	0.10	< 0.10	0.10	< 0.10	0.10
	Toxaphene	0.06	< 0.20	0.20	< 0.20	0.20	< 0.20	0.20	< 0.19	0.19	< 0.20	0.20	< 0.20	0.20	< 0.20	0.20
PCBs	PCB-1016	0.09	< 0.051	0.051	< 0.050	0.050	< 0.050	0.050	< 0.049	0.049	< 0.050	0.050	< 0.050	0.050	< 0.051	0.051
	PCB-1221	0.09	< 0.051	0.051	< 0.050	0.050	< 0.050	0.050	< 0.049	0.049	< 0.050	0.050	< 0.050	0.050	< 0.051	0.051
	PCB-1232	0.09	< 0.051	0.051	< 0.050	0.050	< 0.050	0.050	< 0.049	0.049	< 0.050	0.050	< 0.050	0.050	< 0.051	0.051
	PCB-1242	0.09	< 0.051	0.051	< 0.050	0.050	< 0.050	0.050	< 0.049	0.049	< 0.050	0.050	< 0.050	0.050	< 0.051	0.051
	PCB-1248	0.09	< 0.051	0.051	< 0.050	0.050	< 0.050	0.050	< 0.049	0.049	< 0.050	0.050	< 0.050	0.050	< 0.051	0.051
	PCB-1254	0.09	< 0.051	0.051	< 0.050	0.050	< 0.050	0.050	< 0.049	0.049	< 0.050	0.050	< 0.050	0.050	< 0.051	0.051
	PCB-1260	0.09	< 0.051	0.051	< 0.050	0.050	< 0.050	0.050	< 0.049	0.049	< 0.050	0.050	< 0.050	0.050	< 0.051	0.051
	PCB-1262		< 0.051	0.051	< 0.050	0.050	< 0.050	0.050	< 0.049	0.049	< 0.050	0.050	< 0.050	0.050	< 0.051	0.051
	PCB-1268		< 0.051	0.051	< 0.050	0.050	< 0.050	0.050	< 0.049	0.049	< 0.050	0.050	< 0.050	0.050	< 0.051	0.051

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

Table 11
26-22 4th Street
Queens, New York
2018 Phase II and 2019/2020 Remedial Investigation
Groundwater Analytical Results
TAL Metals

Compound	NYSDEC Groundwater Quality Standards	MW1		MW2		MW3				MW4		MW5		MW6	
		12/17/2019		12/17/2019		12/17/2019		1/28/2020		12/17/2019		12/17/2019		12/17/2019	
		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L	
	mg/L	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL
Aluminum	0.1	1.25	0.025	8.31	0.025	1.09	0.025	12.8	0.020	1.53	0.025	0.896	0.025	1.01	0.025
Antimony	0.003	< 0.0030	0.0030	< 0.0030	0.0030	< 0.0030	0.0030	< 0.0030	0.0030	< 0.0030	0.0030	< 0.0030	0.0030	< 0.0030	0.0030
Arsenic	0.025	< 0.004	0.004	0.003	0.004	< 0.004	0.004	< 0.004	0.004	< 0.004	0.004	< 0.004	0.004	< 0.004	0.004
Barium	1	0.022	0.010	0.157	0.010	0.151	0.010	0.224	0.010	0.193	0.010	0.221	0.010	0.127	0.010
Beryllium	0.003	< 0.001	0.001	< 0.001	0.001	< 0.001	0.001	< 0.001	0.001	< 0.001	0.001	< 0.001	0.001	< 0.001	0.001
Cadmium	0.005	< 0.004	0.004	< 0.004	0.004	< 0.004	0.004	< 0.004	0.004	< 0.004	0.004	< 0.004	0.004	< 0.004	0.004
Calcium		21.9	0.010	202	0.10	144	0.010	131	0.010	151	0.10	119	0.010	54.7	0.010
Chromium	0.05	< 0.003	0.003	0.015	0.003	< 0.003	0.003	0.016	0.001	0.004	0.003	< 0.003	0.003	< 0.003	0.003
Cobalt		< 0.005	0.005	0.006	0.005	< 0.005	0.005	0.007	0.005	0.003	0.005	0.005	0.005	0.005	0.005
Copper	0.2	0.006	0.005	0.048	0.005	0.005	0.005	0.026	0.005	0.007	0.005	0.005	0.005	0.007	0.005
Iron	0.3	1.19	0.01	15.8	0.01	1.24	0.01	12.4	0.01	2.24	0.01	1.29	0.01	1.5	0.01
Lead	0.025	0.003	0.002	0.084	0.002	< 0.002	0.002	0.025	0.002	< 0.002	0.002	< 0.002	0.002	0.002	0.002
Magnesium	35	3.55	0.010	29.9	0.010	25.6	0.010	33.3	0.010	31.2	0.010	20.5	0.010	10.9	0.010
Manganese	0.3	0.278	0.005	1.07	0.005	0.68	0.005	1.04	0.005	1.94	0.005	0.721	0.005	1.47	0.005
Mercury	0.0007	< 0.0002	0.0002	0.0003	0.0002	< 0.0002	0.0002	< 0.0002	0.0002	< 0.0002	0.0002	< 0.0002	0.0002	< 0.0002	0.0002
Nickel	0.1	0.002	0.004	0.013	0.004	0.002	0.004	0.014	0.004	0.005	0.004	0.008	0.004	0.005	0.004
Potassium		4.4	0.1	7.3	0.1	9.8	0.1	10.8	0.1	13.6	0.1	16.7	0.1	9.4	0.1
Selenium	0.01	< 0.010	0.010	0.014	0.010	< 0.010	0.010	< 0.010	0.010	< 0.010	0.010	0.016	0.010	< 0.010	0.010
Silver	0.05	< 0.005	0.005	< 0.005	0.005	< 0.005	0.005	< 0.005	0.005	< 0.005	0.005	< 0.005	0.005	< 0.005	0.005
Sodium	20	14.6	0.10	46.7	0.10	209	1.0	211	1.0	112	1.0	97.8	1.0	143	1.0
Thallium	0.0005	< 0.0005	0.0005	< 0.0005	0.0005	< 0.0005	0.0005	< 0.0005	0.0005	< 0.0005	0.0005	< 0.0005	0.0005	< 0.0005	0.0005
Vanadium		0.005	0.010	0.024	0.010	0.004	0.010	0.021	0.010	0.006	0.010	0.003	0.010	0.005	0.010
Zinc	5	0.008	0.010	0.127	0.010	0.006	0.010	0.042	0.010	0.008	0.010	0.009	0.010	0.008	0.010

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

Table 12
26-22 4th Street
Queens, New York
2018 Phase II and 2019/2020 Remedial Investigation
Groundwater Analytical Results
TAL Filtered Metals

		Associated Phase II (2018)						EBC Remedial Investigation											
Compound	**NYSDEC Groundwater Quality Standards**	**GW-2**		**GW-5**		**GW-8**		**MW1**		**MW2**		**MW3**		**MW4**		**MW5**		**MW6**	
		9/20/2018		9/20/2018		9/20/2018		1/28/2020		1/28/2020		1/28/2020		1/28/2020		1/28/2020		1/28/2020	
		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L	
	mg/L	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL
Aluminum (Dissolved)	0.1	-	-	-	-	-	-	**0.047**	0.011	**0.056**	0.011	**0.046**	0.011	**0.044**	0.011	**0.049**	0.011	**0.04**	0.011
Antimony (Dissolved)-LDL	0.003	-	-	-	-	-	-	< 0.0010	0.0010	< 0.0010	0.0010	< 0.0010	0.0010	< 0.0010	0.0010	< 0.0010	0.0010	< 0.0010	0.0010
Arsenic, (Dissolved)	0.025	< 0.004	0.004	<0.004	0.004	<0.004	0.004	< 0.003	0.003	< 0.003	0.003	< 0.003	0.003	< 0.003	0.003	< 0.003	0.003	< 0.003	0.003
Barium (Dissolved)	1	**0.125**	0.002	**0.519**	0.002	**0.071**	0.002	**0.139**	0.011	**0.137**	0.011	**0.136**	0.011	**0.135**	0.011	**0.136**	0.011	**0.134**	0.011
Beryllium (Dissolved)	0.003	-	-	-	-	-	-	< 0.001	0.001	< 0.001	0.001	< 0.001	0.001	< 0.001	0.001	< 0.001	0.001	< 0.001	0.001
Cadmium (Dissolved)	0.005	<0.001	0.001	<0.001	0.001	<0.001	0.001	< 0.004	0.004	< 0.004	0.004	< 0.004	0.004	< 0.004	0.004	< 0.004	0.004	< 0.004	0.004
Calcium (Dissolved)		-	-	-	-	-	-	**130**	0.01	**129**	0.01	**128**	0.01	**128**	0.01	**128**	0.01	**126**	0.01
Chromium (Dissolved)	0.05	<0.001	0.001	<0.001	0.001	<0.001	0.001	< 0.001	0.001	< 0.001	0.001	< 0.001	0.001	< 0.001	0.001	< 0.001	0.001	< 0.001	0.001
Cobalt, (Dissolved)		-	-	-	-	-	-	< 0.005	0.005	< 0.005	0.005	< 0.005	0.005	< 0.005	0.005	< 0.005	0.005	< 0.005	0.005
Copper, (Dissolved)	0.2	-	-	-	-	-	-	< 0.005	0.005	< 0.005	0.005	< 0.005	0.005	< 0.005	0.005	< 0.005	0.005	< 0.005	0.005
Iron, (Dissolved)	0.3	-	-	-	-	-	-	< 0.01	0.01	< 0.01	0.01	< 0.01	0.01	< 0.01	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	< 0.002	0.002	< 0.002	0.002	< 0.002	0.002	< 0.002	0.002	< 0.002	0.002
Magnesium (Dissolved)	35	-	-	-	-	-	-	**29.6**	0.01	**28.8**	0.01	**27.9**	0.01	**27.8**	0.01	**28.9**	0.01	**28.4**	0.01
Manganese, (Dissolved)	0.3	-	-	-	-	-	-	**0.447**	0.005	**0.446**	0.005	**0.447**	0.005	**0.455**	0.005	**0.444**	0.005	**0.43**	0.005
Mercury (Dissolved)	0.0007	<0.0002	0.0002	<0.0002	0.0002	<0.0002	0.0002	< 0.0002	0.0002	< 0.0002	0.0002	< 0.0002	0.0002	< 0.0002	0.0002	< 0.0002	0.0002	< 0.0002	0.0002
Nickel, (Dissolved)	0.1	-	-	-	-	-	-	< 0.004	0.004	< 0.004	0.004	< 0.004	0.004	< 0.004	0.004	< 0.004	0.004	< 0.004	0.004
Potassium (Dissolved)		-	-	-	-	-	-	**9.3**	0.1	**9.2**	0.1	**9.1**	0.1	**8.7**	0.1	**8.9**	0.1	**8.7**	0.1
Selenium (Dissolved)-LDL	0.01	<0.02	0.02	<0.02	0.02	<0.02	0.02	< 0.010	0.010	< 0.010	0.010	< 0.010	0.010	< 0.010	0.010	< 0.010	0.010	< 0.010	0.010
Silver (Dissolved)	0.05	<0.005	0.005	<0.005	0.005	<0.005	0.005	< 0.005	0.005	< 0.005	0.005	< 0.005	0.005	< 0.005	0.005	< 0.005	0.005	< 0.005	0.005
Sodium (Dissolved)	20	-	-	-	-	-	-	**179**	1.1	**197**	1.1	**199**	1.1	**188**	1.1	**196**	1.1	**188**	1.1
Thallium (Dissolved)	0.0005	-	-	-	-	-	-	< 0.0003	0.0003	< 0.0003	0.0003	< 0.0003	0.0003	< 0.0003	0.0003	< 0.0003	0.0003	< 0.0003	0.0003
Vanadium, (Dissolved)		-	-	-	-	-	-	< 0.011	0.011	< 0.011	0.011	< 0.011	0.011	< 0.011	0.011	< 0.011	0.011	< 0.011	0.011
Zinc, (Dissolved)	5	-	-	-	-	-	-	< 0.011	0.011	< 0.011	0.011	< 0.011	0.011	< 0.011	0.011	< 0.011	0.011	< 0.011	0.011

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

Table 13
26-22 4th Street
Queens, New York
2018 Phase II and 2019/2020 Remedial Investigation
Groundwater Analytical Results
Emerging Contaminants

Compound	MW1		MW2		MW3		MW4		MW5		MW6	
	12/17/2019		12/17/2019		12/17/2019		12/17/2019		12/17/2019		12/17/2019	
	ng/L		ng/L		ng/L		ng/L		ng/L		ng/L	
	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL
Perfluorobutanoic Acid (PFBA)	**2.28**	1.96	**15.4**	2.04	**8.66**	1.99	**18.8**	1.87	**5.41**	2	**9.55**	1.86
Perfluoropentanoic Acid (PFPeA)	**3.36**	1.96	**16.7**	2.04	**17.4**	1.99	**24.4**	1.87	**8.68**	2	**8.03**	1.86
Perfluorobutanesulfonic Acid (PFBS)	**5.12**	1.96	**10.9**	2.04	**3.65**	1.99	**7.32**	1.87	**9.42**	2	**3.94**	1.86
Perfluorohexanoic Acid (PFHxA)	**2.91**	1.96	**15.3**	2.04	**14.8**	1.99	**19.3**	1.87	**9.98**	2	**11.5**	1.86
Perfluoroheptanoic Acid (PFHpA)	**1.24J**	1.96	**12.6**	2.04	**11.2**	1.99	**14.2**	1.87	**4.26**	2	**6.19**	1.86
Perfluorohexanesulfonic Acid (PFHxS)	**0.776J**	1.96	**9.2**	2.04	**6.23**	1.99	**5.72**	1.87	**0.912J**	2	**2.09**	1.86
Perfluorooctanoic Acid (PFOA)	**2.45**	1.96	**64.3**	2.04	**42.8**	1.99	**58.6**	1.87	**16.1**	2	**29.7**	1.86
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND	1.96	ND	2.04	ND	1.99	ND	1.87	**2.54**	2	ND	1.86
Perfluoroheptanesulfonic Acid (PFHpS)	ND	1.96	ND	2.04	ND	1.99	ND	1.87	ND	2	ND	1.86
Perfluorononanoic Acid (PFNA)	**1.07J**	1.96	**2.52**	2.04	**2.89**	1.99	**4.5**	1.87	**1.47J**	2	**6.33**	1.86
Perfluorooctanesulfonic Acid (PFOS)	**12.6**	1.96	**20.7**	2.04	**19.5**	1.99	**31.5**	1.87	**4.01**	2	**51.4**	1.86
Perfluorodecanoic Acid (PFDA)	**1.64J**	1.96	**0.584J**	2.04	**0.382J**	1.99	**0.464J**	1.87	**0.516J**	2	**3.43**	1.86
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND	1.96	ND	2.04	ND	1.99	ND	1.87	ND	2	ND	1.86
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND	1.96	**0.718J**	2.04	ND	1.99	ND	1.87	ND	2	ND	1.86
Perfluoroundecanoic Acid (PFUnA)	**0.412J**	1.96	ND	2.04	ND	1.99	ND	1.87	ND	2	**0.552J**	1.86
Perfluorodecanesulfonic Acid (PFDS)	ND	1.96	ND	2.04	ND	1.99	ND	1.87	ND	2	ND	1.86
Perfluorooctanesulfonamide (FOSA)	ND	1.96	ND	2.04	ND	1.99	ND	1.87	ND	2	ND	1.86
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND	1.96	ND	2.04	**0.932J**	1.99	ND	1.87	ND	2	**1.27J**	1.86
Perfluorododecanoic Acid (PFDoA)	ND	1.96	ND	2.04	ND	1.99	ND	1.87	ND	2	ND	1.86
Perfluorotridecanoic Acid (PFTrDA)	ND	1.96	ND	2.04	ND	1.99	ND	1.87	ND	2	ND	1.86
Perfluorotetradecanoic Acid (PFTA)	ND	1.96	ND	2.04	ND	1.99	ND	1.87	ND	2	ND	1.86
Combined PFOA and PFOS	**15.1**		**85**		**62.3**		**90.1**		**20.1**		**81.1**	
Combined Total Detections	**33.858**		**168.922**		**128.444**		**184.804**		**63.298**		**133.982**	

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 14
26-22 4th Street
Queens, New York
2018 Phase II and 2019/2020 Remedial Investigation
Soil Gas - Volatile Organic Compounds

COMPOUNDS	NYSDOH Maximum Sub-Slab Value (µg/m³) (a)	NYSDOH Soil Outdoor Background Levels (µg/m³) (b)	SS1		SS2		SS3		SS4		SS5		SS6		SS7		SS8	
			12/11/2019		12/11/2019		12/11/2019		12/11/2019		12/11/2019		12/11/2019		12/11/2019		12/11/2019	
			µg/m³		µg/m³		µg/m³		µg/m³		µg/m³		µg/m³		µg/m³		µg/m³	
			Result	RL	Result	RL	Result	RL	Result	RL	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	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00
1,1,1-Trichloroethane	100	<2.0 - 2.8	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	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	< 1.00	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	< 1.00	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	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00
1,1-Dichloroethene		<1.0	< 0.20	0.20	**0.37**	0.20	< 0.20	0.20	**3.58**	0.20	< 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	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00
1,2,4-Trimethylbenzene		<1.0	**1.07**	1.00	**1.11**	1.00	**2.33**	1.00	**1.91**	1.00	**2**	1.00	**1.68**	1.00	**1.65**	1.00	**1.37**	1.00
1,2-Dibromoethane		<1.5	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 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	< 1.00	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	< 1.00	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	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00
1,2-Dichlorotetrafluoroethane			< 1.00	1.00	**2.61**	1.00	**5.09**	1.00	< 1.00	1.00	< 1.00	1.00	**17.8**	1.00	**2.12**	1.00	< 1.00	1.00
1,3,5-Trimethylbenzene		<1.0	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00
1,3-Butadiene		NA	< 1.00	1.00	**1.19**	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00
1,3-Dichlorobenzene		<2.0	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00
1,4-Dichlorobenzene		NA	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 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	< 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	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00
4-Ethyltoluene		NA	**1.27**	1.00	**1.33**	1.00	**2.5**	1.00	**1.72**	1.00	**1.97**	1.00	**1.49**	1.00	**1.37**	1.00	**1.47**	1.00
4-Isopropyltoluene			< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00
4-Methyl-2-pentanone			**1.2**	1.00	**1.24**	1.00	**1.61**	1.00	**2.75**	1.00	**2.8**	1.00	**4.3**	1.00	**2.04**	1.00	**1.76**	1.00
Acetone		NA	**38.2**	1.00	**54.6**	1.00	**38.7**	1.00	**42.3**	1.00	**83.1**	1.00	**39.9**	1.00	**33.7**	1.00	**42.5**	1.00
Acrylonitrile			< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00
Benzene		<1.6 - 4.7	**1.18**	1.00	**1.85**	1.00	**4.18**	1.00	**3**	1.00	**1.76**	1.00	**3.93**	1.00	**2.96**	1.00	**1.9**	1.00
Benzyl Chloride		NA	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 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	< 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	< 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	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00
Carbon Disulfide		NA	**1.43**	1.00	**12.4**	1.00	**10.1**	1.00	**36.4**	1.00	**2.23**	1.00	**4.89**	1.00	**31.4**	1.00	**11.6**	1.00
Carbon Tetrachloride	5	<3.1	**0.37**	0.20	**0.4**	0.20	**0.46**	0.20	**0.22**	0.20	**0.25**	0.20	**0.25**	0.20	**0.29**	0.20	**0.21**	0.20
Chlorobenzene		<2.0	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 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	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00
Chloroform		<2.4	< 1.00	1.00	**6.78**	1.00	**26.2**	1.00	**2.7**	1.00	**2.74**	1.00	< 1.00	1.00	**7.27**	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	< 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	**18.7**	0.20	**5.67**	0.20	**201**	1.00	< 0.20	0.20	< 0.20	0.20	**0.66**	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	< 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	**1.09**	1.00	**8.19**	1.00	**1.51**	1.00	< 1.00	1.00	**8.7**	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	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00
Dichlorodifluromethane		NA	**1.63**	1.00	**1.31**	1.00	**2.2**	1.00	**1.27**	1.00	**4.73**	1.00	**4.37**	1.00	**2.47**	1.00	**2.24**	1.00
Ethanol			**42.4**	1.00	**56.9**	1.00	**38.6**	1.00	**40.5**	1.00	**60.6**	1.00	**30.5**	1.00	**47.1**	1.00	**42.2**	1.00
Ethyl Acetate		NA	**1.71**	1.00	**1.89**	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00
Ethylbenzene		<4.3	< 1.00	1.00	< 1.00	1.00	**1.97**	1.00	**1.23**	1.00	**1.54**	1.00	**1.39**	1.00	**1.43**	1.00	**1.22**	1.00
Heptane		NA	< 1.00	1.00	**1.31**	1.00	**11.8**	1.00	**6.64**	1.00	**1.08**	1.00	**5.2**	1.00	**3.25**	1.00	**43.8**	1.00
Hexachlorobutadiene		NA	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00
Hexane		<1.5	**6.87**	1.00	**7.71**	1.00	**23**	1.00	**21.1**	1.00	**2.04**	1.00	**19.4**	1.00	**9.72**	1.00	**99.7**	1.00
Isopropylalcohol		NA	**1.86**	1.00	**2.85**	1.00	**1.65**	1.00	**4.1**	1.00	**3.37**	1.00	< 1.00	1.00	**2.75**	1.00	**1.37**	1.00
Isopropylbenzene			< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00
Xylene (m&p)		<4.3	**3.05**	1.00	**2.84**	1.00	**8.59**	1.00	**4.04**	1.00	**5.34**	1.00	**4.6**	1.00	**4.73**	1.00	**4.18**	1.00
Methyl Ethyl Ketone			**5.81**	1.00	**8.78**	1.00	**7.25**	1.00	**10.9**	1.00	**15.1**	1.00	**5.81**	1.00	**9.02**	1.00	**7.6**	1.00
MTBE		NA	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00
Methylene Chloride		<3.4	**4.2**	3.00	< 3.00	3.00	**5.24**	3.00	< 3.00	3.00	< 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	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00
Xylene (o)		<4.3	**1.37**	1.00	**1.28**	1.00	**3.84**	1.00	**1.88**	1.00	**2.53**	1.00	**1.89**	1.00	**1.89**	1.00	**1.9**	1.00
Propylene		NA	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00
sec-Butylbenzene			< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	**2.13**	1.00	< 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	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00
Tetrachloroethene	30		**9.9**	0.25	**247**	0.25	**344**	1.25	**13.8**	0.25	**12.1**	0.25	**1,130**	1.25	**6.07**	0.25	**55.9**	0.25
Tetrahydrofuran		NA	**6.75**	1.00	**9.31**	1.00	< 1.00	1.00	**5.84**	1.00	**18.5**	1.00	**5.39**	1.00	**7.66**	1.00	< 1.00	1.00
Toluene		1.0 - 6.1	**3.73**	1.00	**3.95**	1.00	**11.8**	1.00	**5.95**	1.00	**6.89**	1.00	**8.32**	1.00	**9.42**	1.00	**5.95**	1.00
trans-1,2-Dichloroethene		NA	< 1.00	1.00	**1.12**	1.00	< 1.00	1.00	**15.4**	1.00	< 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	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00
Trichloroethene	2	<1.7	< 0.20	0.20	**32.1**	0.20	**57.5**	0.20	**9.18**	0.20	**8.32**	0.20	**13.1**	0.20	< 0.20	0.20	< 0.20	0.20
Trichlorofluoromethane		NA	**1.82**	1.00	**1.06**	1.00	**1.56**	1.00	< 1.00	1.00	< 1.00	1.00	**3.5**	1.00	< 1.00	1.00	< 1.00	1.00
Trichlorotrifluoroethane			< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 1.00	1.00	< 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	**70**	0.20	< 0.20	0.20	< 0.20	0.20	**1.81**	0.20	< 0.20	0.20
BTEX			**5.6**		**5.97**		**18.58**		**10.15**		**11.17**		**11.81**		**11.01**		**9.2**	
Total VOCs			**135.82**		**481.99**		**616.93**		**517.73**		**240.5**		**1307.71**		**199.48**		**326.87**	

