REMEDIAL INVESTIGATION WORK PLAN

12074 FLATLANDS AVENUE
Brooklyn, New York
NYSDEC BCP No. C224353

Prepared for:

Innovative Urban Living, LLC
c/o Gotham Organization, LLC
432 Park Avenue South, Second Floor
New York, New York 10016

Prepared by:

Langan Engineering, Environmental, Surveying,
Landscape Architecture and Geology, D.P.C.
300 Kimball Drive
Parsippany, New Jersey 07054

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LANGAN

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CERTIFICATION

I, Amanda Forsburg, certify that I am currently a Qualified Environmental Professional as defined in 6 New York Codes, Rules, and Regulations (NYCRR) Part 375 and that this Remedial Investigation Work Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the New York State Department of Environmental Conservation (NYSDEC) Division of Environmental Remediation (DER)-10 Technical Guidance for Site Investigation and Remediation.

Amanda M. Forsburg

Amanda Forsburg, CHMM

1.0 INTRODUCTION

This Remedial Investigation Work Plan (RIWP) was prepared on behalf of Innovative Urban Living, LLC (the Applicant) for the property at 12074 Flatlands Avenue Brooklyn, New York (the Site). The objective of the proposed Remedial Investigation (RI) is to further investigate potential on-site sources and extents of soil and groundwater impacts identified in Langan's 30 May 2018 Due Diligence Phase II Environmental Investigation Report prepared for the Applicant and to assess for the presence of soil vapor impacts. Results of previous investigation and areas of concern identified in the Phase II report are described in detail in Section 2.6 of this RIWP. Proposed investigation activities will be completed in the vicinity of the Former On-Site Automotive Dismantling/Wrecking, to assess for impacts from the adjacent gasoline filling station, to further investigate the presence of contaminated fill and incinerator ash historically placed at the Site, to complete a Site-wide assessment, and to determine the extent of contamination in groundwater, soil, and soil vapor.

The following work scope has been developed to meet the investigation requirements of the NYSDEC Brownfield Cleanup Program in accordance with the requirements of Environmental Conservation Law (ECL) Article 27-1415(2). This RIWP was developed in accordance with the process and requirements identified in the NYSDEC Division of Environmental Remediation (DER)-10 *Technical Guidance for Site Investigation and Remediation* (May 2010) Section 3.3 "Investigation Work Plans" and the New York State Department of Health (NYSDOH) "Guidance for Evaluating Soil Vapor Intrusion in the State of New York, with updates" (October 2006).

2.0 SITE BACKGROUND

2.1 Site Description

The approximately 2.084-acre site located on the south side of Flatlands Avenue in Brooklyn, New York, is designated as New York City Tax Block 4434, Lot 1 (portion). A Site Location Plan is provide as Figure 1 and a Tax Map is provided as Figure 2. The Site consists of a vacant gravel lot used for parking. A figure showing the site boundary and adjacent properties is provided as Figure 3. The site is bound to the north by Flatlands Avenue followed by an automobile dismantling company and used automobile parts business, medical offices, and the Oasis Hotel. The Site is bound to the east by a twelve-story multi-family residential apartment building and Block 4434 Lot 10, which also consists of a RCA covered lot used for parking, followed by Pennsylvania Avenue. The Site is bound to the south by a twelve-story multi-family residential apartment building and to the west by an offsite extension of the RCA covered parking lot

followed by the Christian Cultural Center (CCC) building and the surrounding asphalt-paved parking lot.

According to the New York City Department of City Planning (NYCDCP) zoning map effective 10 December 2020 the site is currently zoned by the New York City Department of City Planning as R5, which is identified as a residential district that allows for a variety of residential housing. The Applicant has initiated a re-zoning action that would be consistent with the proposed redevelopment and, if approved, the resulting zoning designation would be a R7-2 with a commercial overlay which allows for the development of higher density buildings than currently acceptable within the R5 designation.

2.2 Surrounding Property Land Use

According to records maintained online by New York City Open Accessible Space Information System (NYCOASIS) and aerial/street-view observations provided by Google Maps, surrounding properties include commercial, industrial, and automotive uses to the north, a parking lot to the east, residential properties to the east and south, and parking lots and the CCC building to the west. The following is a summary of surrounding property usage:

Direction	Adjacent Properties			Surrounding Properties
	Block No.	Lot No.	Description	
North	4411	24 & 34	Flatlands Avenue followed by an automobile dismantling company and used auto parts business, medical offices, and the Oasis Hotel (12079 Flatlands Avenue and 1036 Sheffield Avenue)	Flatlands Avenue followed by industrial / manufacturing and commercial buildings
East	4434	10	RCA paved lot and twelve-story multi-family residential apartment building	Pennsylvania Avenue followed by a vacant landscaped lot and the northern courtyard of a twenty-story residential building (part of the Starrett City Complex)
South	4431	70	A twelve-story multi-family residential building	Residential building complexes
West	4432	1	Christian Cultural Center (CCC) Church facility and an asphalt paved parking lot for the CCC building	CCC building, commercial buildings, Fresh Creek Nature Preserve

Public infrastructure (storm drains, sewers, and underground utility lines) exists within the street to the north of the Site.