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 15
26-22 4th Street
Queens, New York
Remaining Remedial Investigation Soil Sample Exceedences
Parameters Detected Above Track 1 Soil Cleanup Objectives

COMPOUND	Range in Exceedances	Frequency of Detection	B-1	B-3	B-4	B-6	B-7	B-9	19B1	19B2		19B3	19B4		19B5	19B6		19B7	19B8		19B9	19B10
			(6-8')	(2-4')	(2-4')	(2-4')	(2-4')	(2-4')	(0-2')	(0-2')	(8-10')	(0-2')	(0-2')	(8-10')	(0-2')	(0-2')	(8-10')	(0-2')	(0-2')	(8-10')	(0-2')	(0-2')
			9/20/2018	9/20/2018	9/20/2018	9/20/2018	9/20/2018	9/20/2018	12/10/2019	12/10/2019	12/10/2019	12/10/2019	12/10/2019	12/10/2019	12/10/2019	12/10/2019	12/10/2019	12/10/2019	12/10/2019	12/10/2019	12/10/2019	12/10/2019
Sample Results in µg/kg																						
Acetone	73-790	3	-	**790**	-	-	-	-	-	-	-	-	**91**	-	-	**73**	-	-	-	-	-	-
Cis-1,2-dichloroethene	320	1	-	-	-	-	**320**	-	-	-	-	-	-	-	-	-	-	-	-	-		
Tetrachloroethene	1,400 - 5,600	6	-	**2,700**	**2,000**	**2,300**	**5,000**	-	-	-	-	**5,600**	-	-	-	-	-	-	**1,400**	-	-	-
Trichloroethene	1,400	1	-	-	-	-	**1,400**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sample Results in µg/kg																						
Benz(a)anthracene	2,200-9,400	4	-	-	**3,700**	**3,200**	**2,200**	**9,400**	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**
Benzo(a)pyrene	2,000-8,900	4	-	-	**3,300**	**2,800**	**2,000**	**8,900**	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**
Benzo(b)fluoranthene	1,800-7,500	4	-	-	**2,900**	**2,300**	**1,800**	**7,500**	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**
Benzo(k)fluoranthene	1,700-4,300	4	-	-	**2,700**	**2,300**	**1,700**	**4,300**	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**
Chrysene	2,200-9,600	4	-	-	**3,900**	**3,700**	**2,200**	**9,600**	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**
Dibenz(a,h)anthracene	340-2,100	4	-	-	**490**	**440**	**340**	**2,100**	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**
Indeno(1,2,3-cd)pyrene	560-6,000	5	-	-	**2,400**	**2,000**	**1,400**	**6,000**	-	-												**560**
Sample Results in µg/kg																						
4,4'-DDD	5.8 - 17	4	-	-	-	-	-	-	-	-	-	-	**5.8**	**8.1**	-	-	-	**17**	**6.5**	-	-	-
4,4'-DDE	5.8	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4,4'-DDT	3.9 - 6.4	3	-	-	-	-	-	-	-	-	**3.6**	-	-	-	-	-	-	**6.4**	**5.9**	-	-	-
Sample Results in µg/kg																						
PCB-1254	190	1	-	-	-	-	-	**190**	-	-	-	-	-	-	-	-	-	**110**	**130**	-	-	-
PCB-1260	110 - 130	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**110**	**130**	-	-	-
Sample Results in mg/kg																						
Arsenic	14.2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**14.2**	-	-	-
Barium	370 - 934	4	-	-	-	-	**934**	-	-	-	-	**370**	-	-	-	-	**407**	-	-	-	-	**401**
Chromium	38.5 - 40.7	2	-	-	-	-	-	-	-	-	**40.7**	-	-	-	-	-	-	-	-	**38.5**	-	-
Copper	73.6 - 97.5	5	-	-	-	-	-	-	-	-	-	**79.1**	-	-	-	**85**	-	**83.1**	**73.6**	-	-	**97.5**
Lead	77 - 8,430	9	-	**257**	**327**	**300**	**8,430**	**173**	-	**93**	-	**783**	**169**	-	**77**	**343**	-	**885**	**412**	-	**384**	**655**
Mercury	0.22 - 2.26	13	-	-	**0.28**	**0.51**	**0.45**	**0.45**	**0.43**	**0.24**	-	**0.83**	**0.35**	-	**2.26**	**0.36**	-	**0.31**	**0.4**	-	-	**0.22**
Nickel	32	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**31.7**	-	-
Zinc	2.61 - 555	6	-	-	-	-	-	-	-	-	-	-	**175**	-	-	**284**	-	**2.61**	**262**	-	**426**	**555**

Notes:

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

\- - Not Analyzed

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
26-22 4th Street
Queens, New York
2018 Phase II and 2019/2020 RI Parameters Detected Above Ambient Groundwater Standards

COMPOUND	Range in Exceedances	Frequency of Detection	GW-2	GW-5	GW-8	MW1	MW2	MW3		MW4	MW5	MW6
			9/20/2018	**9/20/2018**	**9/20/2018**	12/17/2019	12/17/2019	12/17/2019	1/28/2020	12/17/2019	12/17/2019	12/17/2019
Sample Results in µg/kg												
Tetrachloroethene	8.1 - 43	5	**15**	**16**	**5.2**	**9.9**	**43**	**9.1**	**8.1**	**13**	-	-
cis-1,2-Dichloroethene	9.9-15	2	**15**	-	-	-	-	-	-	**9.9**	-	-
Trichloroethene	10	1	**10**	-	-	-	-	-	-	-	-	-
Sample Results in µg/kg												
4,4-DDT	0.026 - 0.028	2				-	-	-	-	**0.026**	**0.028**	-
Sample Results in mg/kg												
Aluminum	0.90 - 12.8	7				**1.25**	**8.31**	**1.09**	**12.8**	**1.53**	**0.90**	**1.01**
Iron	1.19 - 15.8	7				**1.19**	**15.8**	**1.24**	**12.4**	**2.24**	**1.29**	**1.50**
Lead	0.025 - 0.084	2				-	**0.084**	-	**0.025**	-	-	-
Manganese	0.68 - 1.94	6				-	**1.07**	**0.68**	**1.04**	**1.94**	**0.72**	**1.47**
Selenium	0.014 - 0.016	2				-	**0.014**	-	-	-	**0.016**	-
Sodium	46.7 - 211	6				-	**46.7**	**209**	**211**	**112**	**97.8**	**143**
Sample Results in mg/kg												
Magnesium (Dissolved)	0.43 - 0.447	6				**0.447**	**0.446**	**0.447**	-	**0.455**	**0.444**	**0.430**
Sodium (Dissolved)	179 - 199	6				**179**	**197**	**199**	-	**188**	**196**	**188**

Notes:

Bold/highlighted- Indicated exceedance of the NYSDEC Groundwater Standard

TABLE 17
Project Permit Listing
To Be Updated as Project Progresses

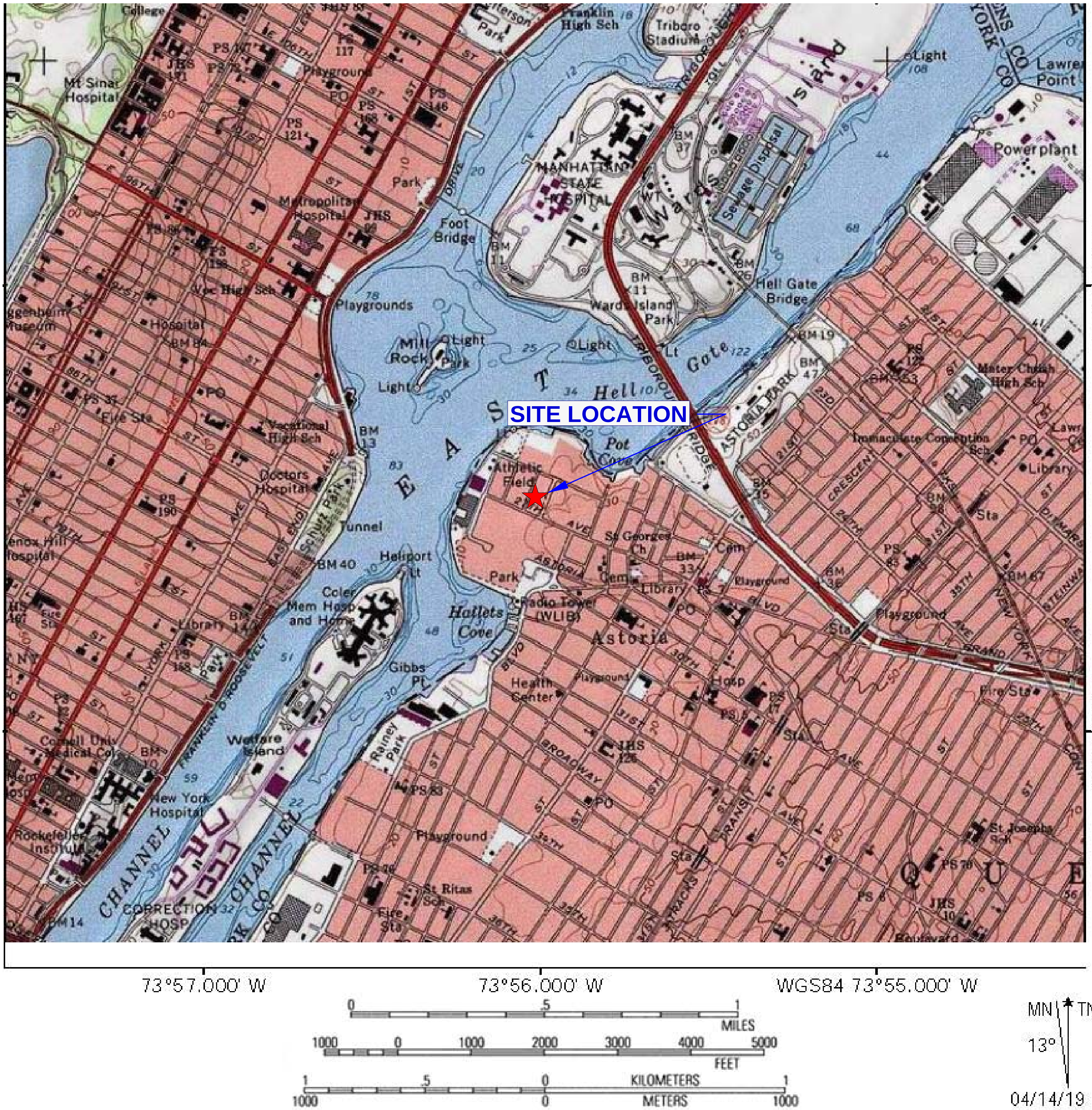
Permit	*Permit Number*	*Originating Agency*	*Pursuant to*	*Issued*	*Expires*
DM - Full Demolition	421636251-01-DM	NYC Department of Buildings	Demolition of one-story building	2/4/2019	3/19/2020
NB - New Building	420665499-01-NB	NYC Department of Buildings	Proposing Multi-Story Building	11/12/2019	
NB - New Building	420665499-01-FO	NYC Department of Buildings	Foundation	11/12/2019	
NB - New Building	420665499-01-FO EA	NYC Department of Buildings	Foundation	11/12/2019	
A2 - Alteration Type 2	420665499-04-PL	NYC Department of Buildings	Plumbing	11/12/2019	
A2 - Alteration Type 2	421638696-01-EW SP	NYC Department of Buildings	Proposed to Cap and Remove Sprinkler System.	5/9/2019	
A2 - Alteration Type 2	421638696-01-PL	NYC Department of Buildings	Proposed to Cap and Remove Sprinkler System.	5/9/2019	
A3 - Alteration Type 3	440547026	NYC Department of Buildings	Builders Pavenment Plan filed in connection with NB#420665499	12/13/2019	
A2 - Alteration Type 2	421919259	NYC Department of Buildings	Installation of smoke, heat CO detection and sprinkler fire alarm in connection with NB	1/31/2020	
A3 - Alteration Type 3	440560420-01-EQ-OT	NYC Department of Buildings	Construction Equipment - Temporary Roof Protection During Demoltion	8/8/2019	8/7/2020
NO OTHER PERMITS ISSUED AT THIS TIME - TO BE ADDED					

Note: This list will be updated as the project progresses

Table 18
Emergency Contact List

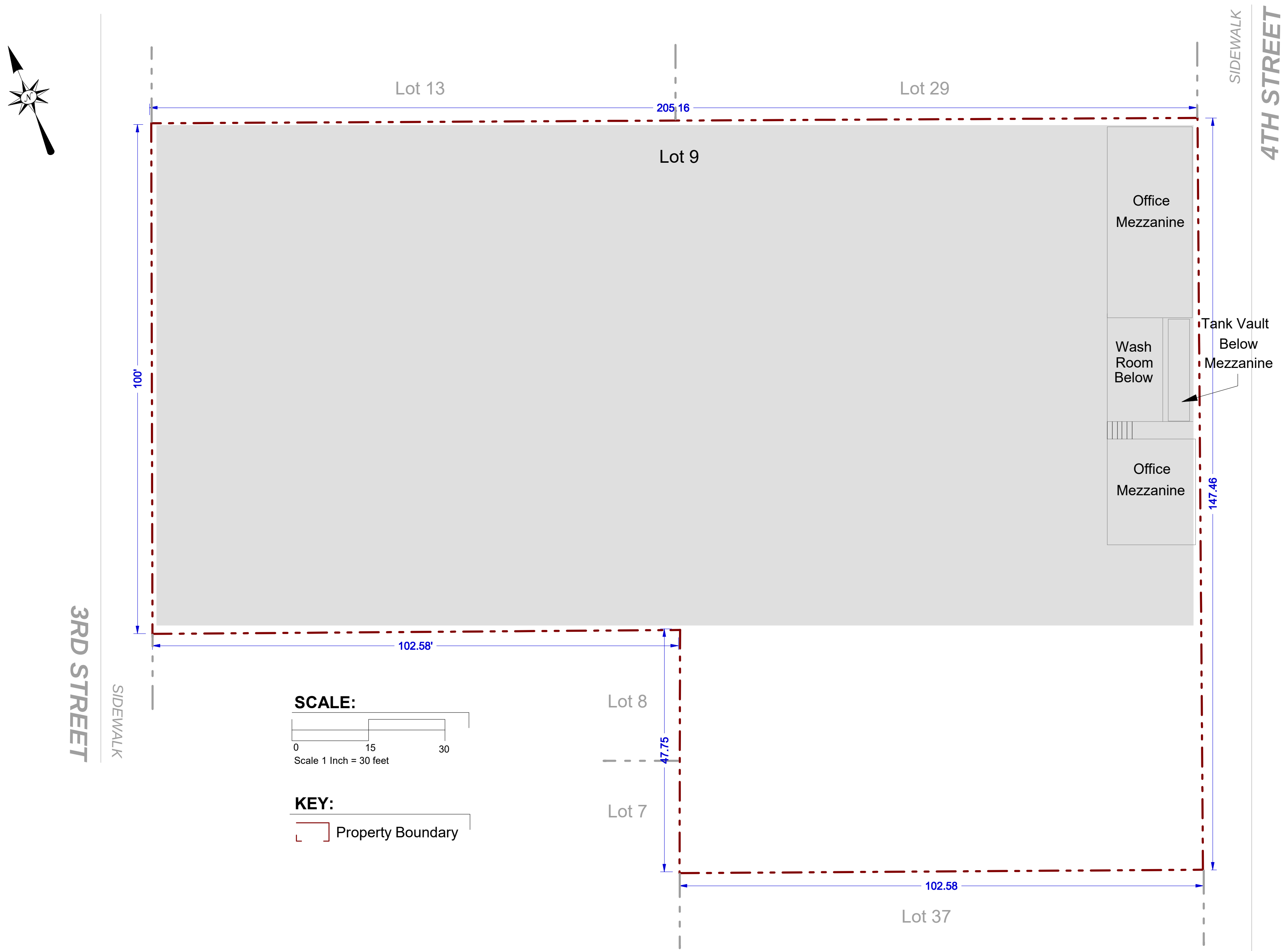
General Emergencies		911
NYC Police		911
NYC Fire Department		911
Mount Sinai Queens - General Hospital		(718) 932-1000
NYSDEC Spills Hotline		1-800-457-7362
NYSDEC Project Manager		(518) 402-9687
NYC Department of Health		(212) 676-2400
National Response Center		1-800-424-8802
Poison Control		1-800-222-1222
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

FIGURES



USGS Brooklyn, NY Quadrangle 1995, Contour Interval = 10 ft.

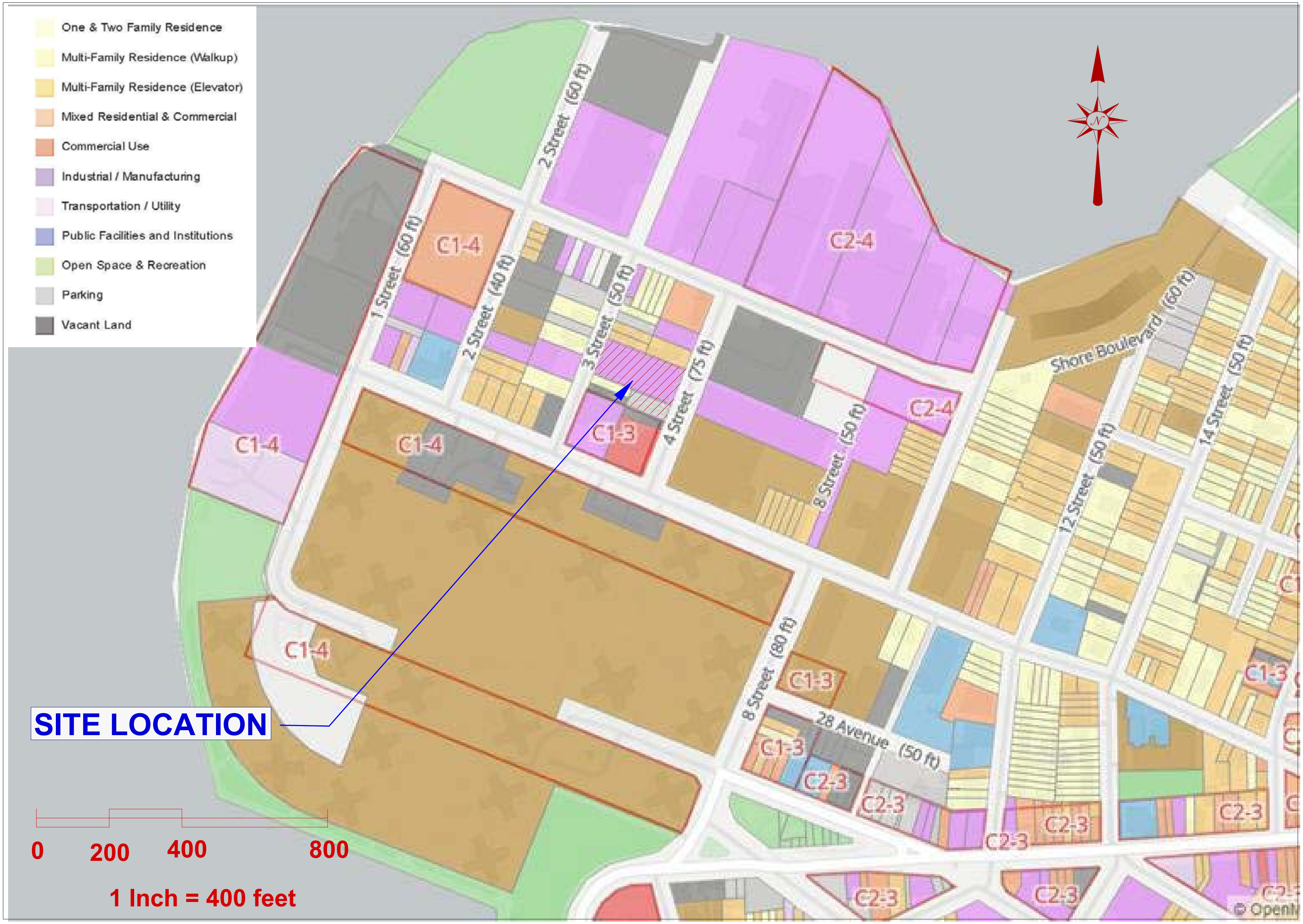
EBC Environmental Business Consultants Phone 631.504.6000 Fax 631. 924 .2870	Figure No. 1	Site Name: Former Andor Medical Systems Site Address: 26-22 4th Street, Queens, NY Drawing Title: Site Location Map



EBC
ENVIRONMENTAL BUSINESS CONSULTANTS
Phone 631.504.6000
Fax 631. 924 .2870

Figure No. 2

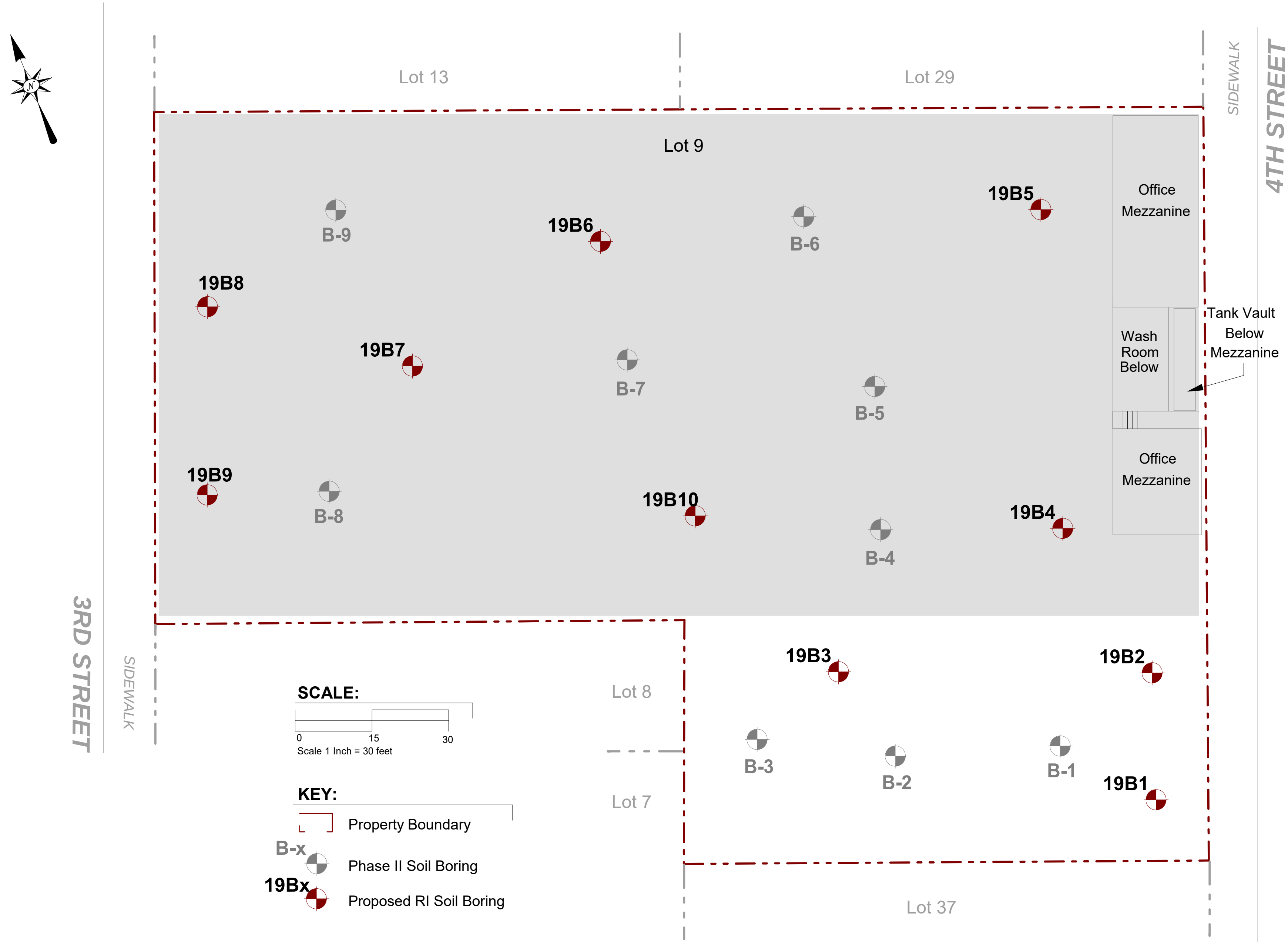
Site Name: FORMER ANDOR MEDICAL SYSTEMS
Site Address: 26-22 4TH STREET, QUEENS, NY
Drawing Title: SITE PLAN



EBC
Environmental Business Consultants

Phone 631.504.6000
Fax 631. 924 .2870

Figure No. 3	
Site Name:	Former Andor Medical Systems
Site Address:	26-22 4th Street, Astoria, NY
Drawing Title:	Surroundung Land Use



EBC

Phone 631.504.6000
Fax 631. 924 .2870

Environmental Business Consultants

Figure No.
4

Site Name:	Former Andor Medical Systems
Site Address:	26-22 4th Street, Queens, NY
Drawing Title:	Soil Boring Location Map

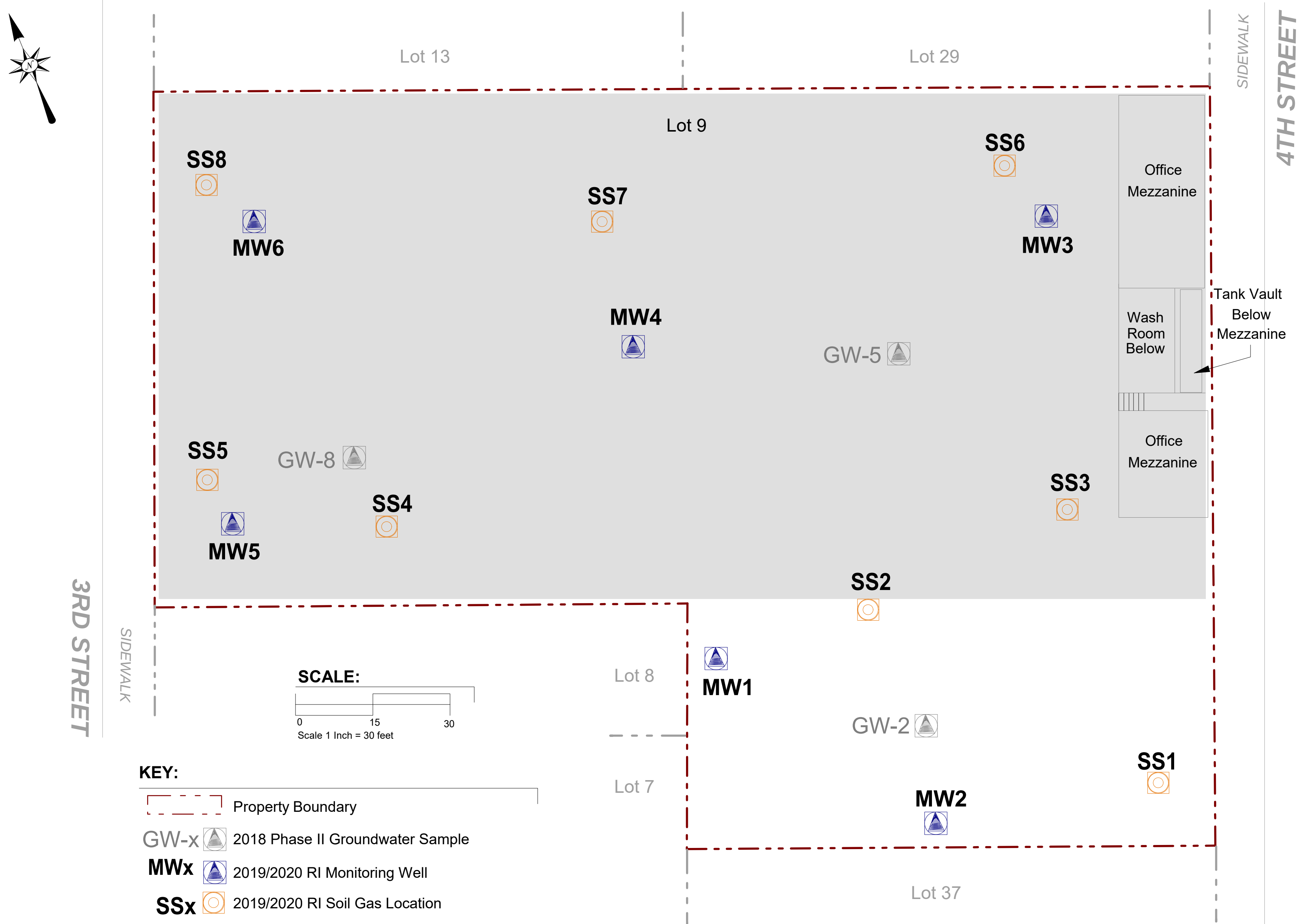


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Figure No.
5

Site Name: FORMER ANDOR MEDICAL SYSTEMS
Site Address: 26-22 4TH STREET, QUEENS, NY
Drawing Title: GROUNDWATER & SOIL VAPOR LOCATION MAP

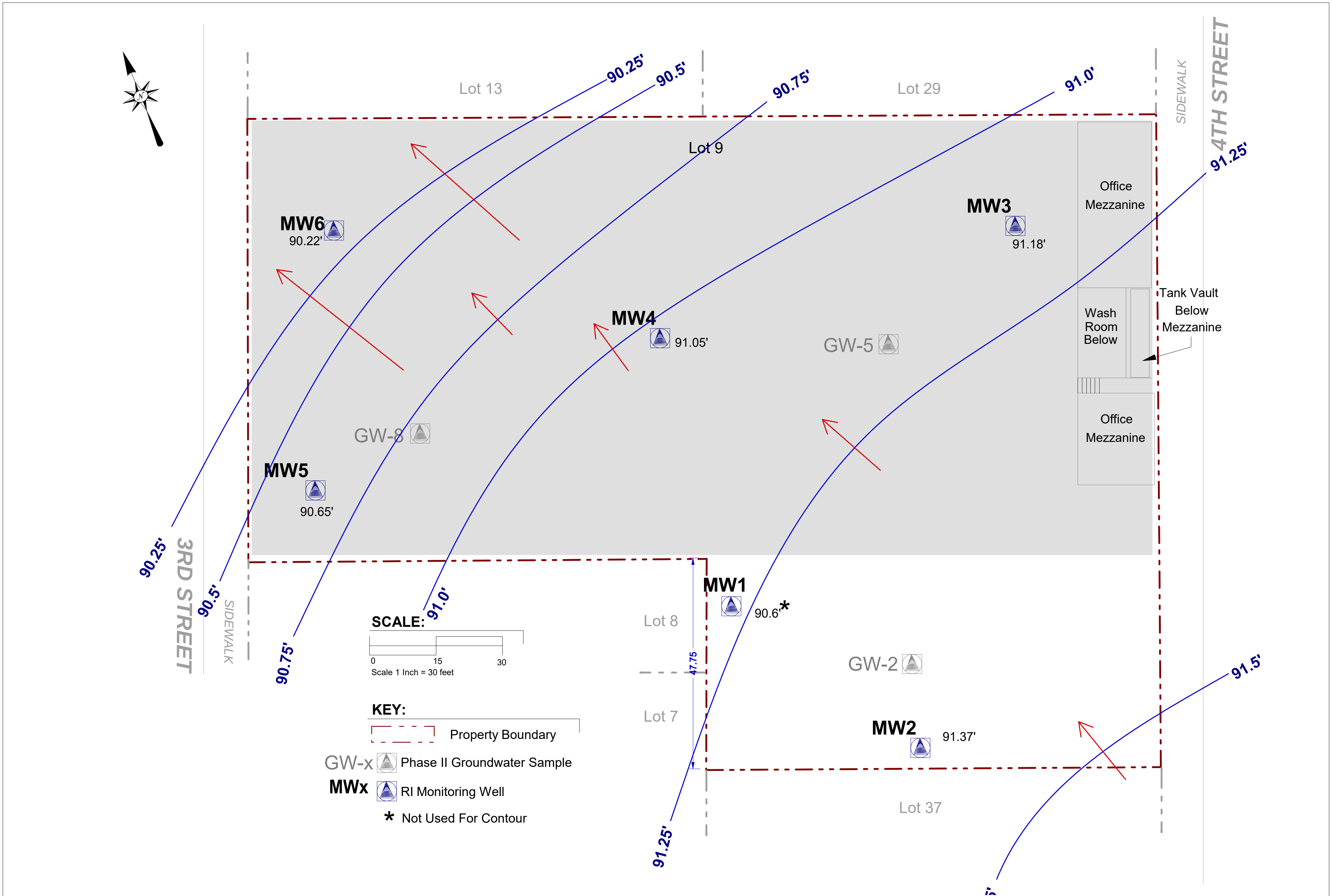

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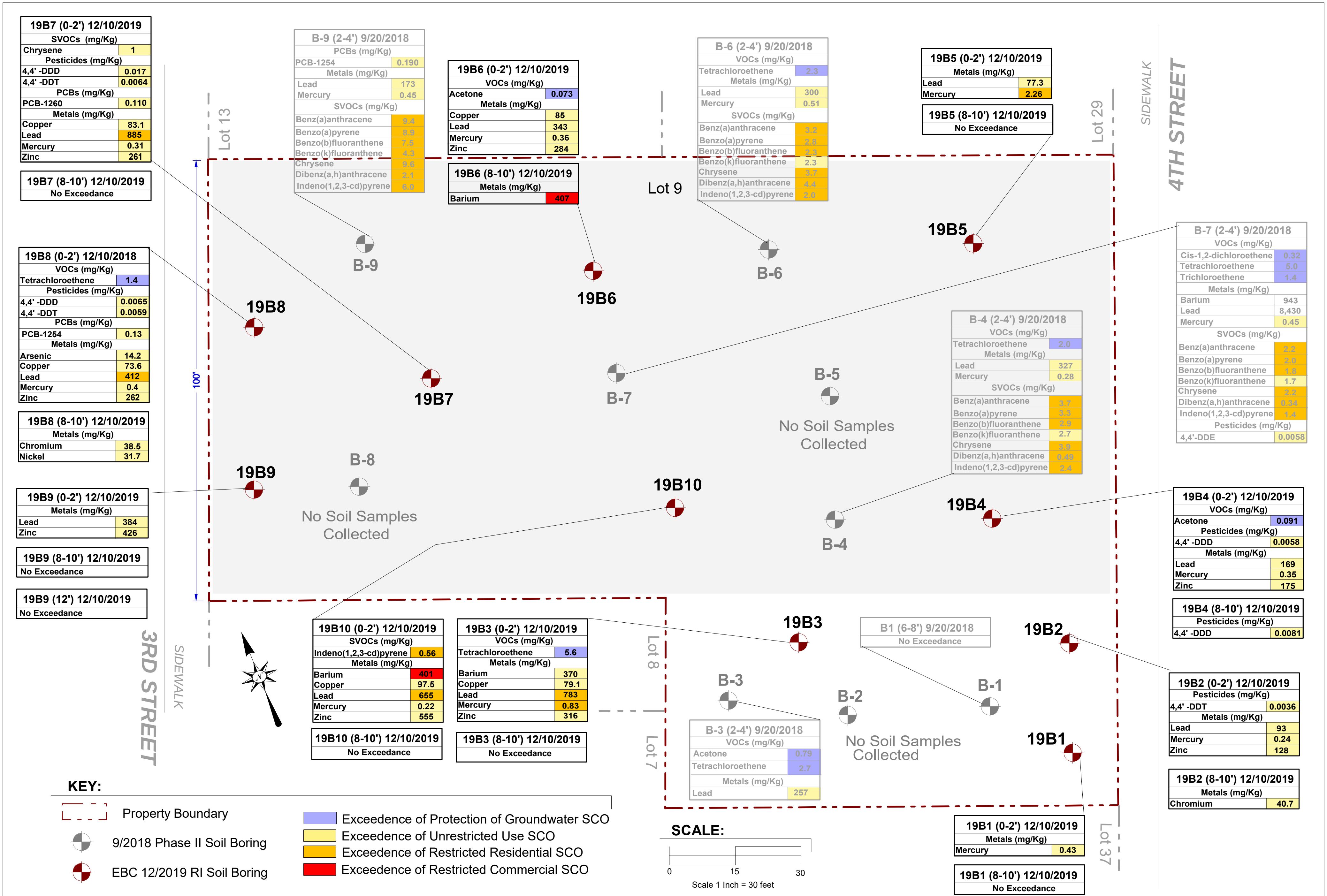
Figure No.
6

Site Name: FORMER ANDOR MEDICAL SYSTEMS
Site Address: 26-22 4TH STREET, QUEENS, NY
Drawing Title: GROUNDWATER ELEVATION



19B7 (0-2') 12/10/2019	
SVOCs (mg/Kg)	
Chrysene	1
Pesticides (mg/Kg)	
4,4' -DDD	0.017
4,4' -DDT	0.0064
PCBs (mg/Kg)	
PCB-1260	0.110
Metals (mg/Kg)	
Copper	83.1
Lead	885
Mercury	0.31
Zinc	261

19B7 (8-10') 12/10/2019
No Exceedance

B-9 (2-4') 9/20/2018	
PCBs (mg/Kg)	
PCB-1254	0.190
Metals (mg/Kg)	
Lead	173
Mercury	0.45
SVOCs (mg/Kg)	
Benz(a)anthracene	9.4
Benzo(a)pyrene	8.9
Benzo(b)fluoranthene	7.5
Benzo(k)fluoranthene	4.3
Chrysene	9.6
Dibenz(a,h)anthracene	2.1
Indeno(1,2,3-cd)pyrene	6.0

19B6 (0-2') 12/10/2019	
VOCs (mg/Kg)	
Acetone	0.073
Metals (mg/Kg)	
Copper	85
Lead	343
Mercury	0.36
Zinc	284

19B6 (8-10') 12/10/2019	
Metals (mg/Kg)	
Barium	407

B-6 (2-4') 9/20/2018	
VOCs (mg/Kg)	
Tetrachloroethene	2.3
Metals (mg/Kg)	
Lead	300
Mercury	0.51
SVOCs (mg/Kg)	
Benz(a)anthracene	3.2
Benzo(a)pyrene	2.8
Benzo(b)fluoranthene	2.3
Benzo(k)fluoranthene	2.3
Chrysene	3.7
Dibenz(a,h)anthracene	4.4
Indeno(1,2,3-cd)pyrene	2.0

19B5 (0-2') 12/10/2019	
Metals (mg/Kg)	
Lead	77.3
Mercury	2.26

19B5 (8-10') 12/10/2019
No Exceedance

19B8 (0-2') 12/10/2018	
VOCs (mg/Kg)	
Tetrachloroethene	1.4
Pesticides (mg/Kg)	
4,4' -DDD	0.0065
4,4' -DDT	0.0059
PCBs (mg/Kg)	
PCB-1254	0.13
Metals (mg/Kg)	
Arsenic	14.2
Copper	73.6
Lead	412
Mercury	0.4
Zinc	262

19B8 (8-10') 12/10/2019	
Metals (mg/Kg)	
Chromium	38.5
Nickel	31.7

B-7 (2-4') 9/20/2018	
VOCs (mg/Kg)	
Cis-1,2-dichloroethene	0.32
Tetrachloroethene	5.0
Trichloroethene	1.4
Metals (mg/Kg)	
Barium	943
Lead	8,430
Mercury	0.45
SVOCs (mg/Kg)	
Benz(a)anthracene	2.2
Benzo(a)pyrene	2.0
Benzo(b)fluoranthene	1.8
Benzo(k)fluoranthene	1.7
Chrysene	2.2
Dibenz(a,h)anthracene	0.34
Indeno(1,2,3-cd)pyrene	1.4
Pesticides (mg/Kg)	
4,4'-DDE	0.0058

B-4 (2-4') 9/20/2018	
VOCs (mg/Kg)	
Tetrachloroethene	2.0
Metals (mg/Kg)	
Lead	327
Mercury	0.28
SVOCs (mg/Kg)	
Benz(a)anthracene	3.7
Benzo(a)pyrene	3.3
Benzo(b)fluoranthene	2.9
Benzo(k)fluoranthene	2.7
Chrysene	3.9
Dibenz(a,h)anthracene	0.49
Indeno(1,2,3-cd)pyrene	2.4

19B9 (0-2') 12/10/2019	
Metals (mg/Kg)	
Lead	384
Zinc	426

19B9 (8-10') 12/10/2019
No Exceedance

19B9 (12') 12/10/2019
No Exceedance

19B4 (0-2') 12/10/2019	
VOCs (mg/Kg)	
Acetone	0.091
Pesticides (mg/Kg)	
4,4' -DDD	0.0058
Metals (mg/Kg)	
Lead	169
Mercury	0.35
Zinc	175

19B4 (8-10') 12/10/2019	
Pesticides (mg/Kg)	
4,4' -DDD	0.0081

19B10 (0-2') 12/10/2019	
SVOCs (mg/Kg)	
Indeno(1,2,3-cd)pyrene	0.56
Metals (mg/Kg)	
Barium	401
Copper	97.5
Lead	655
Mercury	0.22
Zinc	555

19B10 (8-10') 12/10/2019
No Exceedance

19B3 (0-2') 12/10/2019	
VOCs (mg/Kg)	
Tetrachloroethene	5.6
Metals (mg/Kg)	
Barium	370
Copper	79.1
Lead	783
Mercury	0.83
Zinc	316

19B3 (8-10') 12/10/2019
No Exceedance

B1 (6-8') 9/20/2018
No Exceedance

B-3 (2-4') 9/20/2018	
VOCs (mg/Kg)	
Acetone	0.79
Tetrachloroethene	2.7
Metals (mg/Kg)	
Lead	257

19B2 (0-2') 12/10/2019	
Pesticides (mg/Kg)	
4,4' -DDT	0.0036
Metals (mg/Kg)	
Lead	93
Mercury	0.24
Zinc	128

19B2 (8-10') 12/10/2019	
Metals (mg/Kg)	
Chromium	40.7

19B1 (0-2') 12/10/2019	
Metals (mg/Kg)	
Mercury	0.43

19B1 (8-10') 12/10/2019
No Exceedance

KEY:

- Property Boundary
- 9/2018 Phase II Soil Boring
- EBC 12/2019 RI Soil Boring
- Exceedence of Protection of Groundwater SCO
- Exceedence of Unrestricted Use SCO
- Exceedence of Restricted Residential SCO
- Exceedence of Restricted Commercial SCO

SCALE:

0 15 30

Scale 1 Inch = 30 feet

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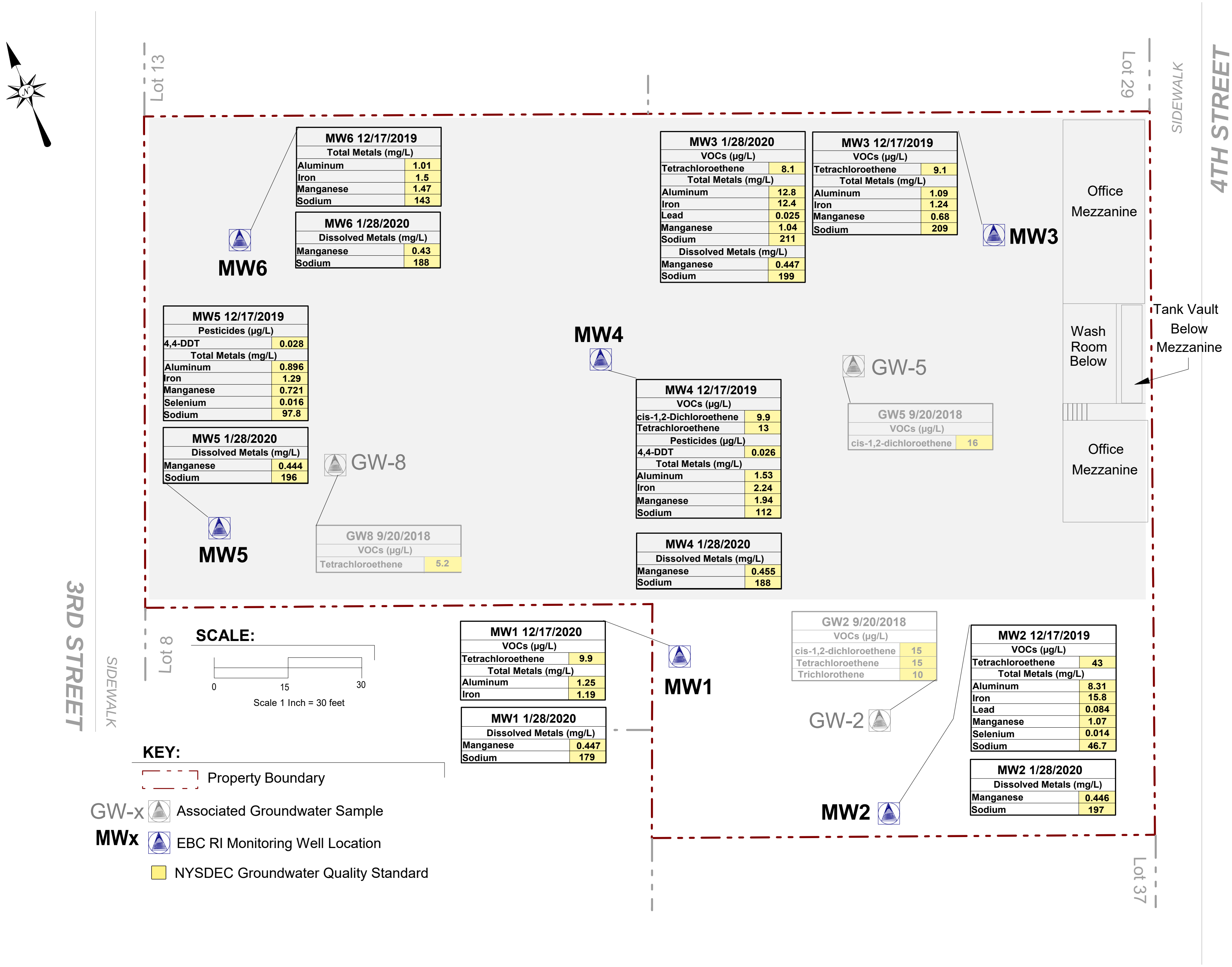
Figure No. 7