Sensitive receptors, as defined in DER-10, located within a half-mile of the site include those listed below:

Number	Name (Approximate distance from site)	Address
1	Brooklyn Public Library After School Program, Spring Creek Branch (approximately 650 feet northeast of the site)	12143 Flatlands Avenue Brooklyn, NY 11207
2	PS 306 Ethan Allen (approximately 1,300 feet northeast of the site)	970 Vermont Street Brooklyn, NY 11207
3	The Fresh Creek School (approximately 0.37 miles to the	875 Williams Avenue Brooklyn, NY 11207
4	Starrett City Early Learning Center (approximately 1,500 feet southeast of the site)	1325 Pennsylvania Avenue Brooklyn, NY 11239
5	Breukelen Head Start (approximately 0.44 miles southwest of the site)	715 East 105 Street Brooklyn, NY 11236
6	P.S 346 Abe Stark (approximately 0.48 miles to the southeast of the site)	1400 Pennsylvania Avenue Brooklyn, NY 11207
7	Charisma Christian Academy daycare (approximately 1,900 feet west of the site)	921 East 107th Street Brooklyn, NY 11236
8	Yeshiva R'tzahd School Annex daycare (approximately 2,000 feet west of the site)	8700 Avenue K Brooklyn, NY 11236
9	PS 260 Breuckelen (approximately 2,100 feet west of the site)	875 Williams Avenue Brooklyn, NY 11207

2.3 Site Physical Conditions

2.3.1 Topography

Based on a Boundary and Topographic Survey prepared by Control Point Associates Inc. PC, the Site slopes from south to north with elevations ranging from 24.45 to 13.17 North American Vertical Datum of 1988 (NAVD88).

2.3.2 Geology

Historical topographic maps reveal that the Site consisted of marshland associated with Jamaica Bay. Based on subsurface conditions encountered during the 2018 Phase II Environmental Investigation, the soil profile at the Site consists of an approximately 16- to at least 25-foot thick layer of miscellaneous fill. Fill was identified from the surface to the depth of soil boring completion between 20 and 25 feet below grade in four of the five soil borings completed. As the bottom of the fill layer was not encountered at these locations, fill may be present deeper than the soil boring completion depth. An up to 3-foot-thick ash layer was encountered in four of five soil borings at depths ranging from 10 to 20 feet below existing grade in the northern, western, and southern portions of the Site. Native sand was encountered in one of the five soil borings at 16 feet below grade.

The "Surficial Geologic Map of New York" Lower Hudson Sheet by the New York State Museum State Geological Survey identifies that the site surficial geology consists of outwash sand and gravel which is generally a well-rounded and stratified layer of coarse to fine gravel with sand with variable thickness (2 to 20 meters). According to the "Geologic Map of New York – Lower Hudson Sheet" by the University of the State of New York, bedrock geology at the site consists of up to 2,000 feet of the Monmouth Group, Matawan Group, and Magothy Formation which is made up of silty clay, sand, and gravel.

2.3.3 Hydrogeology

Groundwater flow is typically topographically influenced, as shallow groundwater tends to originate in areas of topographic highs and flow toward areas of topographic lows, such as rivers, stream valleys, ponds, and wetlands. A broader, interconnected hydrogeologic network often governs groundwater flow at depth or in the bedrock aquifer. Groundwater depth and flow direction are also subject to hydrogeologic and anthropogenic variables such as precipitation, evaporation, extent of vegetation cover, coverage by impervious surfaces, and subsurface structures. Other factors influencing groundwater include depth to bedrock, the presence of anthropogenic fill, and variability in local geology and groundwater sources or sinks. Groundwater in New York City is not used as a potable water source. Potable water provided to the City of New York is derived from surface impoundments in the Croton, Catskill, and Delaware watersheds.

Groundwater, as inferred from moisture content observed in the soil borings, was encountered at approximately 13 feet below existing grade along Flatlands Avenue, and at approximately 18 feet below existing grade at the southern property boundary. Static groundwater level was measured at two-inch permanent groundwater monitoring wells installed in the central portion of the Site (LMW-4) at approximately 18.8-feet below existing grade and at approximately 13.7-feet below existing grade in the northern part of the Site (LMW-6). Groundwater is expected to flow to the southeast toward Fresh Creek Nature Preserve and Jamaica Bay.