Site Name: FORMER ANDOR MEDICAL SYSTEMS

Site Address: 26-22 4TH STREET, QUEENS, NY

Drawing Title: POSTED SOIL RESULTS ABOVE UUSCOs



MW6 12/17/2019	
Total Metals (mg/L)	
Aluminum	1.01
Iron	1.5
Manganese	1.47
Sodium	143

MW6 1/28/2020	
Dissolved Metals (mg/L)	
Manganese	0.43
Sodium	188

MW3 1/28/2020	
VOCs (µg/L)	
Tetrachloroethene	8.1
Total Metals (mg/L)	
Aluminum	12.8
Iron	12.4
Lead	0.025
Manganese	1.04
Sodium	211
Dissolved Metals (mg/L)	
Manganese	0.447
Sodium	199

MW3 12/17/2019	
VOCs (µg/L)	
Tetrachloroethene	9.1
Total Metals (mg/L)	
Aluminum	1.09
Iron	1.24
Manganese	0.68
Sodium	209

MW5 12/17/2019	
Pesticides (µg/L)	
4,4-DDT	0.028
Total Metals (mg/L)	
Aluminum	0.896
Iron	1.29
Manganese	0.721
Selenium	0.016
Sodium	97.8

MW5 1/28/2020	
Dissolved Metals (mg/L)	
Manganese	0.444
Sodium	196

MW4 12/17/2019	
VOCs (µg/L)	
cis-1,2-Dichloroethene	9.9
Tetrachloroethene	13
Pesticides (µg/L)	
4,4-DDT	0.026
Total Metals (mg/L)	
Aluminum	1.53
Iron	2.24
Manganese	1.94
Sodium	112

MW4 1/28/2020	
Dissolved Metals (mg/L)	
Manganese	0.455
Sodium	188

GW5 9/20/2018	
VOCs (µg/L)	
cis-1,2-dichloroethene	16

GW8 9/20/2018	
VOCs (µg/L)	
Tetrachloroethene	5.2

MW1 12/17/2020	
VOCs (µg/L)	
Tetrachloroethene	9.9
Total Metals (mg/L)	
Aluminum	1.25
Iron	1.19

MW1 1/28/2020	
Dissolved Metals (mg/L)	
Manganese	0.447
Sodium	179

GW2 9/20/2018	
VOCs (µg/L)	
cis-1,2-dichloroethene	15
Tetrachloroethene	15
Trichlorothene	10

MW2 12/17/2019	
VOCs (µg/L)	
Tetrachloroethene	43
Total Metals (mg/L)	
Aluminum	8.31
Iron	15.8
Lead	0.084
Manganese	1.07
Selenium	0.014
Sodium	46.7

MW2 1/28/2020	
Dissolved Metals (mg/L)	
Manganese	0.446
Sodium	197

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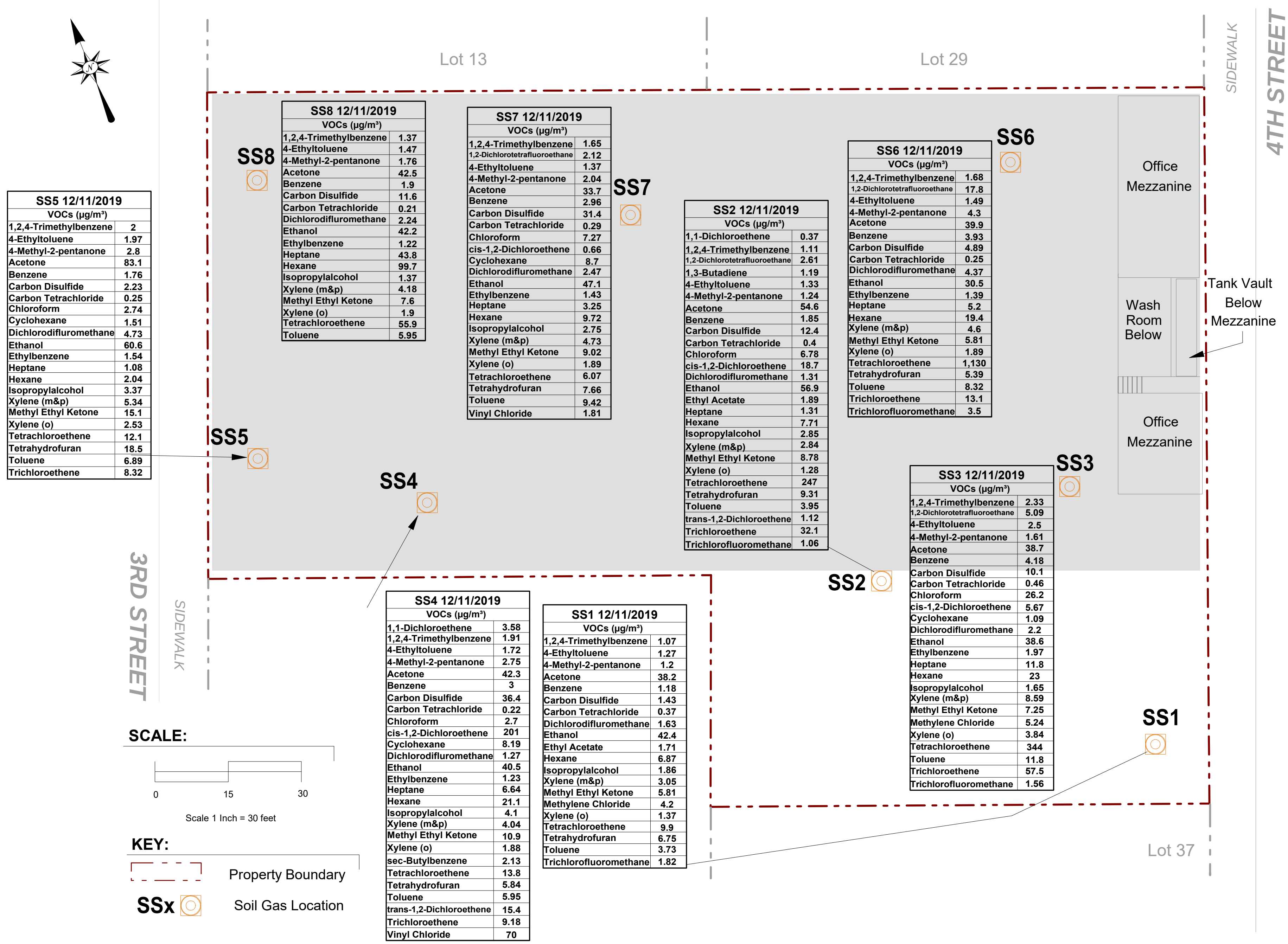
Figure No. 8

Site Name: FORMER ANDOR MEDICAL SYSTEMS

Site Address: 26-22 4TH STREET, QUEENS, NY

Drawing Title: GROUNDWATER RESULTS ABOVE AWQS



SS8 12/11/2019	
VOCs (µg/m³)	
1,2,4-Trimethylbenzene	1.37
4-Ethyltoluene	1.47
4-Methyl-2-pentanone	1.76
Acetone	42.5
Benzene	1.9
Carbon Disulfide	11.6
Carbon Tetrachloride	0.21
Dichlorodifluromethane	2.24
Ethanol	42.2
Ethylbenzene	1.22
Heptane	43.8
Hexane	99.7
Isopropylalcohol	1.37
Xylene (m&p)	4.18
Methyl Ethyl Ketone	7.6
Xylene (o)	1.9
Tetrachloroethene	55.9
Toluene	5.95

SS7 12/11/2019	
VOCs (µg/m³)	
1,2,4-Trimethylbenzene	1.65
1,2-Dichlorotetrafluoroethane	2.12
4-Ethyltoluene	1.37
4-Methyl-2-pentanone	2.04
Acetone	33.7
Benzene	2.96
Carbon Disulfide	31.4
Carbon Tetrachloride	0.29
Chloroform	7.27
cis-1,2-Dichloroethene	0.66
Cyclohexane	8.7
Dichlorodifluoromethane	2.47
Ethanol	47.1
Ethylbenzene	1.43
Heptane	3.25
Hexane	9.72
Isopropylalcohol	2.75
Xylene (m&p)	4.73
Methyl Ethyl Ketone	9.02
Xylene (o)	1.89
Tetrachloroethene	6.07
Tetrahydrofuran	7.66
Toluene	9.42
Vinyl Chloride	1.81

SS6 12/11/2019	
VOCs (µg/m³)	
1,2,4-Trimethylbenzene	1.68
1,2-Dichlorotetrafluoroethane	17.8
4-Ethyltoluene	1.49
4-Methyl-2-pentanone	4.3
Acetone	39.9
Benzene	3.93
Carbon Disulfide	4.89
Carbon Tetrachloride	0.25
Dichlorodifluromethane	4.37
Ethanol	30.5
Ethylbenzene	1.39
Heptane	5.2
Hexane	19.4
Xylene (m&p)	4.6
Methyl Ethyl Ketone	5.81
Xylene (o)	1.89
Tetrachloroethene	1,130
Tetrahydrofuran	5.39
Toluene	8.32
Trichloroethene	13.1
Trichlorofluoromethane	3.5

SS5 12/11/2019	
VOCs (µg/m³)	
1,2,4-Trimethylbenzene	2
4-Ethyltoluene	1.97
4-Methyl-2-pentanone	2.8
Acetone	83.1
Benzene	1.76
Carbon Disulfide	2.23
Carbon Tetrachloride	0.25
Chloroform	2.74
Cyclohexane	1.51
Dichlorodifluoromethane	4.73
Ethanol	60.6
Ethylbenzene	1.54
Heptane	1.08
Hexane	2.04
Isopropylalcohol	3.37
Xylene (m&p)	5.34
Methyl Ethyl Ketone	15.1
Xylene (o)	2.53
Tetrachloroethene	12.1
Tetrahydrofuran	18.5
Toluene	6.89
Trichloroethene	8.32

SS2 12/11/2019	
VOCs (µg/m³)	
1,1-Dichloroethene	0.37
1,2,4-Trimethylbenzene	1.11
1,2-Dichlorotetrafluoroethane	2.61
1,3-Butadiene	1.19
4-Ethyltoluene	1.33
4-Methyl-2-pentanone	1.24
Acetone	54.6
Benzene	1.85
Carbon Disulfide	12.4
Carbon Tetrachloride	0.4
Chloroform	6.78
cis-1,2-Dichloroethene	18.7
Dichlorodifluromethane	1.31
Ethanol	56.9
Ethyl Acetate	1.89
Heptane	1.31
Hexane	7.71
Isopropylalcohol	2.85
Xylene (m&p)	2.84
Methyl Ethyl Ketone	8.78
Xylene (o)	1.28
Tetrachloroethene	247
Tetrahydrofuran	9.31
Toluene	3.95
trans-1,2-Dichloroethene	1.12
Trichloroethene	32.1
Trichlorofluoromethane	1.06

SS3 12/11/2019	
VOCs (µg/m³)	
1,2,4-Trimethylbenzene	2.33
1,2-Dichlorotetrafluoroethane	5.09
4-Ethyltoluene	2.5
4-Methyl-2-pentanone	1.61
Acetone	38.7
Benzene	4.18
Carbon Disulfide	10.1
Carbon Tetrachloride	0.46
Chloroform	26.2
cis-1,2-Dichloroethene	5.67
Cyclohexane	1.09
Dichlorodifluromethane	2.2
Ethanol	38.6
Ethylbenzene	1.97
Heptane	11.8
Hexane	23
Isopropylalcohol	1.65
Xylene (m&p)	8.59
Methyl Ethyl Ketone	7.25
Methylene Chloride	5.24
Xylene (o)	3.84
Tetrachloroethene	344
Toluene	11.8
Trichloroethene	57.5
Trichlorofluoromethane	1.56

SS4 12/11/2019	
VOCs (µg/m³)	
1,1-Dichloroethene	3.58
1,2,4-Trimethylbenzene	1.91
4-Ethyltoluene	1.72
4-Methyl-2-pentanone	2.75
Acetone	42.3
Benzene	3
Carbon Disulfide	36.4
Carbon Tetrachloride	0.22
Chloroform	2.7
cis-1,2-Dichloroethene	201
Cyclohexane	8.19
Dichlorodifluromethane	1.27
Ethanol	40.5
Ethylbenzene	1.23
Heptane	6.64
Hexane	21.1
Isopropylalcohol	4.1
Xylene (m&p)	4.04
Methyl Ethyl Ketone	10.9
Xylene (o)	1.88
sec-Butylbenzene	2.13
Tetrachloroethene	13.8
Tetrahydrofuran	5.84
Toluene	5.95
trans-1,2-Dichloroethene	15.4
Trichloroethene	9.18
Vinyl Chloride	70

SS1 12/11/2019	
VOCs (µg/m³)	
1,2,4-Trimethylbenzene	1.07
4-Ethyltoluene	1.27
4-Methyl-2-pentanone	1.2
Acetone	38.2
Benzene	1.18
Carbon Disulfide	1.43
Carbon Tetrachloride	0.37
Dichlorodifluoromethane	1.63
Ethanol	42.4
Ethyl Acetate	1.71
Hexane	6.87
Isopropylalcohol	1.86
Xylene (m&p)	3.05
Methyl Ethyl Ketone	5.81
Methylene Chloride	4.2
Xylene (o)	1.37
Tetrachloroethene	9.9
Tetrahydrofuran	6.75
Toluene	3.73
Trichlorofluoromethane	1.82

SCALE:

0 15 30

Scale 1 Inch = 30 feet

KEY:

Property Boundary

SSx Soil Gas Location

EBC

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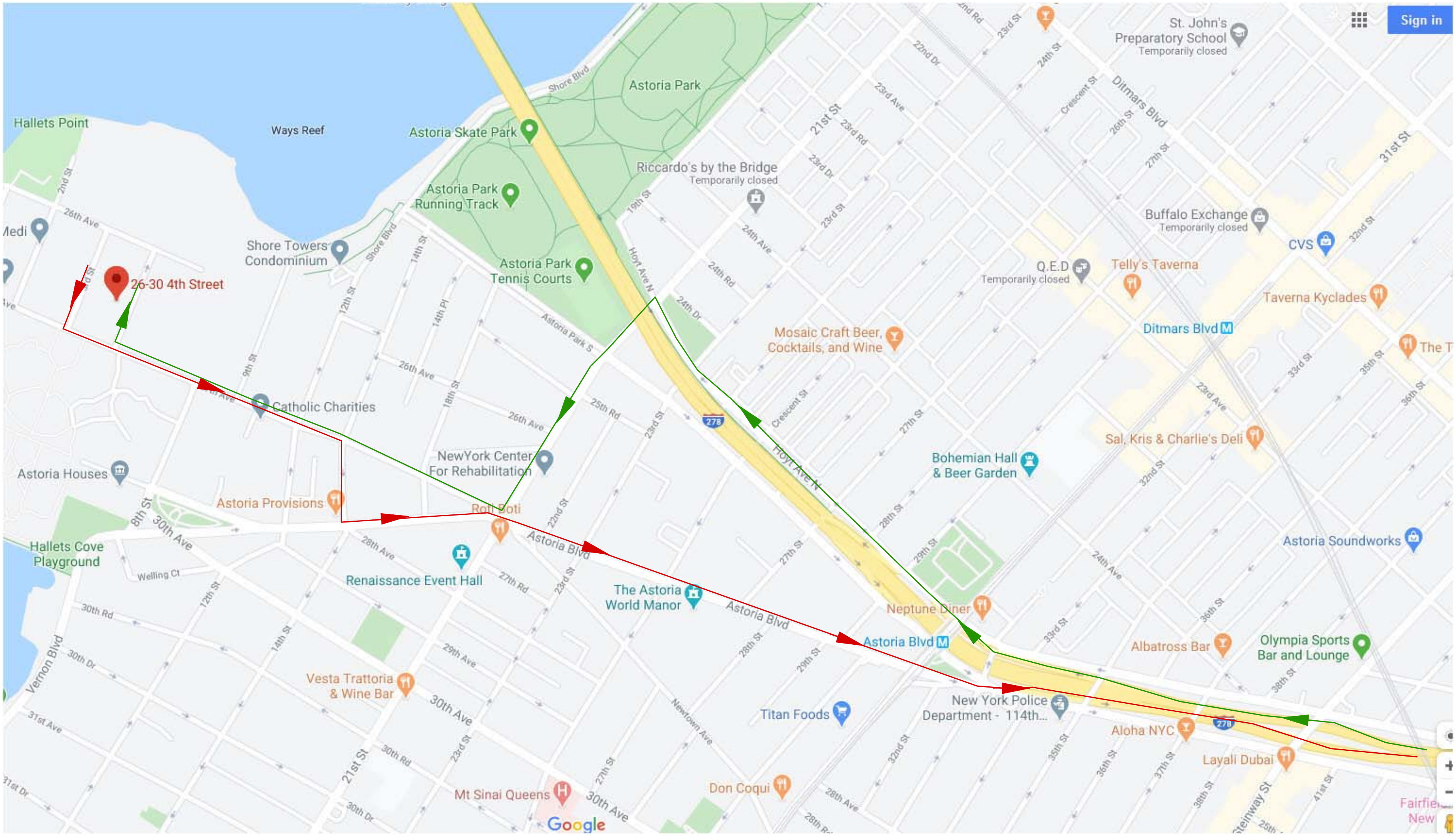
Figure No. 9

Site Name: FORMER ANDOR MEDICAL SYSTEMS

Site Address: 26-22 4TH STREET, QUEENS, NY

Drawing Title: POSTED SOIL VAPOR DETECTIONS

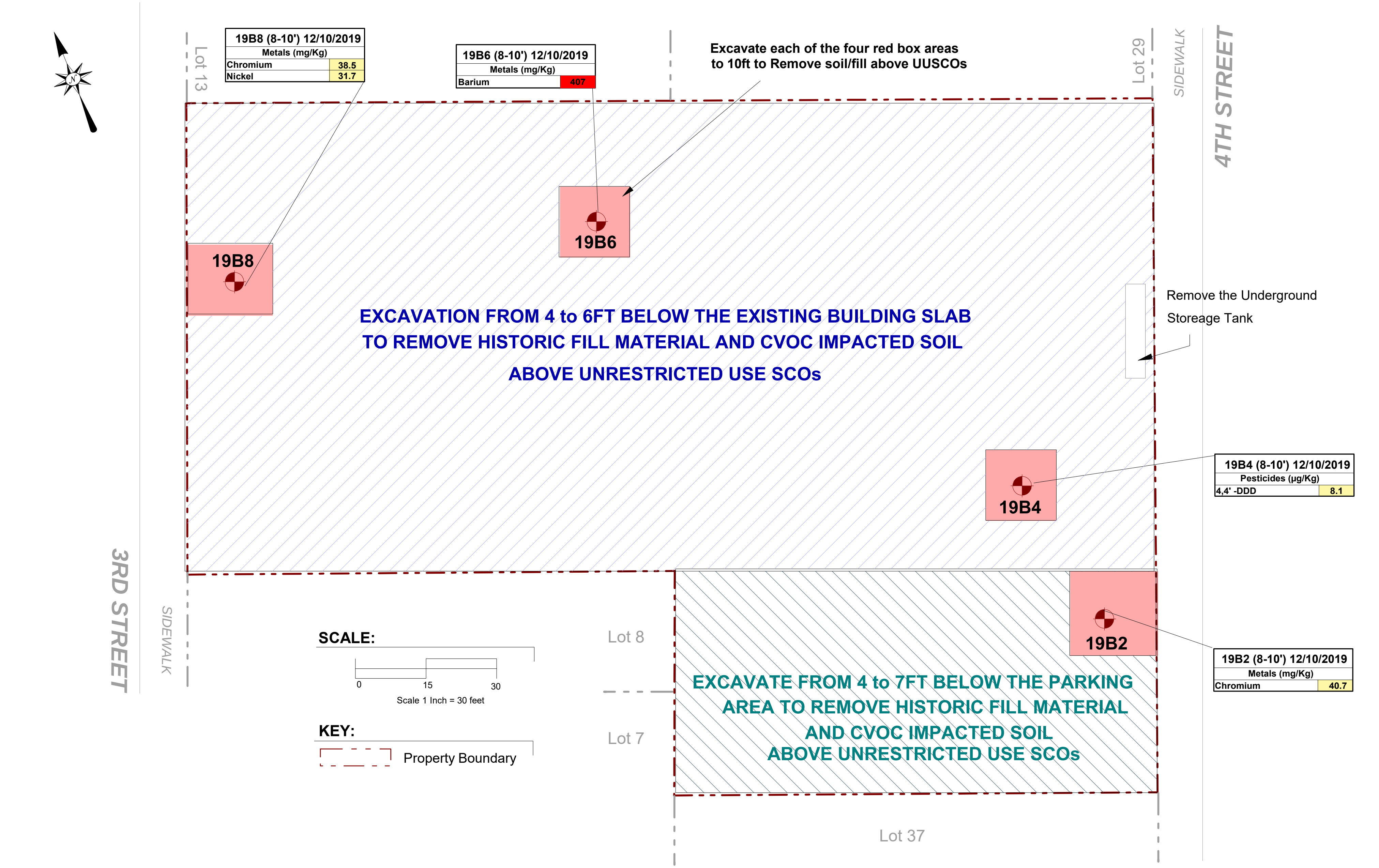


Key:

→ (green)	Inbound Truck Route
← (red)	Outbound Truck Route

4/20/2020

EBC Environmental Business Consultants Phone 631.504.6000 Fax 631.924.2870	Figure No. 10	Site Name: Former Andor Medical Systems Site Address: 26-22 4th Street, Queens, NY 11102 Drawing Title: Truck Route Map

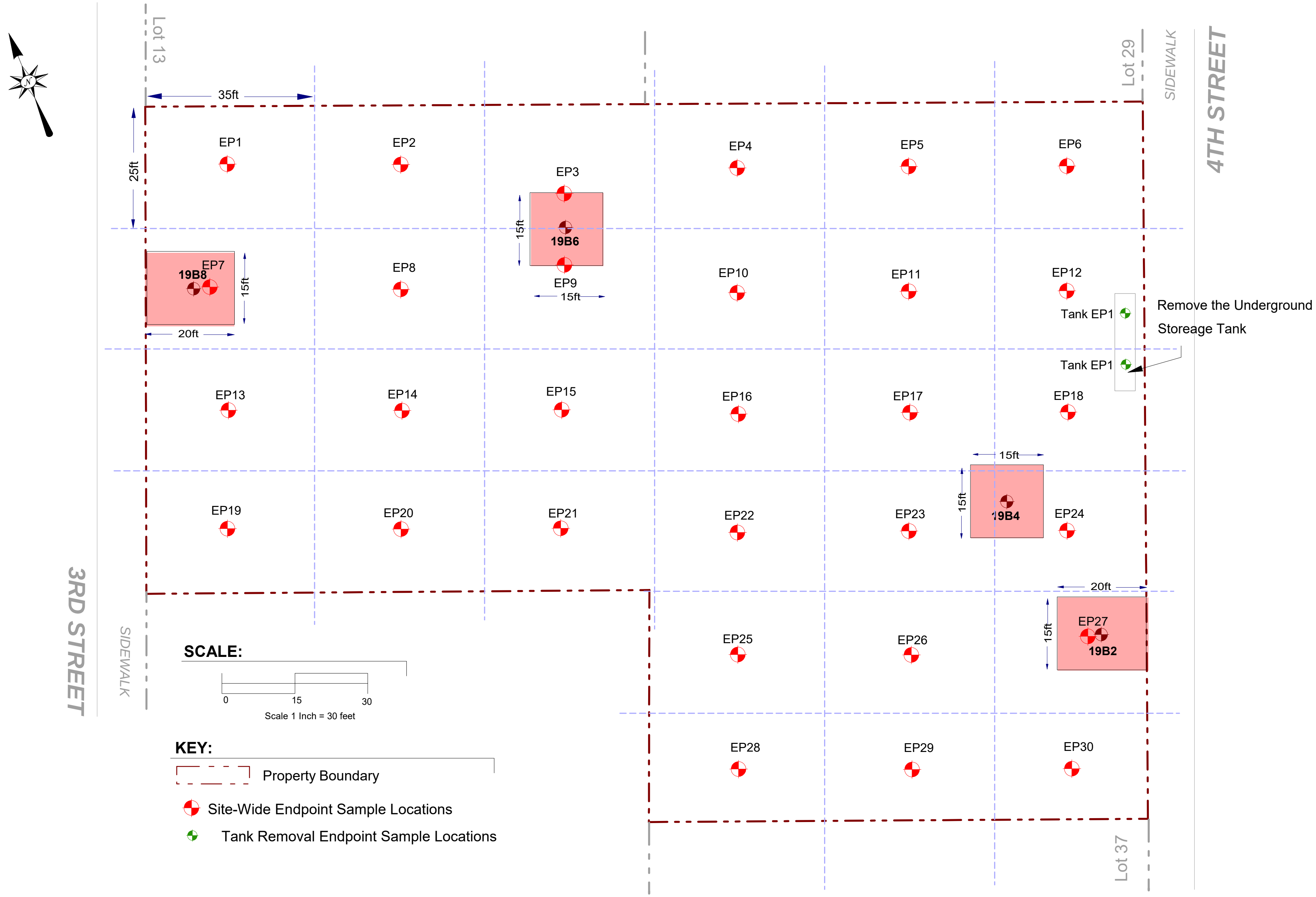


4/13/2020

AMC Engineering
1836 42nd Street
Astoria, NY 11105

Figure No.
11

Site Name: FORMER ANDOR MEDICAL SYSTEMS
Site Address: 26-22 4TH STREET, QUEENS, NY
Drawing Title: EXCAVATION PLAN



4/13/2020

AMC Engineering
1836 42nd Street
Astoria, NY 11105

Figure No.
12

Site Name: FORMER ANDOR MEDICAL SYSTEMS
Site Address: 26-22 4TH STREET, QUEENS, NY
Drawing Title: ENDPOINT SAMPLING PLAN

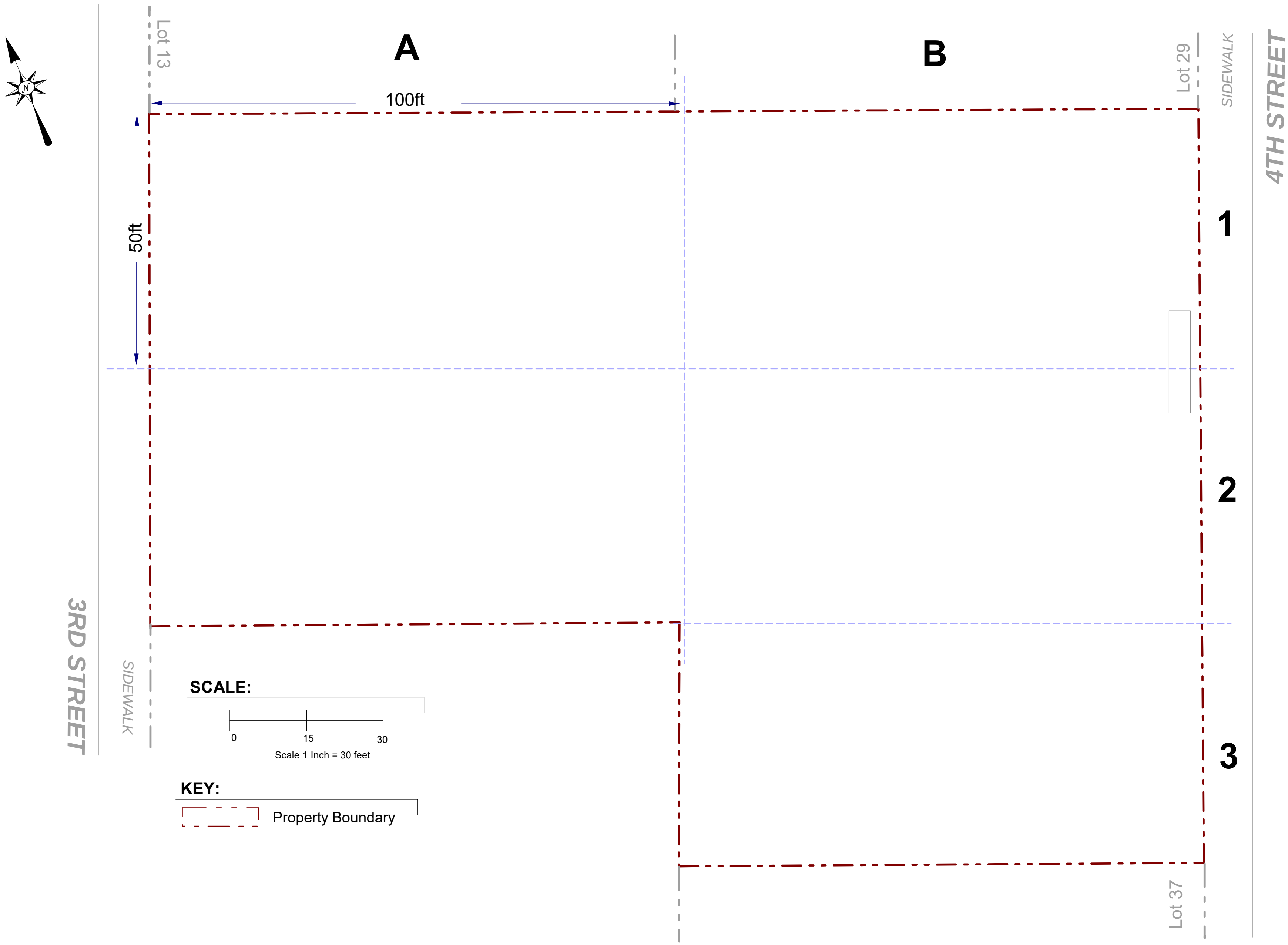


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Figure No. 13

Site Name: Former Andor Medical Systems

Site Address: 26-22 4th Street, Queens, NY

Drawing Title: Alpha-Numeric Grid Map

ATTACHMENT A
Metes and Bounds Description

METES AND BOUNDS DESCRIPTION

BEGINNING at a point on the westerly side of 4th Street as laid out 150.25 feet northerly from the corner formed by the intersection of the westerly side of 4th Street with the northerly side of 27 Avenue as now legally established;

RUNNING THENCE northerly along the westerly side of 4th Street, 147.46 feet;

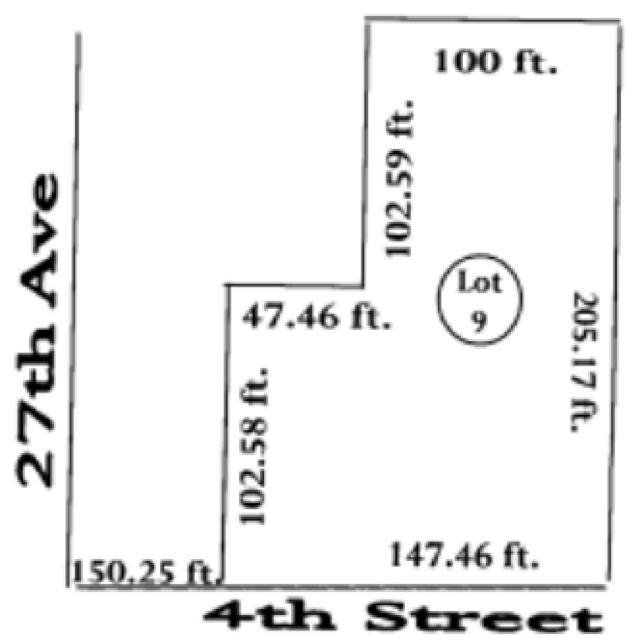
THENCE westerly on a line drawn at right angles to the westerly side of 4th Street, 205.17 feet to the easterly side of 3rd Street (formerly Washington Avenue as now legally established);

THEN Southerly along the easterly side of 3rd Street 100 feet to point distant 192.64 feet northerly measured along the easterly side of 3rd Street from the corner formed by the intersection of the easterly side of 3rd Street with the northerly side of 27th Avenue;

THENCE easterly on a line drawn at right angles to the easterly side of 3rd Street, 102.59 feet;
THENCE southerly on a line drawn at right angles to the easterly side of 3rd Street, 47.46 feet;

THENCE easterly again at right angles to 4th Street, 102.58 feet to the westerly side of 4th Street at the point or place of BEGINNING.

SAID PREMISES being known as Block 910, Lot. 9 as shown on the following diagram.



ATTACHMENT B
Health and Safety Plan

FORMER ANDOR MEDICAL SYSTEMS
BCP SITE NO. C241234
26-22 4th STREET
ASTORIA, NEW YORK 11202
Block 910, Lots 9 and 35

CONSTRUCTION
HEALTH AND SAFETY PLAN

Prepared for:
4th Street Developments LLC
143 Division Avenue
Brooklyn, NY 11211

Prepared by:

EBC
ENVIRONMENTAL BUSINESS CONSULTANTS
1808 Middle Country Road
Ridge, NY 11961

TABLE OF CONTENTS
CONSTRUCTION HEALTH AND SAFETY PLAN

TABLE OF CONTENTS
CONSTRUCTION HEALTH AND SAFETY PLAN

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 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 Site 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 owner 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.

Work performed under the remedial action will not involve confined space entry since the excavations will be large and sloped back in accordance with NYCDOB shoring requirements and will not have a limited or restricted means for entry or exit.

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.

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- 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 CHASP 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	Project Manager	1808 Middle Country Rd Ridge, NY 11961	(631) 504-6000
Ms. Chawinie Reilly	Health & Safety Manager	1808 Middle Country Rd Ridge, NY 11961	(631) 504-6000
Mr. Thomas 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.

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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 addresses for the Site are 26-22 4th Street and 26-30 4th Street, Queens, New York 11102 (**Figure 1**). The Site is located in the Astoria neighborhood of Queens County and is comprised of a two tax lots (Block 910, Lots 9 & 35) totaling 25,473 square feet (0.584 acres). The Site is rectangular shaped with 100 feet of frontage along 3rd Street and 147.75 feet of frontage along 4th Street (**Figure 2**).

The Site is improved with one-story 20,000 sf industrial building constructed in 1961 (estimate) on Lot 9. The building is currently vacant. Lot 35 is a paved parking area which was previously used by the former Lot 9 tenant. The entire site is covered by either the concrete building slab or the asphalt parking lot with no exposed soil.

2.1 Summary of Remedial Investigation

Investigations performed at the Site include the following:

- Phase I Environmental Site Assessment (AES, August, 2018)
- Focused Phase II Subsurface Site Investigation (AES, October, 2018)
- Remedial Investigation Report (EBC, March 2020)

Phase I Environmental Site Assessment (AES)

In August 2018, Associated Environmental Services (AES) performed a due diligence Phase I Environmental Site Assessment at the 26-22 4th Street property. AES reported the following Recognized Environmental Conditions (RECs) in connection with the Property:

- The Property was occupied by Andor Medical Systems around 1991 which may have used chemicals related to medical imaging.
- According to NYCDOB, Department of Finance Building Classification for Lot 35 is GARAGE/GAS STATION.
- A data gap exists for the tenants of the Property from 1961 to 1983.
- A 2,000-gallon fuel oil underground storage tank (UST) is present at the Property. According to the records provided, the UST had recently passed a tightness test. However, the UST is registered as being installed in 1961. Due to the age and known useful life of single wall steel USTs (approximately 30 years) and the fact the top has been excavated, subsurface testing is recommended.

Focused Subsurface Site Investigation (AES, October 2018)

The subsurface investigation performed by AES was performed as part of a due diligence environmental assessment to further investigate the property and recognized environmental conditions that were identified in the Phase I ESA report. The subsurface investigation included a geophysical survey, and the advancement of 9 soil borings and the collection of 3 groundwater samples.

The results of soil analysis reported elevated levels of volatile and semi-volatile organic compounds (VOCs/SVOCs), pesticides, PCBs and metals. The chlorinated solvents cis-1,2-dichloroethene, (cis-DCE), tetrachloroethene (PCE) and trichloroethene (TCE) were reported above Protection of Groundwater Soil Cleanup Objectives (SCOs) in one or more samples. Multiple SVOCs were reported in 4 of 6 soil samples above Restricted Residential and/or Restricted Commercial SCOs. The metals barium and lead were also reported above Restricted

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Commercial SCOs. The pesticide 4,4'-DDE, the PCB PCB-1254, and the metal mercury were all reported above Unrestricted Use SCOs.

The chlorinated VOCs, PCE, TCE and cis-DCE were all reported above Groundwater Quality Standards in all three groundwater samples collected by AES.

Summary of the Remedial Investigation

A Remedial Investigation was completed at the Site from December 10, 2019, through December 30, 2019, and documented in a Remedial Investigation Report dated March 2020. 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:

- The installation of ten soil borings to collect twenty soil samples for laboratory analysis of volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, PCBs, metals and emerging contaminants;
- The installation of six groundwater monitoring wells and the collection of six groundwater samples for laboratory analysis of VOCs, SVOCs, pesticides, PCBs, and total and dissolved metals and emerging contaminants;
- The collection of analysis of eight sub-slab soil gas samples for VOCs from eight sub-slab soil gas sampling locations.

The results of sampling performed during this RI identified historic fill material across the Site to depths as great as 5 feet below the asphalt parking area (Lot 35), and as great as 5 feet below the existing building's concrete slab (Lot 9). Depending on location, the historic fill material contains one or more of the metals arsenic, barium, chromium, copper, lead, or mercury, PCBs (PCB-1260), or pesticides (4,4'-DDD, 4,4'-DDT), above Unrestricted Use and/or Restricted Residential and/or Commercial SCOs. The chlorinated VOC PCE was detected above Unrestricted Use SCOs and Protection of Groundwater SCOs within two shallow soil samples.

PCE was detected within the groundwater samples collected in the central area of the existing building (Lot 9), the northeast corner of the existing building (Lot 9), and in the parking area (Lot 35). Concentrations were low (<10 µg/L) in all samples with the exception of the MW2 groundwater sample located in the south – central area of the parking area (Lot 35) near the property line. The PCE concentration at the MW2 location was 43 µg/L. The pesticide 4,4'-DDT was detected in the parts per trillion range in two of the samples and is likely related to suspended solids in the groundwater samples. Two dissolved metals were detected in all of the groundwater samples. Manganese and sodium were detected above AWQS in all six wells and are attributable to residual salt water intrusion. Low levels of PFAS compounds were detected in groundwater throughout the Site.

Petroleum-related VOCs were generally low in the sub-slab soil gas samples and were consistent with typical background levels. Chlorinated VOCs in soil vapor included PCE (ranged from 6.07 $\mu g/m^3$ to 1,130 $\mu g/m^3$), TCE (ranged from 9.18 $\mu g/m^3$ to 57.5 $\mu g/m^3$), and cis-DCE (ranged from 5.67 $\mu g/m^3$ to 201 $\mu g/m^3$). PCE was reported in all eight sub-slab soil gas samples, and TCE and cis-DCE were detected within 5 and 4 of the eight sub-slab soil gas samples respectively. The

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highest CVOC concentrations were in the northeast corner of the building and did not correlate with the highest concentrations in soil or in groundwater.

2.2 Description of Remedial Action

Site activities included within the Remedial Action that are included within the scope of this CHASP include the following:

The remedy recommended for the Site is a Track 1 remedy (Alternative 1), which consists of the removal of all on-Site soil in exceedance of Track 1 Unrestricted Use Soil Cleanup Objectives (SCOs). It is expected that a Track 1 alternative will require excavation across the Site to depths varying between 4 and 6 feet below grade to removal all historic fill material with additional excavation to up to 10 feet below grade in some areas. All CVOC impacted soil and all non-hazardous fill material with parameters above Protection of Groundwater SCOs and Unrestricted Use SCOs will be removed from the Site and properly disposed of at off-site facilities. The Track 1 alternative also includes remediation of groundwater through dewatering during excavation activities. Over-excavated areas and portions of the Site that require grade to be raised will be backfilled with either virgin mined materials, recycled materials, or certified fill which meet Unrestricted Use SCOs.

1. Excavation of CVOC impacted soil exceeding Protection of Groundwater SCOs and Track 1 Unrestricted Use SCOs as listed in Table 1;
2. Excavation of historic fill material exceeding Track 1 Unrestricted Use SCOs as listed in Table 1 to depths varying between 4 and 6 feet across the Site with additional excavation to depths as great as 10 ft in some areas as needed to meet Track 1 Unrestricted Use SCOs;
3. Screening for indications of contamination (by visual means, odor, and monitoring with PID) of all excavated soil during any intrusive Site work;
4. Collection and analysis of end-point samples to evaluate the performance of the remedy with respect to attainment of Track 1 Unrestricted Use SCOs;
5. 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;
6. Installation of SOE and a dewatering system to allow for excavation/removal of CVOC impacted soil and historic fill material at/below the groundwater table, and discharge of groundwater to the NYC sewer system under a NYCDEP sewer discharge permit;
7. 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;
8. If Track 1 SCOs are not achieved, and Track 2 Restricted Residential SCOs are also not achieved, a composite cover system consisting of the concrete building slab will be constructed.

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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.

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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.
   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.

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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

"Urban 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 (VOCs), semi-volatile organic compounds (SVOCs), pesticides, polychlorinated biphenyl's (PCBs), and heavy metals such as arsenic, chromium, lead and mercury.

Based on the findings of the Remedial Investigation and the inherent properties of urban fill, the following compounds are considered for the site as potential contaminants: volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, and heavy metals.

Volatile organic compounds reported to be present in soil, soil gas and/or groundwater include the following:

Acetone	Cis-1,2-dichloroethene	Tetrachloroethene	Trichloroethene

Semi-Volatile organic compounds reported to be present in soil and / or fill materials include the following:

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

Pesticides reported to be present in soil and / or fill materials include the following:

4'-4'-DDE	4,4'-DDD	4'-4'-DDT

PCBs reported to be present in soil and / or fill materials include the following:

PCB-1254	PCB-1260

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Metals reported to be present in fill materials include the following:

Arsenic	Barium	Chromium	Copper
Lead	Mercury	Nickel	Zinc

The primary routes of exposure to these contaminants are inhalation, ingestion and absorption. **Appendix C** includes information sheets for suspected chemicals that may be encountered at the site.

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 office will employ dust monitoring using a particulate monitor (Miniram 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 pet VOCs were detected in soil and groundwater 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.

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- 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.

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.

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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. **It is expected that the entire fenced in area of the Site will be the exclusion zone, with the decontamination zone the Site entrance.** The support zone will be the office trailer.

Tasks requiring OSHA 40-hour Hazardous Waste Operations and Emergency Response Operations training are carried out in the exclusion zone. The exclusion zone is defined by the site safety officer but will typically be a 50-foot area around work activities. 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.

6.2 General Site Work

An excavation contractor with appropriate experience, personnel and training (40 hr OSHA Hazardous Waste Operations and Emergency Response Operations - HAZWOPER) is required to perform the removal of the lead hazardous soil. After this material is removed the contractor will remove historic fill and uncontaminated soil. The excavation contractor’s on-site personnel engaged in historic fill and native soil removal will have a minimum of 24 hour HAZWOPER training.

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
Mount Sinai Queens – General Hospital	1- **(718) 932-1000**
NYSDEC Spills Division	1-800-457-7362
NYSDEC Division of Env. Remediation	1-718-482-4900
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 Superintendent — Abraham Guttman (929) 441-0051
- 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.
- 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

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

ICSC: 0087

International Chemical Safety Cards

ACETONE

ICSC: 0087

IMPORTANT DATA	**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**

Material Safety Data Sheet
cis-1,2-Dichloroethylene, 97%

ACC# 97773

Section 1 - Chemical Product and Company Identification

MSDS Name: cis-1,2-Dichloroethylene, 97%
Catalog Numbers: AC113380000, AC113380025, AC113380100
Synonyms: cis-Acetylene dichloride.
Company Identification:
Acros Organics N.V.
One Reagent Lane
Fair Lawn, NJ 07410
For information in North America, call: 800-ACROS-01
For emergencies in the US, call CHEMTREC: 800-424-9300

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
156-59-2	cis-1,2-Dichloroethylene	97	205-859-7

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: Clear liquid. Flash Point: 6 deg C.
Warning! **Flammable liquid and vapor.** Harmful if inhaled. Unstabilized substance may polymerize. Causes eye and skin irritation. May be harmful if swallowed. May cause respiratory tract irritation.
Target Organs: Central nervous system, respiratory system, eyes, skin.