2.3.4 Wetlands

Langan reviewed United States Fish and Wildlife National Wetland Inventory (NWI) and New York State Freshwater Wetlands maps. Based on these documents no mapped wetlands are listed on the Site. The nearest wetlands is Fresh Creek Basin (Estuarine and Marine Deepwater habitat), located approximately 1,000 feet to the southwest of the Site.

2.4 Proposed Development Plan

The proposed future use of the Site consists of construction of two mixed-use community facility/commercial/residential towers with affordable housing, a daycare, a playground, and below-grade parking. Construction for the redevelopment is proposed to begin in 2024. Remediation during excavation and foundation construction will be completed in approximately six months and construction of the new building is anticipated to be completed within approximately two years.

2.5 Environmental History

According to Langan's review of previous environmental assessments and investigation reports prepared for the Site, as discussed in Section 2.6, historical site use and features include former operations as an automotive junkyard and historical filling of the former marshland during the early 1900's using ash and residue from a city solid waste incinerator.

Historical uses of concern were identified on adjacent properties to the north and northwest, including automobile junking, repair, and parts facilities between 1950 and 2007. Historical uses of concern were identified on the adjacent property to the east including a gasoline filling station in 1950 and an auto wrecking facility between 1967 and 1987. Historical uses of concern were identified on the adjacent properties to the west including auto junk facilities between 1967 and 1981. Although not adjacent, historical uses of concern were identified at the property across the intersection of Flatlands Avenue and Sheffield Avenue to the northeast of the subject property,

including a gasoline filling station between 1950 and 1977 and an automobile repair facility in 1979.

2.6 Previous Environmental Reports

Langan reviewed available environmental reports historically prepared for a larger property area including the entire CCC church and all associated parking lots, including this Site ("the entire CCC property"):

- *Fresh Creek Estates, Technical Memorandum to the Draft Environmental Impact Statement (DEIS)*, prepared by AKRF, Inc., dated June 1991;
- *Subsurface Investigation and Report*, prepared by Soil Engineering Services, Inc. (SESI), dated March 1994;
- *Phase I Environmental Site Assessment (ESA)*, prepared by Soil Mechanics Environmental Services (SMES), dated July 1997; and,
- *Phase I ESA for Flatlands Ave. & Pennsylvania Ave.,* prepared by Soil Mechanics Environmental Services (SMES), dated April 2003.

In addition, Langan prepared the following environmental reports for the Site:

- *Phase II Environmental Investigation Report,* prepared by Langan, dated 30 May 2018; and
- *Phase I ESA,* prepared by Langan, dated 24 August 2018.

Copies of these reports are provided in Appendix C and discussed below.

<u>Fresh Creek Estates, Technical Memorandum to the Draft Environmental Impact Statement (DEIS), AKRF, Inc., June 1991</u>

According to the Technical Memorandum, AKRF, Inc. (AKRF) prepared a comprehensive environmental assessment of the proposed Fresh Creek Estates site which consisted of current Block 4430 Lot 1, Block 4431 Lots 1, 70 and 200, Block 4432 Lot 1, and Block 4434 Lots 1, 60 and 75. The Technical Memorandum identified that the site was originally marshlands and was landfilled during the early 1900's using ash and residue from a city solid waste incinerator. Prior to 1950, a gasoline filling station was located on the northeast portion of the site at the intersection of Pennsylvania Avenue and Flatlands Avenue, which corresponds to the Site parcel subject to Langan's Phase II EI, located on the eastern portion of Block 4434, Lot 1. Potential subsurface impacts to soil, groundwater, and soil vapor due to historical site use and historic filling operations were investigated by completion of an electromagnetic survey, excavation of

three test pits, installation of ten soil borings, five groundwater monitoring wells, collection of 34 soil vapor samples, 24 soil samples, and five groundwater samples. Based on the sample location plan provided, one test pit (TP-3), two soil borings (B-6 and B-7), and two groundwater monitoring wells (MW-1 and MW-2) were installed on the eastern portion of Block 4434, Lot 1 (the Site). Soil and groundwater samples were analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), total petroleum hydrocarbons (TPH), and metals, and groundwater samples were analyzed for total dissolved solids, hexavalent chromium, and chloride. Although a soil vapor sample location map was not provided for review, the sampling methodology discussion identified that all 34 soil vapor samples were collected from the former gasoline filling station and were likely located within the eastern portion of Block 4434, Lot 1 (the Site). As laboratory analytical packages and summary tables were not provided for review, subsurface soil and groundwater impacts identified during the 1991 environmental investigation could not be correlated to the Site parcel and the area assessed during Langan's Phase II Investigation on the eastern portion of Block 4434, Lot 1.