Potential Health Effects
Eye: Causes moderate eye irritation.
Skin: Causes moderate skin irritation. May cause dermatitis.
Ingestion: May cause gastrointestinal irritation with nausea, vomiting and diarrhea. May be harmful if swallowed. May cause central nervous system depression.
Inhalation: May cause respiratory tract irritation. May cause narcotic effects in high concentration. Eye irritation, vertigo, and nausea were reported in humans exposed at 2200 ppm.
Chronic: Not available. Some German investigators reported fatty degeneration of the liver upon repeated narcotic doses in rats and

Section 4 - First Aid Measures

Eyes: In case of contact, immediately flush eyes with plenty of water for a t least 15 minutes. Get medical aid.
Skin: In case of contact, flush skin with plenty of water. Remove contaminated clothing and shoes. Get medical aid if irritation develops and persists. Wash clothing before reuse.
Ingestion: If swallowed, do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical aid.
Inhalation: If inhaled, remove to fresh air. 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. Vapors may form an explosive mixture with air. Use water spray to keep fire-exposed containers cool. Flammable liquid and vapor. Fire or excessive heat may result in violent rupture of the container due to bulk polymerization. Vapors are heavier than air and may travel to a source of ignition and flash back. Vapors can spread along the ground and collect in low or confined areas. Hazardous polymerization may occur under fire conditions.
Extinguishing Media: Use water fog, dry chemical, carbon dioxide, or regular foam.
Flash Point: 6 deg C (42.80 deg F)
Autoignition Temperature: 440 deg C (824.00 deg F)
Explosion Limits, Lower:9.70 vol %
Upper: 12.80 vol %
NFPA Rating: (estimated) Health: 2; Flammability: 3; Instability: 2

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Remove all sources of ignition. Use a spark-proof tool. Provide ventilation.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Ground and bond containers when transferring material. Use spark-proof tools and explosion proof equipment. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Avoid ingestion and inhalation. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames. Use only with adequate ventilation. Pure vapor will be uninhibited and may polymerize in vents or other confined spaces.
Storage: Keep away from sources of ignition. Store in a tightly closed container. Flammables-area. Store protected from light and air.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Use process enclosure, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits. Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
cis-1,2-Dichloroethylene	200 ppm TWA	none listed	none listed

OSHA Vacated PELs: cis-1,2-Dichloroethylene: No OSHA Vacated PELs are listed for this chemical.
Personal Protective Equipment
Eyes: Wear chemical splash goggles.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Section 9 - Physical and Chemical Properties

Physical State: Liquid
Appearance: Clear
Odor: Pleasant odor
pH: Not available.
Vapor Pressure: 201 mm Hg @ 25 deg C
Vapor Density: 3.34 (air=1)
Evaporation Rate: Not available.
Viscosity: Not available.
Boiling Point: 60 deg C @ 760 mm Hg
Freezing/Melting Point:-80 deg C
Decomposition Temperature: Not available.
Solubility: Insoluble.
Specific Gravity/Density:1.2800
Molecular Formula:C2H2Cl2
Molecular Weight:96.94

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures. This material is a monomer and may polymerize under certain conditions if the stabilizer is lost.
Conditions to Avoid: Light, ignition sources, exposure to air, excess heat.
Incompatibilities with Other Materials: Strong oxidizing agents, strong bases, copper.
Hazardous Decomposition Products: Hydrogen chloride, phosgene, carbon monoxide, carbon dioxide.
Hazardous Polymerization: May occur.

Section 11 - Toxicological Information

RTECS#:
CAS# 156-59-2: KV9420000
LD50/LC50:
CAS# 156-59-2:
Inhalation, rat: LC50 = 13700 ppm;
.

Carcinogenicity:
CAS# 156-59-2: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: No data available.
Teratogenicity: No data available.
Reproductive Effects: No data available.
Mutagenicity: No data available.
Neurotoxicity: No data available.
Other Studies:

Section 12 - Ecological Information

No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	DOT regulated - small quantity provisions apply (see 49CFR173.4)	1,2-DICHLOROETHYLENE
Hazard Class:		3
UN Number:		UN1150
Packing Group:		II

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 156-59-2 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
CERCLA Hazardous Substances and corresponding RQs
None of the chemicals in this material have an RQ.
SARA Section 302 Extremely Hazardous Substances
None of the chemicals in this product have a TPQ.
Section 313 No chemicals are reportable under Section 313.
Clean Air Act:
This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
None of the chemicals in this product are listed as Hazardous Substances under the CWA.
None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.
OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.
STATE
CAS# 156-59-2 can be found on the following state right to know lists: Pennsylvania, Massachusetts.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European / International Regulations
European Labeling in Accordance with EC Directives
Hazard Symbols:
XN F
Risk Phrases:

R 11 Highly flammable.
R 20 Harmful by inhalation.
R 52/53 Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Safety Phrases:
S 16 Keep away from sources of ignition - No smoking.
S 29 Do not empty into drains.
S 7 Keep container tightly closed.
S 61 Avoid release to the environment. Refer to special instructions /safety data sheets.

WGK (Water Danger/Protection)
CAS# 156-59-2: No information available.
Canada - DSL/NDSL
CAS# 156-59-2 is listed on Canada's NDSL List.
Canada - WHMIS
WHMIS: Not available.
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.
Canadian Ingredient Disclosure List

Section 16 - Additional Information

MSDS Creation Date: 2/09/1998
Revision #5 Date: 3/16/2007

International Chemical Safety Cards

TETRACHLOROETHYLENE

ICSC: 0076

UNEP

National Institute for Occupational Safety and Health

NIOSH

1,1,2,2-Tetrachloroethylene
Perchloroethylene
Tetrachloroethene
C_2Cl_4 / $Cl_2C=CCl_2$
Molecular mass: 165.8

ICSC # 0076
CAS # 127-18-4
RTECS # KX3850000
UN # 1897
EC # 602-028-00-4
April 13, 2000 Validated

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		STRICT HYGIENE! PREVENT GENERATION OF MISTS!	
•INHALATION	Dizziness. Drowsiness. Headache. Nausea. Weakness. Unconsciousness.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
•SKIN	Dry skin. Redness.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES	Redness. Pain.	Safety goggles , face shield .	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Abdominal pain. (Further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Give plenty of water to drink. Rest.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Ventilation. 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. Personal protection: filter respirator for organic gases and vapours.	Separated from metals ,(see Chemical Dangers), food and feedstuffs . Keep in the dark. Ventilation along the floor.	Do not transport with food and feedstuffs. Marine pollutant. Xn symbol N symbol R: 40-51/53 S: (2-)23-36/37-61 UN Hazard Class: 6.1 UN Packing Group: III

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0076

International Chemical Safety Cards

TETRACHLOROETHYLENE

ICSC: 0076

IMPORTANT DATA

PHYSICAL STATE; APPEARANCE:
COLOURLESS LIQUID , WITH CHARACTERISTIC ODOUR.

PHYSICAL DANGERS:
The vapour is heavier than air.

CHEMICAL DANGERS:
On contact with hot surfaces or flames this substance decomposes forming toxic and corrosive fumes (hydrogen chloride, phosgene, chlorine). The substance decomposes slowly on contact with moisture producing trichloroacetic acid and hydrochloric acid. Reacts with metals such as aluminium, lithium, barium, beryllium.

OCCUPATIONAL EXPOSURE LIMITS:
TLV: 25 ppm as TWA, 100 ppm as STEL; A3 (confirmed animal carcinogen with unknown relevance to humans); BEI issued; (ACGIH 2004).
MAK: skin absorption (H);
Carcinogen category: 3B;
(DFG 2004).
OSHA PEL†: TWA 100 ppm C 200 ppm 300 ppm (5-minute maximum peak in any 3-hours)
NIOSH REL: Ca Minimize workplace exposure concentrations. See Appendix A
NIOSH IDLH: Ca 150 ppm See: 127184

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation 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 . If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. The substance may cause effects on the central nervous system. Exposure at high levels may result in unconsciousness.

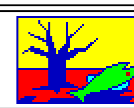
EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the liver and kidneys. This substance is probably carcinogenic to humans.

PHYSICAL PROPERTIES

Boiling point: 121°C
Melting point: -22°C
Relative density (water = 1): 1.6
Solubility in water, g/100 ml at 20°C: 0.015
Vapour pressure, kPa at 20°C: 1.9
Relative vapour density (air = 1): 5.8
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.09
Octanol/water partition coefficient as log Pow: 2.9

ENVIRONMENTAL DATA

The substance is toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment.



NOTES

Depending on the degree of exposure, periodic medical examination is suggested. The odour warning when the exposure limit value is exceeded is insufficient. Do NOT use in the vicinity of a fire or a hot surface, or during welding. An added stabilizer or inhibitor can influence the toxicological properties of this substance, consult an expert. Card has been partly updated in April 2005. See section Occupational Exposure Limits.

Transport Emergency Card: TEC (R)-61S1897

NFPA Code: H2; F0; R0;

ADDITIONAL INFORMATION

ICSC: 0076 **TETRACHLOROETHYLENE**

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

TRICHLOROETHYLENE

ICSC: 0081

1,1,2-Trichloroethylene
Trichloroethene
Ethylene trichloride
Acetylene trichloride
C_2HCl_3 / $ClCH{=}CCl_2$
Molecular mass: 131.4

ICSC # 0081
CAS # 79-01-6
RTECS # KX4550000
UN # 1710
EC # 602-027-00-9
April 10, 2000 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible under specific conditions. See Notes.		In case of fire in the surroundings: all extinguishing agents allowed.
EXPLOSION		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! STRICT HYGIENE!	
•INHALATION	Dizziness. Drowsiness. Headache. Weakness. Nausea. Unconsciousness.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Artificial respiration may be needed. 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, 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. (Further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Give one or two glasses of water to drink. Rest.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Ventilation. Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. 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.	Separated from metals (see Chemical Dangers), strong bases, food and feedstuffs . Dry. Keep in the dark. Ventilation along the floor. Store in an area without drain or sewer access.	Do not transport with food and feedstuffs. Marine pollutant. T symbol R: 45-36/38-52/53-67 S: 53-45-61 UN Hazard Class: 6.1 UN Packing Group: III

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0081 OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

TRICHLOROETHYLENE

ICSC: 0081

IMPORTANT DATA

PHYSICAL STATE; APPEARANCE:
COLOURLESS LIQUID , WITH CHARACTERISTIC ODOUR.

PHYSICAL DANGERS:
The vapour is heavier than air. As a result of flow, agitation, etc., electrostatic charges can be generated.

CHEMICAL DANGERS:
On contact with hot surfaces or flames this substance decomposes forming toxic and corrosive fumes (phosgene , hydrogen chloride). The substance decomposes on contact with strong alkali producing dichloroacetylene , which increases fire hazard. Reacts violently with metal powders such as magnesium, aluminium, titanium, and barium. Slowly decomposed by light in presence of moisture, with formation of corrosive hydrochloric acid.

OCCUPATIONAL EXPOSURE LIMITS:
TLV: 50 ppm as TWA; 100 ppm as STEL; A5; BEI issued; (ACGIH 2004).
MAK:
Carcinogen category: 1; Germ cell mutagen group: 3B; (DFG 2007).
OSHA PEL†: TWA 100 ppm C 200 ppm 300 ppm (5-minute maximum peak in any 2 hours)
NIOSH REL: Ca See Appendix A See Appendix C
NIOSH IDLH: Ca 1000 ppm See: 79016

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation and by ingestion.

INHALATION RISK:
A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C.

EFFECTS OF SHORT-TERM EXPOSURE:
The substance is irritating to the eyes and the skin . 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 , resulting in respiratory failure . Exposure could cause lowering of consciousness.

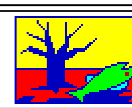
EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the central nervous system , resulting in loss of memory. The substance may have effects on the liver and kidneys (see Notes). This substance is probably carcinogenic to humans.

PHYSICAL PROPERTIES

Boiling point: 87°C
Melting point: -73°C
Relative density (water = 1): 1.5
Solubility in water, g/100 ml at 20°C: 0.1
Vapour pressure, kPa at 20°C: 7.8
Relative vapour density (air = 1): 4.5
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.3
Auto-ignition temperature: 410°C
Explosive limits, vol% in air: 8-10.5
Octanol/water partition coefficient as log Pow: 2.42
Electrical conductivity: 800pS/m

ENVIRONMENTAL DATA

The substance is harmful to aquatic organisms. The substance may cause long-term effects in the aquatic environment.



NOTES

Combustible vapour/air mixtures difficult to ignite, may be developed under certain conditions. Use of alcoholic beverages enhances the harmful effect. Depending on the degree of exposure, periodic medical examination is suggested. The odour warning when the exposure limit value is exceeded is insufficient. Do NOT use in the vicinity of a fire or a hot surface, or during welding. An added stabilizer or inhibitor can influence the toxicological properties of this substance, consult an expert.

Transport Emergency Card: TEC (R)-61S1710

NFPA Code: H2; F1; R0;
Card has been partially updated in October 2004: see Occupational Exposure Limits, EU Classification, Emergency Response.
Card has been partially updated in April 2010: see Occupational Exposure Limits, Ingestion First Aid, Storage.

ADDITIONAL INFORMATION

ICSC: 0081	**TRICHLOROETHYLENE**

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.

BENZ(a)ANTHRACENE

ICSC: 0385

National Institute for Occupational Safety and Health

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

BENZ(a)ANTHRACENE

IMPORTANT DATA

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

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

I M P O R T A N T D A T A

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/cm^3
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:** COLOURLESS CRYSTALS	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation

I 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**

International Chemical Safety Cards

BENZO(g,h,i)FLUORANTHENE

ICSC: 0527

2,13-Benzofluoranthene
Benzo(mno)fluoranthene
$C_{18}H_{10}$
Molecular mass: 226.3

ICSC # 0527
CAS # 203-12-3
RTECS # DF6140000
March 25, 1998 Peer reviewed

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible.	NO open flames.	Water spray, powder.
EXPLOSION			
EXPOSURE		PREVENT DISPERSION OF DUST!	
•INHALATION		Local exhaust or breathing protection.	
•SKIN	MAY BE ABSORBED!	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention. Wear protective gloves when administering first aid.
•EYES		Safety goggles, 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		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.	Well closed.	R: S:

SEE IMPORTANT INFORMATION ON BACK

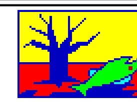
ICSC: 0527

International Chemical Safety Cards

BENZO(g,h,i)FLUORANTHENE

ICSC: 0527

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.

ORTANT DATA		
	CHEMICAL DANGERS: The substance decomposes on heating producing toxic fumes. **OCCUPATIONAL EXPOSURE LIMITS:** TLV not established.	**INHALATION RISK:** **EFFECTS OF SHORT-TERM EXPOSURE:** **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** See Notes.
PHYSICAL PROPERTIES	Melting point: 149°C Solubility in water: none Vapour pressure, Pa at 20°C: <10	Relative vapour density (air = 1): 7.8 Relative density of the vapour/air-mixture at 20°C (air = 1): 1.0 Octanol/water partition coefficient as log Pow: 7.23
ENVIRONMENTAL DATA	This substance may be hazardous to the environment; special attention should be given to the total environment. In the food chain important to humans, bioaccumulation takes place, specifically in oils and fats. 	

N O T E S

Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken. Also consult ICSC #0720 and 0721.

ADDITIONAL INFORMATION

ICSC: 0527 **BENZO(g,h,i)FLUORANTHENE**

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.

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 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**

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

CHRYSENE

ICSC: 1672

National Institute for Occupational Safety and Health

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.

N O T E S

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

International Chemical Safety Cards

DIBENZO(a,h)ANTHRACENE

ICSC: 0431

1,25,6-Dibenzanthracene
$C_{22}H_{14}$
Molecular mass: 278.4

ICSC # 0431
CAS # 53-70-3
RTECS # HN2625000
EC # 601-041-00-2
October 23, 1995 Peer reviewed

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible.	NO open flames.	Water spray, powder.
EXPLOSION			
EXPOSURE		AVOID ALL CONTACT!	
•INHALATION		Local exhaust or breathing protection.	Fresh air, rest.
•SKIN	Redness. Swelling. Itching.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES	Redness.	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: P3 filter respirator for toxic particles.	Well closed.	T symbol N symbol R: 45-50/53 S: 53-45-60-61

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0431

International Chemical Safety Cards

DIBENZO(a,h)ANTHRACENE

ICSC: 0431

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PHYSICAL STATE; APPEARANCE:
COLOURLESS CRYSTALLINE POWDER.

PHYSICAL DANGERS:

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

R T A N T D A T A	**CHEMICAL DANGERS:** **OCCUPATIONAL EXPOSURE LIMITS:** TLV not established.	of airborne particles can, however, be reached quickly. **EFFECTS OF SHORT-TERM EXPOSURE:** **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** The substance may have effects on the skin , resulting in photosensitization. This substance is probably carcinogenic to humans.
PHYSICAL PROPERTIES	Boiling point: 524°C Melting point: 267°C Relative density (water = 1): 1.28	Solubility in water: none Octanol/water partition coefficient as log Pow: 6.5
ENVIRONMENTAL DATA	Bioaccumulation of this chemical may occur in seafood.	

N O T E S

This 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. DBA is a commonly used name. This substance is one of many polycyclic aromatic hydrocarbons (PAH).

ADDITIONAL INFORMATION

ICSC: 0431 **DIBENZO(a,h)ANTHRACENE**

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**

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

ALL MSDS PAGES IN THIS GROUP

4-Cyano-4-Phenylpiperidine Hydrochloride, 99% (TLC)	51304-58-6
Methanesulfonamide	3144-09-0
gamma-Octanoic lactone, 98%	104-50-7
Cis,cis,cis,cis-1,2,3,4-cyclopentane- tetracarboxylic dianhydride,	4802-47-5
Tetrachloroethylene Carbonate, 98+%	22432-68-4
Oxamic Acid, 98%	471-47-6
1O,11-Dihydro-5H-Dibenzo(A,D)-Cycloheptene, 98%	833-48-7
Thallium (I) Sulfate, 99.9+%	7446-18-6
N-(2,6-Dimethylphenylcarbamoyl-Methyl)-Iminodiacetic Acid, 99%	59160-29-1
P-(Dimethylamino)cinnamic Acid, 99%	1552-96-1
Biebrich Scarlet, 99% (UV-VIS)	4196-99-0
4-Chlorobenzenediazonium hexafluoro- phosphate	1582-27-0
Ammonium hexachloroiridate(IV), 99.99%	16940-92-4
Methylamine-d2 deuteriochloride, 98+ atom % D	593-51-1
2,2-Bis-(4-chlorophenyl)-1,1-dichloroethylene, 99%	72-55-9
Nitro red	56431-61-9
Methyl 2,3-dichlorobenzoate, 98+%	2905-54-6
Isopropyl Bromoacetate, 98% (GC)	29921-57-1
1-Iodo-4-Nitrobenzene, 99%	636-98-6
4-Ethylcyclohexanol, 99% cis/trans mixture	4534-74-1
Fluorescamine	38183-12-9
Tris(2,2,6,6-Tetramethyl-3,5-Heptanedionato)Dysprosium(III), 99+%	15522-69-7
3-Amino-2,2,5,5-Tetramethyl-1-Pyrrolidinyloxy, 99% (Titr.)	34272-83-8
3,4-Dihydroxyphenylacetic Acid,98%	102-32-9

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.

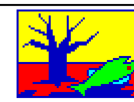
EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
The substance may have effects on the central nervous system and liver. This substance is possibly carcinogenic to humans. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

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**

International Chemical Safety Cards

POLYCHLORINATED BIPHENYL (AROCLOR 1254)

ICSC: 0939

National Institute for Occupational Safety and Health NIOSH

UNEP

Chlorobiphenyl (54% chlorine)
Chlorodiphenyl (54% chlorine)
PCB
Molecular mass: 327 (average)

ICSC # 0939
CAS # 11097-69-1
RTECS # TQ1360000
UN # 2315
EC # 602-039-00-4
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: powder, carbon dioxide.
EXPLOSION			
EXPOSURE		PREVENT GENERATION OF MISTS! STRICT HYGIENE!	
•INHALATION		Ventilation.	Fresh air, rest. Refer for medical attention.
•SKIN	MAY BE ABSORBED! Dry skin. Redness.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention.
•EYES		Safety goggles, face shield.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Headache. Numbness.	Do not eat, drink, or smoke during work.	Rest. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Consult an expert! Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT let this chemical enter the environment. Personal protection: complete protective clothing including self-contained breathing apparatus.	Separated from food and feedstuffs . Cool. Dry. Keep in a well-ventilated room.	Unbreakable packaging; put breakable packaging into closed unbreakable container. Do not transport with food and feedstuffs. Severe marine pollutant. Note: C Xn symbol N symbol R: 33-50/53 S: 2-35-60-61 UN Hazard Class: 9 UN Packing Group: II

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0939

International Chemical Safety Cards

POLYCHLORINATED BIPHENYL (AROCLOR 1254)

ICSC: 0939

IMPORTANT DATA

PHYSICAL STATE; APPEARANCE:
LIGHT YELLOW VISCOUS LIQUID.

PHYSICAL DANGERS:

CHEMICAL DANGERS:
The substance decomposes in a fire producing irritating and toxic gases .

OCCUPATIONAL EXPOSURE LIMITS:
TLV: 0.5 mg/m^3 as TWA; (skin); A3; (ACGIH 2004).
MAK: 0.05 ppm, 0.70 mg/m^3; H;
Peak limitation category: II(8); Carcinogen category: 3B; Pregnancy risk group: B;
(DFG 2004).
OSHA PEL: TWA 0.5 mg/m^3 skin
NIOSH REL*: Ca TWA 0.001 mg/m^3 See Appendix A *Note: The REL also applies to other PCBs.
NIOSH IDLH: Ca 5 mg/m^3 See: IDLH INDEX

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 contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

EFFECTS OF SHORT-TERM EXPOSURE:

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
Repeated or prolonged contact with skin may cause dermatitis. Chloracne is the most visible effect. The substance may have effects on the liver . Animal tests show that this substance possibly causes toxic effects upon human reproduction.

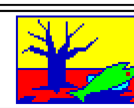
PHYSICAL PROPERTIES

Relative density (water = 1): 1.5
Solubility in water:
none

Vapour pressure, Pa at 25°C: 0.01
Octanol/water partition coefficient as log Pow: 6.30 (estimated)

ENVIRONMENTAL DATA

In the food chain important to humans, bioaccumulation takes place, specifically in aquatic organisms. It is strongly advised not to let the chemical enter into the environment.



NOTES

Changes into a resinous state (pour point) at 10°C. Distillation range: 365°-390°C. Card has been partly updated in October 2004. See sections Occupational Exposure Limits, EU classification, Emergency Response.

Transport Emergency Card: TEC (R)-90GM2-II-L

ADDITIONAL INFORMATION

ICSC: 0939 **POLYCHLORINATED BIPHENYL (AROCLOR 1254)**

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.

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/m^3 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/cm^3

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.

NOTES

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

<table>
<tr><td>IMPORTANT DATA</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/m³ (total) TWA 5 mg/m³ (resp)
NIOSH REL: TWA 10 mg/m³ (total) TWA 5 mg/m³ (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>
</table>

N O T E S

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.

ADDITIONAL INFORMATION

ICSC: 0827 **BARIUM SULFATE**

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/m^3 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/cm^3	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**

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.

O R T A N T D A T A	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/m³ fume (ACGIH 1992-1993). TLV (as Cu, dusts & mists): 1 mg/m³ (ACGIH 1992-1993). Intended change 0.1 mg/m³ Inhal., A4 (not classifiable as a human carcinogen); MAK: 0.1 mg/m³ (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	**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.
PHYSICAL PROPERTIES	Boiling point: 2595°C Melting point: 1083°C Relative density (water = 1): 8.9	Solubility in water: none
ENVIRONMENTAL DATA		

N O T E S

The symptoms of metal fume fever do not become manifest until several hours.

ADDITIONAL INFORMATION

ICSC: 0240 **COPPER**

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

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

International Chemical Safety Cards

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.

N O T E S

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**

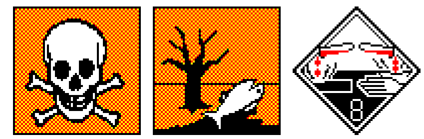
International Chemical Safety Cards

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

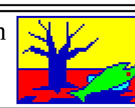
SEE IMPORTANT INFORMATION ON BACK

ICSC: 0056

International Chemical Safety Cards

MERCURY

ICSC: 0056

I M P O R T A N T D A T A	**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**

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

ZINC POWDER

ICSC: 1205

National Institute for Occupational Safety and Health

NIOSH

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

ICSC: 1205

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**

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.

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.)? ____

____

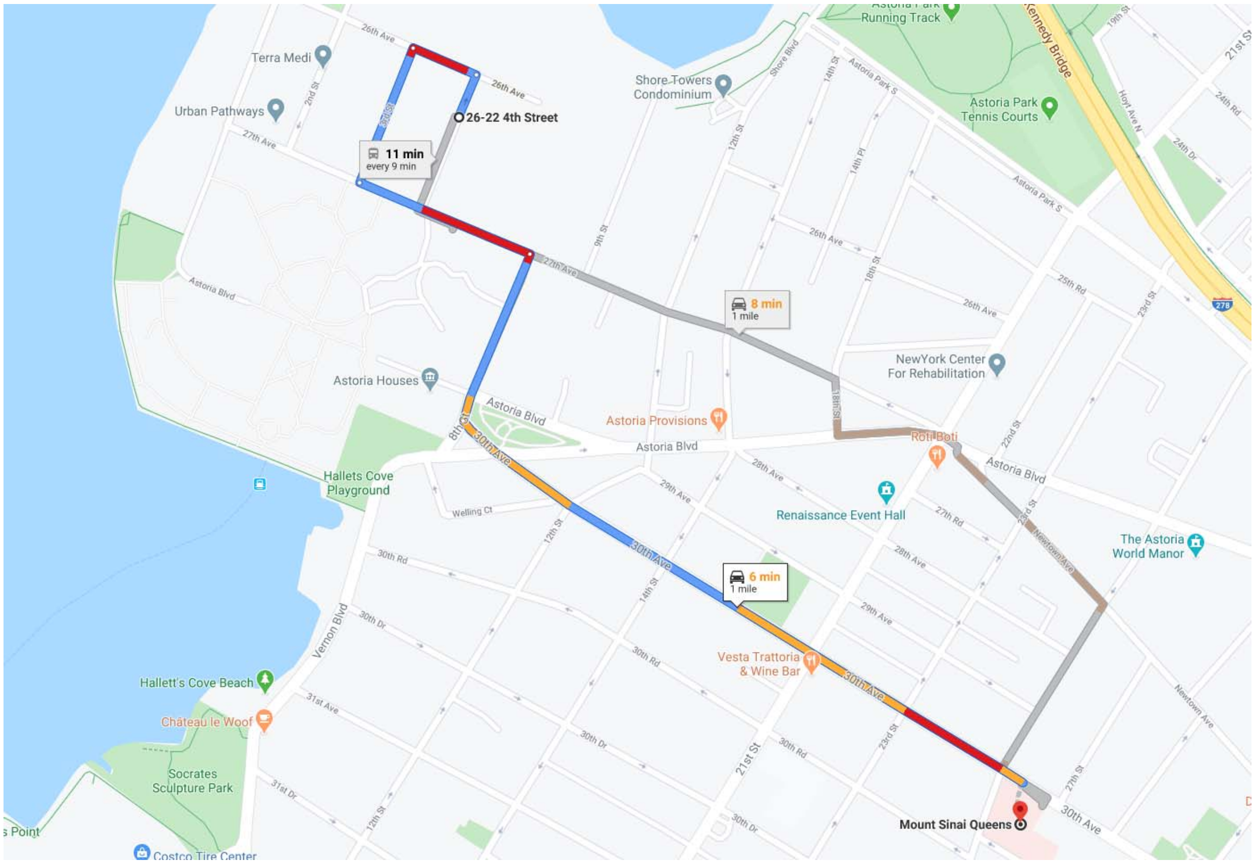
(If not, it is the EMPLOYEE'S sole responsibility to process his/her claim through his/her Health and Welfare Fund.)

INDICATE STREET NAMES, DESCRIPTION OF VEHICLES, AND NORTH ARROW

HOSPITAL INFORMATION AND MAP

The hospital nearest the site is:

Mount Sinai Queens – General Hospital
25-10 30th Avenue, Queens, NY 11102
718-932-1000
1 Mile – About 6 Minutes



DIRECTIONS:

Head south on 3rd Street towards 27th Avenue.
Turn right (East) onto 27th Avenue (0.1 miles)
Turn right (South) onto 8th Street (0.1 miles)
Turn left (East) onto 30th Avenue
Continue 0.5 miles.
Mount Sinai Queens General Hospital will be on your Right:

Arrive:
25-10 30th Avenue, Queens, NY 11102

ATTACHMENT C
Quality Assurance Project Plan

QUALITY ASSURANCE PROJECT PLAN
FORMER ANDOR MEDICAL SYSTEMS
26-22 4th Street, Queens, NY

Prepared on behalf of:

4th Street Developments LLC
143 Division Avenue
Brooklyn, NY 11211

APRIL 2020

Prepared by:

EBC
ENVIRONMENTAL BUSINESS CONSULTANTS
RIDGE, NY 11961

TABLE OF CONTENTS

QUALITY ASSURANCE PROJECT PLAN
FORMER ANDOR MEDIAL SYSTEMS
26-22 4th Street, Queens, 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 samples for VOCs, SVOCs, Pesticides, PCBs, metals, and 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

EBC
ENVIRONMENTAL BUSINESS CONSULTANTS
1808 Middle Country Road
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. 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.

EBC
ENVIRONMENTAL BUSINESS CONSULTANTS
1808 MIDDLE COUNTRY ROAD
RIDGE, NY 11961
PHONE 631.504.6000
FAX 631.924.2870

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.

Rrinsate blanks are samples which are obtained by running analyte free deionized 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 have are adequate. Rinsate blanks will not be collected for soil VOC samples if dedicated or disposable sampling materials are used and changed between samples. Rinsate blanks will be collected for 1,4-dioxane and PFAS soil samples at a minimum frequency of 1 per day.

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.
- 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

Endpoint soil samples to be collected following removal of each of the five D008 Hazardous Lead Hotspots. Additional site-wide endpoint soil samples EP1 through EP79 will be collected across the Site following excavation for the new building.

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.
  - o 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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- o 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.
- o 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.
- o Add soil to the vial taking care to not get soil in the threads.
- o 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.
- o 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.

2.2.11 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.

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

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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 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.

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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 4^{o}C.

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:

- 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 (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	Perflurooctanesulfonamide	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 limits for 1,4-Dioxane in soil is at least 0 0.1 mg/Kg. 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 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	Trip Blanks
Soil	Underground Storage Tank	2	2 from the base of the tank excavation	Endpoint Verification following removal of the tank	TCL VOCs EPA Method 8260C, TCL SVOCs EPA Method 8270,	1 per day	1 per 20 samples	1 per 20 samples	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, TAL/TCL metals EPA 6010, 21 PFAS Compounds by EPA Method 537 Modified, 1,4-dioxane EPA 8270 SIM.	1 per day	1 per 20 samples	1 per 20 samples	1 per trip

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	Terra Core Sampler dispensed into 40mL vials	VOCs	(3) 40 mL vials (Soil VOAs)	Cool to 4° C (2) 40 mL vials w/5mL water, (1) 40 mL vial w/ 10 mL methanol	EPA Method 8260C (test method 5035A)	Compound specific (1-5 ug/kg)	48 hours
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 6010C TCLP Metals 6010C	Compound specific (0.1-1 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	Compound specific [0.1 mg/kg (ppm)]	14 days
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 [1 ug/kg (ppb)]	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.

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)

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

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

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, Inc

Date Created: 05/14/19
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Page: 1

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)
Please Note that the information provided in this table is subject to change at anytime at the discretion of Alpha Analytical, In

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 ±

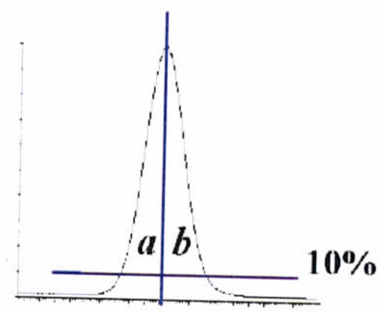
30% of the expected value. If measured analyte concentrations are not of acceptable accuracy, check the entire analytical procedureto locate and correct the problem.

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

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 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

Charles B. Sosik, PG, PHG, Principal

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)

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

FORMER ANDOR MEDICAL SYSTEMS
26-22 4th Street
ASTORIA, NY

APRIL - 2020

COMMUNITY AIR MONITORING PLAN
TABLE OF CONTENTS

APPENDICES

1.0 INTRODUCTION

This Community Air Monitoring Plan (CAMP) has been prepared for the excavation and construction activities to be performed under a Remedial Action Work Plan (RAWP) at 26-22 4th Street, Astoria, NY. 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 investigation activities) from potential airborne contaminant releases resulting from excavation activities at the site.

Compliance with this CAMP is required during all activities associated with soil disturbance activities that have the potential to generate airborne particulate matter and volatile organic compounds (VOCs). These activities include the removal of an underground storage tank, pumping of free phase fuel oil and the excavation and loading of affected soil. 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.

2.0 AIR MONITORING

Petroleum volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), metals and pesticides 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.

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 periodically in series during the site work. When the excavation area is within 20 feet of potentially exposed populations or occupied structures, the perimeter monitoring points will be located to represent the nearest potentially exposed individuals at the downwind location and will take into account the locations of ventilation system intakes of nearby structures.

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 Ionscience 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 or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions. The monitoring work should be performed using equipment appropriate to measure the types of contaminants known or suspected to be present.

The equipment should be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

- 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.

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.

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 µg/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

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ATTACHMENT E
Citizen Participation Plan

NEW YORK STATE OF OPPORTUNITY. Department of Environmental Conservation

Brownfield Cleanup Program

Citizen Participation Plan

For

FORMER ANDOR MEDICAL SYSTEMS SITE

BCP Site # C241234

SEPTEMBER 2019

26-30 4th STREET
LONG ISLAND CITY, NY 11101

www.dec.ny.gov

Contents

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Note: The information presented in this Citizen Participation Plan was current as of the date of its approval by the New York State Department of Environmental Conservation. Portions of this Citizen Participation Plan may be revised during the site's investigation and cleanup process.

Applicant: 4th Street Developments LLC **("Applicant")**
Site Name: **Former Andor Medical Systems ("Site")**
Site Address: **26-30 4th Street, Long Island City**
Site County: Queens
Site Number: C241234

1. What is New York's Brownfield Cleanup Program?

New York's Brownfield Cleanup Program (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. A brownfield typically 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 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 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 reused or redeveloped for the intended use.

For more information about the BCP, go online at:
http://www.dec.ny.gov/chemical/8450.html .

2. Citizen Participation 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 citizens affected and interested in site investigation and cleanup programs is important for many reasons. These include:

- Promoting the development of timely, 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

- 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 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 contact(s) to whom the public should address questions or request information about the site's investigation and cleanup program. The public's suggestions about this CP Plan 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 web-site. If this occurs, NYSDEC will inform the public in fact sheets distributed about the site and by other means, as appropriate.

Site Contact List

Appendix B contains the site contact list. This 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;
- Residents, owners, and 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;
- 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) is distributed both by paper mailing through the postal service and through DEC Delivers, its 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.

CP Activities

The table at the end of this section identifies the CP activities, at a minimum, that have been and will be conducted during the site's investigation and cleanup program. The flowchart in Appendix D shows how these CP activities integrate with the site investigation and cleanup process. The public is informed about these 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 CP Plan 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 citizen participation activities.

Technical Assistance Grant

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 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 Technical Assistance Grant (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 or enjoyment of the environment may be affected by a release or threatened release of contamination at the site.

The significant threat determination for the site has 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 citizen participation activities related to the site's investigation and cleanup program follows bellow:

Citizen Participation 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	Before start of Remedial Investigation **Note:** Applicant must submit CP Plan to NYSDEC for review and approval within 20 days of the effective date of the BCA.
Before NYSDEC Approves Remedial Investigation (RI) Work Plan:	
Distribute fact sheet to site contact list about proposed RI activities and announcing 30-day public comment period about draft RI Work Plan Conduct 30-day public comment period	Before NYSDEC approves RI Work Plan. If RI Work Plan 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 Remedial Investigation:	
Distribute fact sheet to site contact list that describes RI results	Before NYSDEC approves RI Report
Before NYSDEC Approves Remedial Work Plan (RWP):	
Distribute fact sheet to site contact list about draft RWP and announcing 45-day public comment period Public meeting by NYSDEC about proposed RWP (if requested by affected community or at discretion of NYSDEC project manager) Conduct 45-day public comment period	Before NYSDEC approves RWP. 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 Distribute fact sheet to site contact list announcing NYSDEC approval of Final Engineering Report 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 CP Plan 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 major issues of concern to the public will be potential impacts of vapors, nuisance odors and dust during the removal of affected soil at the site. Another example of a major issue of public concern would be the impact of increased truck traffic on the surrounding neighborhood. Construction safety issues will also be addressed. The Applicant needs to be aware of impacts related to odor, noise and truck traffic.

This work will be performed in accordance with procedures which will be specified under a detailed Remedial Program which considers and takes preventive measures for exposures to future residents of the property and those on adjacent properties during construction. Detailed plans to monitor the potential for exposure including a Health and Safety Plan (HASP) and a Community Air Monitoring Plan (CAMP) are required components of the remedial program. Implementation of these plans will be under the direct oversight of the NYSDEC and the New York State Department of Health (NYSDOH).

These plans will specify the following worker and community health and safety activities during remedial activity at the Site:

- On-site air monitoring for worker protection;
- Perimeter air monitoring for community protection;
- The use of odor, vapor, and dust controls, such as water or foam sprays, as needed;
- Monitoring and control of soil, sediments, and water generated during remediation; and
- Truck routes which avoid residential streets.

The HASP and the CAMP will be prepared as part of the Remedial Action Work Plan (RAWP) and will be available for public review at the document repository as identified in Appendix A.

Experience from similar projects, 311 complaints and other construction projects in the area will help in identifying such issues.

The Site is located in an Environmental Justice Area.

Environmental justice is defined as the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.

The Site is located in an area with a sizable Hispanic-American and African-American population nearby, therefore, all future fact sheets will be translated into Spanish.

For additional information, visit: https://statisticalatlas.com/tract/New-York/Queens-County/008700/Race-and-Ethnicity

In addition, there may be concerns with regards to noise, odor or truck traffic.

4. Site Information

Appendix C contains a map identifying the location of the site.

Site Description

The site is located in the Astoria neighborhood of Queens County and is comprised of a two tax lots (Block 910, Lots 9 & 35) totaling 25,473 square feet (0.584 acres). The site is located in the City of New York and Borough of Queens. The site is rectangular shaped with 100 feet of frontage along 3rd Street and 147.75 feet of frontage along 4th Street.

The site is improved with one-story 20,000 sf industrial building constructed in 1961 (estimate) on Lot 9. The building is currently vacant. Lot 35 is a paved parking area which was previously used by the former Lot 9 tenant.

The north side of the property is bordered by multi-family residential buildings. The south side is bordered by a single family residential home and a contractor's yard. Properties to the west include a single family residence and stone countertop businesses. Properties to the east across 4th Street include industrial properties and a Goodwill recycling center.

Surrounding land use includes industrial / manufacturing facilities north of 26th Avenue and a large multi-family multi-building apartment complex south of 27th area. Adjacent properties to the east and west include a mix of commercial (contractor yards, warehouses, manufacturing) with single and multi-family residential properties interspersed among the commercial lots. The area surrounding the property is highly urbanized and predominantly consists of industrial / commercial buildings to the north and residential apartment complexes to the south.

History of Site Use, Investigation, and Cleanup

The site is currently owned by 4th Street Developments LLC. The property consists of a 1-story industrial building which is currently vacant. Historically, the property has been used as a gas station since 1961. Prior to that, it was occupied by a diner since at least 1934. The present 1-story building was constructed in 1961and used for unidentified manufacturing (1961 CO, 1967 sanborn map). From 1977 to 2007 the building is labeled with a W which refers in general to warehouse. City directory listings include SOS Distributers in 1983 and Andor Medical Systems in 1991. There were no other directory listings for the property. The building has been vacant since at least August 2018. The Requestor purchased the property in January 2019.

A Phase II investigation performed at the site in October 2018
reported elevated levels of volatile and semi-volatile organic compounds (VOCs/SVOCs), pesticides, Polychlorinated Biphenyls (PCBs) and metals. The chlorinated solvents cis-1,2-dichloroethene, (cis-DCE), tetrachloroethene (PCE) and trichloroethene (TCE) were reported above groundwater protection soil cleanup objectives (SCOs) in one or more samples. Multiple semi-volatile organic compounds were reported in 4 of 6 soil samples above restricted residential and / or restricted commercial objectives.

Barium and lead were also reported above restricted commercial objectives. DDE, PCB1254 and mercury were all reported above unrestricted SCOs

PCE, TCE and cis-DCE were all reported above groundwater standards in all three groundwater samples.

5. Investigation and Cleanup Process

Application

The Applicant has applied for and been accepted into New York's Brownfield Cleanup Program as a Volunteer. This means that the Applicant was not responsible for the disposal or discharge of the contaminants or whose ownership or operation of the site took place after the discharge or disposal of contaminants. The Volunteer must fully characterize the nature and extent of contamination on-site, and must 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 unrestricted purposes.

To achieve this goal, the Applicant will conduct cleanup activities at the site with oversight provided by NYSDEC. The Brownfield Cleanup Agreement executed by NYSDEC and the Applicant sets forth the responsibilities of each party in conducting these activities at the site.

Investigation

A partial site investigation was completed before the property was entered into the BCP. For the partial investigation, NYSDEC will determine if the data are useable. The Applicant will now conduct an investigation of the Site officially called a "remedial investigation" (RI). This investigation will be performed with NYSDEC oversight. Upon receipt of the RI, the NYSDEC will determine if the investigation goals and requirements of the BCP have been met or if additional work is needed before a remedy can be selected.

NYSDEC will use the information in the investigation report to determine if the Site poses a significant threat to public health 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 Measures

An Interim Remedial Measure (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 investigation report that no action is necessary at the Site. In this case, NYSDEC would make the investigation report available for public comment for 45 days. NYSDEC then would complete its review, make any necessary revisions, and, if appropriate, approve the investigation report. NYSDEC would then issue a "Certificate of Completion" (described below) to the Applicant.

or

2. The Applicant may recommend in its investigation report that action needs to be taken to address site contamination. After NYSDEC approves the investigation report, the Applicant may then develop a cleanup plan, officially called a "Remedial Work Plan". The Remedial Work Plan describes the Applicant's proposed remedy for addressing contamination related to the site.

When the Applicant submits a draft Remedial Work Plan for approval, NYSDEC would 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 cleanup plan if necessary, before approving the proposed remedy. The New York State Department of Health (NYSDOH) must concur with the proposed remedy. After approval, the proposed remedy becomes the selected remedy. The selected remedy is formalized in the site Decision Document.

The Applicant may then design and perform the cleanup action to address the site contamination. NYSDEC and NYSDOH oversee the 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 report to be certain that the cleanup is protective of public health and the environment for the intended use of the Site.

Certificate of Completion

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 Certificate of Completion (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 and engineering controls 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.

An *institutional control* 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 institutional control may be used when the cleanup action leaves some contamination that makes the site suitable for some, but not all uses.

An *engineering control* is a physical barrier or method to manage contamination. Examples include: caps, covers, barriers, fences, and treatment of water supplies.

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):

Rafi Alam
Project Manager
NYSDEC
Division of Environmental Remediation
625 Broadway
Albany, New York 12233
Phone: Tel: 518-402-8606
Email: rafi.alam@dec.ny.gov

Thomas V. Panzone
Public Participation Specialist
NYSDEC Region 2
Office of Communications Services
47-40 21st Street
Long Island City, NY 11101
Phone: (718) 482-4953
Email: Thomas.panzone@dec.ny.gov

New York State Department of Health (NYSDOH):
Dan Tucholski
NYSDOH
Empire State Plaza
Corning Tower Room 1782
Albany, NY 12237
Phone: (518) 402-7860
Email: BEEI@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:

Queens Library at Astoria
14-01 Astoria Blvd
Astoria, NY 11102
(718) 278-2220

Queens Community Board 1
45-02 Ditmars Blvd., LL Suite 1025
Astoria, NY, 11106
Phone: 718-626-1021

Appendix B - Site Contact List

Local Government Contacts

City of New York
Hon. Bill de Blasio
Mayor of New York City
City Hall
New York, NY 10007

Hon. Melinda R. Katz
Queens Borough President
120-55 Queens Boulevard
Kew Gardens, NY 11424

Maria Torniali, Chairwoman
Florence Koulouris, District Manager
Antonella di Saverio, Environmental Committee
Queens Community Board 1
45-02 Ditmars Blvd., LL Suite 1025
Astoria, NY, 11106

Hon. Costa Constantinides
22nd District
31-09 Newtown Ave, Suite 209
Astoria, NY 11102

Marisa Lago
Chair of City Planning (Zoning)
New York, NY 10271

Audrey Pheffer
Queens County Clerk's Office
88-11 Sutphin Boulevard #106
Jamaica, NY 11435

Hon. Jumaane Williams
Public Advocate
1 Centre Street, 15th Floor
New York, NY 10007

Hon. Scott M. Stringer
Office of the Comptroller
1 Centre Street
New York, NY 10007

Hon. Julie Stein
Office of Environmental Planning & Assessment
NYC Dept. of Environmental Protection
96-05 Horace Harding Expressway
Flushing, NY 11373

Mark McIntyre
NYC Department of Environmental Remediation
100 Gold Street, 2nd Floor
New York, NY 10038

New York State
Hon. Michael Gianaris
NYS Senator – District 12
31-19 Newtown Avenue Suite 402
Astoria, NY 11102

Hon. Catherine Nolan
NYS Assembly Member – District 37
47-40 21 Street Room 810
Long Island City, NY 11101

Federal
Hon. Charles Schumer
U.S. Senator
780 Third Avenue, Suite 2301
New York, NY 10017

Hon. Kirsten Gillibrand
U.S. Senator
780 Third Avenue, Suite 2601
New York, NY 10017

Hon. Carolyn Maloney
U.S. House of Representatives
31-19 Newtown Avenue
Astoria, NY 11102

Adjacent Property Owner Contacts

Properties adjacent to the project site are as follows:

North

1. TIMAC ASTORIA LLC
26-19 3RD STREET
QUEENS, NY 11102-4168

   OCCUPANT / TENANT
26-19 3RD STREET
QUEENS, NY 11102-4168

2. HASHEM HOLDING, LLC
21 GRASSFIELD RD.
GREAT NECK, NY 11024-2021

OCCUPANT / TENANT
2618 4TH STREET
QUEENS, NY 11102

East

3. MINGS GARDEN REALTY LLC
7 MAYFAIR LN.
MANHASSET NY 11030-3510

OCCUPANT / TENANT
26-01 4 STREET,
QUEENS, NY 11102

4. GOODWILL INDUSTRIES OF GREATER NEW YORK IN
4-21 27TH AVE. STE 1
QUEENS, NY 11102-4599

5. GOODWILL INDUSTRIES HOUSING CO. INC.
4-21 27TH AVE. STE 1
QUEENS, NY 11102-4599

OCCUPANT / TENANT
4-21 27TH AVENUE,
QUEENS, NY 11102

South

6. LAC REALTY CORP.
1416 160TH STREET
WHITESTONE NY 11357-2723

OCCUPANT / TENANT
4TH STREET,
QUEENS 11102

7. MONIRUZZAMAN, NAZMUN
2631 3RD STREET
QUEENS, NY 11102-4127

OCCUPANT / TENANT
26-31 3RD STREET,
QUEENS, NY 11102

West

8. KOS REALTY, LLC
2634 3RD STREET
QUEENS, NY 11102-4128

OCCUPANT / TENANT
26-34 3 STREET,
QUEENS 11102

9. 26-24 3RD STREET LLC
27 BELLINGHAM LANE
GREAT NECK NY 11023-1301

OCCUPANT / TENANT
26-24 3RD STREET,
QUEENS, NY 11102

10. KOS REALTY, LLC 2
634 3RD STREET
QUEENS, NY 11102-4128

OCCUPANT / TENANT
634 3RD STREET,
QUEENS, NY 11102

11. KOS REALTY, LLC
2618 3RD STREET
QUEENS, NY 11102-4128

OCCUPANT / TENANT
2618 3RD STREET,
QUEENS, NY 11102

Local News Media

Queens Chronicle
71-19 80th Street, Suite 8-201
Glendale, NY 11385
718-205-8000

New York Daily News
4 New York Plaza
New York, NY 10004

New York Post
1211 Avenue of the Americas
New York, NY 10036-8790

Spectrum NY 1 News
75 Ninth Avenue
New York, NY 10011

Queens Tribune
150-50 14th Road
Whitestone, NY 11357

Western Queens Gazette
42-16 34th Avenue
Long Island City, NY 11101

Times-Ledger Newspapers
41-02 Bell Boulevard, 2nd Floor
Bayside, NY 11361

LIC/Astoria Journal
69-60 Grand Avenue
Maspeth, NY 11378

Astoria Post
christian.murray@queenspost.com

Hoy Nueva York
1 MetroTech Center, 18th Floor
Brooklyn, NY 11201

El Diario La Prensa
1 MetroTech Center, 18th Floor
Brooklyn, NY 11201

Public Water Supplier

Vincent Sapienza, Commissioner
New York City Department of Environmental Protection
59-17 Junction Boulevard
Flushing, NY 11373

Schools and Daycare Facilities

AHRC-Astoria Blue Feather - Special education school
27-07 8th St,
Astoria, NY 11102
Principal: Denise Polanco-Nieves (718) 721-3960

SAINT MARGARET MARY HEAD START
9-16 27 AVENUE
Astoria, NY11102

HALLET COVE CHILD DEV CENTER INC.
2-08 Astoria Blvd
Astoria, NY11102

HALLET COVE Child Development Center
2-08 ASTORIA BOULEVARD
QUEENS, NY11102

NYCHA Day Care Center
2-08 ASTORIA BOULEVARD
Astoria, NY 11102

Community, Civic, Religious and Other Environmental Organizations:

St Margaret Mary Church
918 27th Ave
Astoria, NY 11102

The First Reformed Church of Astoria
2726 12th St
Astoria, NY 11102

COMMUNITY CENTER/SENIOR CENTER
4-05 ASTORIA BOULEVARD
Astoria, NY 11102

Astoria Houses
DEVELOPMENT MANAGEMENT OFFICE
4-20 ASTORIA BOULEVARD
Astoria, NY 11102

Astoria Houses
TENANT ASSOCIATION ROOM
1-24 ASTORIA BOULEVARD
Astoria, NY 11102

Astoria Houses
President – Resident Association
4-20 ASTORIA BOULEVARD
Astoria, NY 11102

Goodwill Industries
4-21 27th Avenue
Astoria, NY 11102

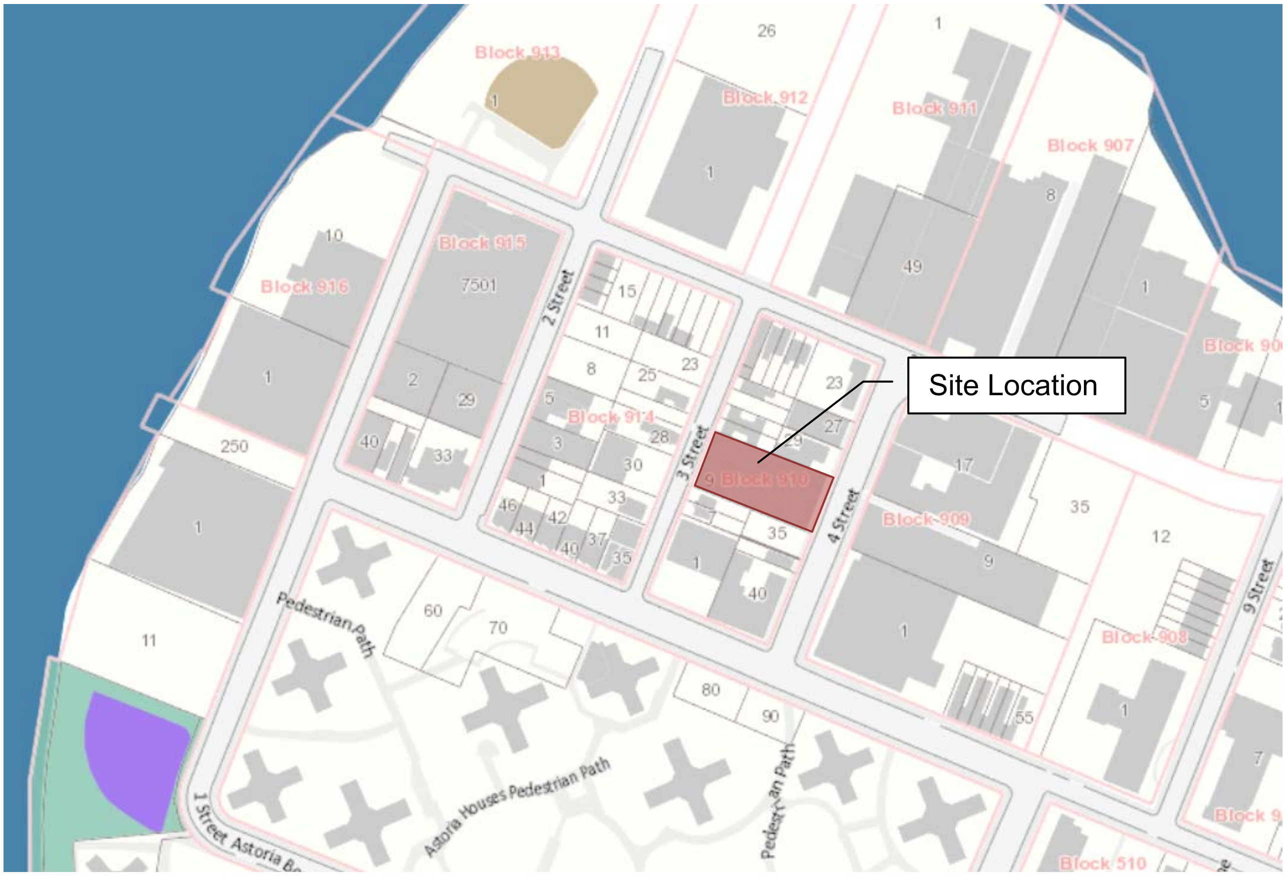
Carol Conslato
Director – Consolidated Edison Corporate Affairs
59-17 Junction Boulevard – 2nd Floor
Elmhurst, NY 11373

Ann Bruno -President
114th Police Precinct Council
34-16 Astoria Boulevard
Astoria, NY 11103

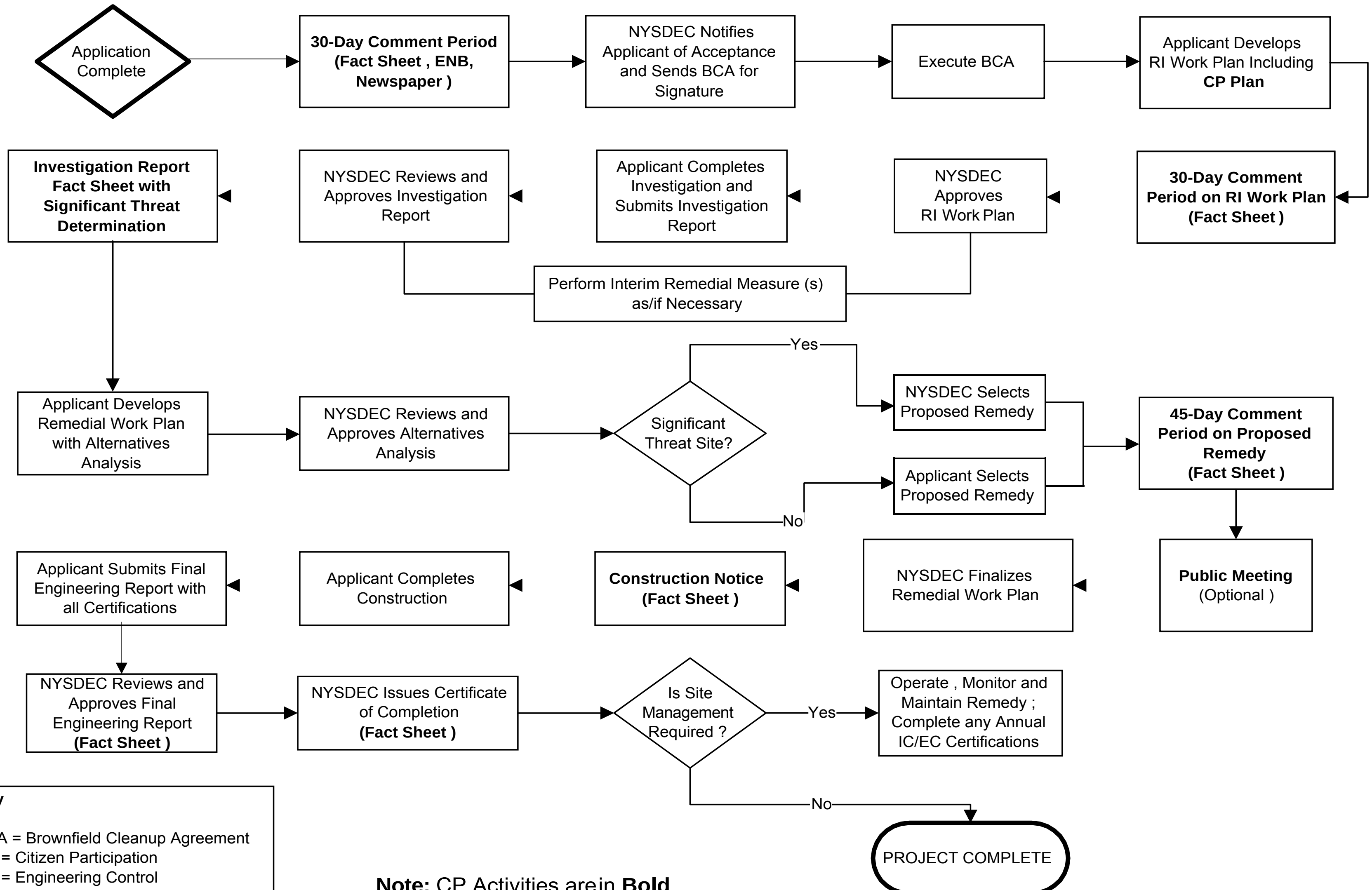
Engine 262
30-89 21 STREET
Astoria, NY 11102

Canaan AME Church
Goodwill Terrace
4616 27th Ave
Astoria, NY 11102

Appendix C - Site Location Map



Appendix D– Brownfield Cleanup Program Process



Key

BCA = Brownfield Cleanup Agreement
CP = Citizen Participation
EC = Engineering Control
ENB = Environmental Notice Bulletin
IC = Institutional Control
RI = Remedial Investigation

Note: CP Activities arein **Bold**

NEW YORK STATE OF OPPORTUNITY. | Department of Environmental Conservation

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

NEW YORK STATE OF OPPORTUNITY. | Department of Environmental Conservation

Division of Environmental Remediation

Remedial Programs
Scoping Sheet for Major Issues of Public Concern (see instructions)

Site Name: Former Andor Medical Systems

Site Number: C241234

Site Address and County: 26-30 4th Street, Queens, NY 11102

Remedial Party(ies): 4th Street Developments 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.**
Vapors, odors, dust, truck traffic, and noise.

How were these issues and/or information needs identified?
Experience on similar projects in the area

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.
N/A

How were these information needs identified?
Click here to enter text.

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.
See BCP CPP milestones and Site Contact list

How were these issues and/or information needs identified?
Applicable guidance

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:
X **Residential** ☐ **Agricultural** ☐ **Recreational** X **Commercial** ☐ **Industrial**

b. Residential type around site:
X **Urban** ☐ **Suburban** ☐ **Rural**

c. Population density around site:
X **High** ☐ **Medium** ☐ **Low**

d. Water supply of nearby residences:
X **Public** ☐ **Private Wells** ☐ **Mixed**

e. Is part or all of the water supply of the affected/interested community currently impacted by the site?
☐ **Yes** X **No**

Provide details if appropriate:
Click here to enter text.

f. Other environmental issues significantly impacted/impacting the affected community?
☐ **Yes** X **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** X **No**

h. Special considerations:
X **Language** ☐ **Age** ☐ **Transportation** ☐ **Other**

Explain any marked categories in **h:**
Sizable Hispanic population

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.)

X **Non-Adjacent Residents/Property Owners:** Click here to enter text.

X **Local Officials:** Click here to enter text.

X **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: Charles Sosik **Date: 9/5/2019**

Reviewed / Approved By: Thomas V. Panzone **Date:**

ATTACHMENT F
Resumes

AMC Engineering PLLC
18-36 42nd Street
Astoria, NY 11105
Phone: (516) 417-8588

ARIEL CZEMERINSKI, P.E.
Email: Ariel@AMC-Engineering.com

SUMMARY:

New York State Professional Engineer. Chemical and Environmental Engineer, with 30 years of experience in the chemical and environmental areas. Areas of expertise include inspections and sign off on Large Scale Vapor Barrier Installations at Various NYC schools, Design and inspections of Sub Slab Depressurization Systems, wastewater treatment systems, Large scale dewatering system design for construction, process control and automation, process optimization, productivity improvement, quality systems, environmental compliance, Phase I Environmental Site Assessments, Phase II Environmental Investigations, Phase III: Remedial Activities, process and plant safety, and management of a production facility. Special Inspector with New York City Department of Buildings. Registered PE in NY.

Professional Experience:

AMC: 19 Years
Prior: 11 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
- Remedial Program Design and Management
- Environmental Compliance, Clean Water Act, Clean Air Act, Hazardous Materials
- Dewatering & Treatment System Design
- SWPPP design and implementation. Preparation and Submittal of NOIs.
- NYCDEP Sewer Discharge Permitting
- Transfer Station Permitting and Compliance
- Chemical Process Design and Optimization
- Wastewater Treatment Systems and Permitting, SPDES, LI Well permit, Water Withdrawal Permit. Obtain permits from NYCDEP and NYSDEC.
- Air Permits and Registration
- 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

Project: Bergen Basin Sewer - CS-JA-BBS -Queens, NY
Project Description: NYC infrastructure (sewer, water) upgrade, drainage channel installation. Dewatering Design. Permits with NYCDEP and NYSDEC. Soil contaminated with petroleum requiring excavation, soil management and disposal under a Materials Handling Plan, Construction Health and Safety Plan. SWPPP design and implementation.
Client: JR Cruz - NYCDDC
Regulatory Authority: NYSDEC, NYCDEP
Role: Mr. Czemerinski served as the Environmental Consultant for the project.

Project: SER002326- Storm and Sanitary Sewers in Wardwell Avenue, Staten Island, New York
Project Description: NYC infrastructure (sewer, water) upgrade.
Dewatering Design. Permits with NYCDEP and NYSDEC. SWPPP design and implementation.
Client: E.E. Cruz - NYCDDC
Regulatory Authority: NYSDEC, NYCDEP
Role: Mr. Czemerinski served as the Environmental Consultant for the project.

Project: HED568-Installation of New 20” Subaqueous water main extension, and new 12” sub-aqueous high pressure gas main from the Bronx to Randall’s Island, New York
Project Description: NYC infrastructure (gas, water) upgrade.
Soil contaminated with petroleum requiring excavation, soil management and disposal under a Materials Handling Plan, Construction Health and Safety Plan. Dewatering Design. Permits with NYCDEP and NYSDEC.
Client: E.E. Cruz - NYCDDC
Regulatory Authority: NYSDEC, NYCDEP
Role: Mr. Czemerinski served as the Environmental Consultant for the project.

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: SE-807 –Construction of Storm and Sanitary Sewers and Water Main in 20th Ave between 126th St and US Bilkhead Line Area, College Point, Queens, NY
Project Description: NYC Residential infrastructure (sewer, water) upgrade, outfall reconstruction, Soil characterization, soil management and disposal under a Materials Handling Plan, Construction Health and Safety Plan and Community Air Monitoring Plan. SWPPP design and implementation, Public Participation Plan, Marine HASP, Dewatering Design and permit application.

Client: EIC Associates
Regulatory Authority: NYCDDC
Role: Mr. Czemerinski served as the Environmental Consultant 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 Environmental Consultant 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: Former Sunbelt Equipment Site – 25 Kent Avenue, Brooklyn, NY
Project Description: NYS Brownfield cleanup project. Soil contaminated with petroleum, and heavy metals and coal tar, requiring deep 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, Dewatering Design and implementation, SWPPP design and implementation
Client: 19 Kent Acquisition LLC
Regulatory Authority: NYSDEC
Role: Mr. Czemerinski served as the Remedial Engineer for the project.

Project Experience

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.

Kevin Brussee

14 Evans Lane, Miller Place, NY 11764
Phone: (631) 338-1749 Email: Kevinbrussee@hotmail.com

Education

Bachelor of Science, Environmental Science 1998-2002
Plattsburgh State University, NY

Master of Science, Environmental Studies 2003-2005
University of Massachusetts, Lowell

Areas of Expertise

Environmental Business Consultants, Ridge, NY 2008-Current
Senior Project Manager

- Complete management of projects, including proposal writing, regulatory interaction, scheduling, sub-contractor management, client development/relations, invoicing and collections.
- Management of Remedial Investigations & RAWP implementation for E-Sites, NYSDEC Spill Sites and NYSDEC BCP Sites.
- Management and preparation of Phase I ESAs in NYC and Long Island for industrial, commercial, and residential properties for real estate developers, private investors, investment banks, and property owners.
- Report writing, including NYSDEC BCP Applications, RIWPs, RIRs, RAWPs, SMPs and FERs.
- Design and implementation of waste characterization soil sampling plans for projects ranging from 100 tons to over 100,000 tons.
- Management of UST removal projects.
- Manage, mentor and training of project managers and junior personnel.

Eastern Environmental Solutions, Manorville, NY 2006-2008
Project Manager

- Complete management of projects, including proposal writing, regulatory interaction, scheduling, and invoicing.
- Management and preparation of Phase I ESAs on Long Island for commercial, and residential properties for real estate developers, private investors, investment banks, and property owners.
- Management of NYSDEC Spill Sites, tank removal and installations, and sanitary system/drywell remediation projects.

EA Engineering, Science & Technology, Sparks, Maryland 2005-2006
Hydrogeologist
- Preparation of RIWPs for Formerly Used Defense Sites.

P.W. Grosser Consulting, Bohemia, NY 2002-2003
Field Hydrogeologist
- Management of home owner spill claims for major insurance company
- O&M of Groundwater and Soil Remediation Systems
- Environmental Sampling (Groundwater and Soil)
- UST/AST Closure and Remedial Oversight

Professional/Training Certifications

- OSHA 40-hr HAZWOPER
- OSHA 8-hr HAZWOPER Supervisor
- OSHA 10-hr Construction Safety
- NYC OER Gold Certified Professional

Publications

Chemical Stress Induced by Copper, Examination of a Biofilm System;
(Water Science Technology, 2006; 54(9): 191-199.)

SELECT PROJECT EXPERIENCE

Project:	BCP Site - Former Dico G, Auto and Truck Repair Site 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:	BCP Site - Former Uniforms for Industry Site Redevelopment from industrial to mixed use
Location:	Jamaica Ave, Richmond Hill Queens, NY
Type:	NYS BCP, NYC E-Site Hazmat, Noise, Former industrial laundry facility
Contamination:	Chlorinated Solvents, Historic Fill, Petroleum - Fuel oil/Mop oil
Role:	Project Manager, RAWP implementation

Project:	BCP Site - Former Gas Station/Car Wash Redevelopment 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:	E-Site – Former Williamsburg Dye Factory 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 development and implementation, waste characterization and soil management

Project:	BCP Site - 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 Hazardous Historic Fill
Role:	Project Manager, RIWP Development and Implementation, RAWP development and implementation, waste characterization and soil management

EBC

ENVIRONMENTAL BUSINESS CONSULTANTS

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

<u>Scavenger Waste Treatment Facility (SWTF), Suffolk County, NY</u>

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.

<u>Advanced Residential Communities, Rockville Centre, NY</u>

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.

<u>Former Temco Uniform site, West Haverstraw, NY</u>

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.

<u>Grovick Properties, Jackson Heights, NY</u>

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 identifIed 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

Charles B. Sosik, PG, PHG, Principal

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)

ATTACHMENT G
Estimated Remedial Costs

2840 ATLANTIC AVENUE
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
Excavation, Transportation and Disposal and Backfilling	$ 1,194,625.00	$ 1,194,625.00	$ 1,106,250.00
Shoring and SOE Work	$ 125,000.00	$ 125,000.00	$ 125,000.00
UST Removal	$ 15,000.00	$ 15,000.00	$ 15,000.00
Waste Charaterization	$ 13,700.00	$ 13,700.00	$ 13,700.00
Endpoint analyis, DUSR, EDDs	$ 53,650.00	$ 53,650.00	$ 53,650.00
Air Monitoring and Field Oversight	$ 119,000.00	$ 119,000.00	$ 119,000.00
Project Management	$ 71,425.00	$ 71,425.00	$ 71,425.00
Dewatering Permits and Treatment System	$ 93,750.00	$ 93,750.00	$ 93,750.00
Status Reports	$ 4,200.00	$ 4,200.00	$ 4,200.00
Environmental Easement Package	-	$ 12,500.00	$ 12,500.00
Site Management Plan	-		$ 11,500.00
Final Engineering Report / Fact Sheets	$ 20,450.00	$ 20,450.00	$ 20,450.00
Subtotal	$ 1,710,800.00	$ 1,723,300.00	$ 1,646,425.00
15% Contigency	$ 256,620.00	$ 258,495.00	$ 246,963.75
Total	**$ 1,967,420.00**	**$ 1,981,795.00**	**$ 1,893,388.75**