The AKRF Technical Memorandum was reviewed by Soil Mechanics Environmental Services (SEMS) and a summary of the AKRF Technical Memorandum investigation and findings was included in the SEMS April 2003 Phase I ESA, as discussed below. According to the 2003 Phase I ESA, the AKRF soil vapor survey was completed within the extents of the former gasoline station, likely referring to the portion of the CCC property subject to this Phase II EI. Results of the soil vapor survey did not indicate elevated VOCs with the exception of methane, which was presumed to be associated from organic material in historic fill and/or underlying marsh deposits. Based on the presence of elevated methane concentrations in soil vapor, AKRF recommended that a Health and Safety Plan (HASP) be implemented including air monitoring protocols during intrusive activities for proposed site development.

The Technical Memorandum concluded that the site is underlain by unconsolidated fill containing varying amounts of sand, gravel, clay, bricks, organic material, concrete, glass, and asphalt. Groundwater was encountered at depths that ranged from 12.67- to 22.82-feet below existing grades. Soil sample analytical results revealed TPH in soil at concentrations ranging from 91 parts-per-million (ppm) to 25,900 ppm over the entire proposed Fresh Creek Estates development site; however, TPH results specific to the Site were not provided.

Subsurface Investigation and Report, Soil Engineering Services, Inc. (SESI), March 1994

SESI completed a subsurface investigation that included installation of eight soil borings to depths that ranged from 26- to 51.5-feet below existing grade at the entire CCC property for the purposes of evaluating geotechnical conditions and providing recommendations for foundation design and general site development. As the report provided was not complete and a geotechnical boring location plan was not provided for review, only general site-wide subsurface conditions are discussed below. The site is underlain by a layer of miscellaneous fill of unspecified thickness followed by native medium-dense medium to fine grained sand. The geotechnical report identified that the bottom of planned excavation at the time, likely for the existing church, was approximately 10-feet below grade and would be within the layer of miscellaneous fill.

Phase I ESA, SMES, July 1997

SMES prepared a Phase I ESA on behalf of Legacy General Contracting Corp. for the intent of constructing an approximately 100,000-square foot two-story building, presumably what became the current CCC building. Based on the descriptions of the subject property and adjacent properties in the SMES Phase I ESA report, it appears that this Phase I ESA was not completed for the eastern portion of Block 4434, Lot 1.

Phase I ESA for Flatlands Ave. & Pennsylvania Ave., SMES, April 2003

The April 2003 SMES Phase I ESA was completed for the entire CCC property consisting of Block 4430 Lot 1, Block 4431 Lots 1 and 200, Block 4432 Lot 1, and Block 4434 Lot 1. Previous environmental reports prepared for the subject property that were reviewed to assist in the identification of RECs included the June 1991 Technical Memorandum to the DEIS prepared by AKRF, Inc., the 1994 Subsurface Investigation and Report prepared by SESI Consulting Engineers, and the 1997 Phase I ESA prepared by SMES, each of which is discussed in detail above.

The Phase I ESA did not specifically identify RECs associated with the environmental findings discussed above, but recommended completion and adherence to a Health and Safety Plan (HASP) and installation of a soil capping system provided in the Technical Memorandum to the DEIS should be strictly followed and noted that a methane mitigation system may be required as part of any future building construction. Soil Mechanics also recommended that future site activities be conducted under the oversight of the New York City Department of Environmental Protection (NYCDEP) or New York State Department of Environmental Conservation (NYSDEC) and that all underground storage tanks (USTs) encountered during redevelopment be removed in accordance with all applicable laws. The report also identified that proper removal of all miscellaneous waste that was observed on the subject property including an abandoned crane,

rubber tires, and demolition debris, and completion of a groundwater investigation to evaluate for potential impacts from hydraulically upgradient properties of concern would be required.

Phase II Environmental Investigation Report, Langan, May 2018

Langan's Phase II Investigation report was prepared for the Applicant. The results of this investigation were provided on Tables 1 and 2 and summarized on Figures 3 and 4 of the Phase II Environmental Investigation Report, which are included in Appendix D. The Phase II investigation analytical results are summarized on Figures 4 and 5.

Geophysical utility clearance was completed in May 2018, which was limited to the areas around each boring.

The May 2018 investigation included excavation of two test pits (LTP-5 and LTP-8) to between approximately 5 and 6 feet below sidewalk grade, installation of five soil borings (LSB-10 through LSB-14), two permanent groundwater monitoring wells (LMW-4 and LMW-6), and collection of soil and groundwater samples for laboratory analysis. Temporary soil vapor/methane monitoring points were installed adjacent to two soil borings (LSB-11 and LSB-13) and methane concentrations were monitored over a 5-minute period at each location.

Test Pit Investigation Results

Two test pits were excavated to investigate soil conditions and assess potential subsurface impacts associated with historical operations at the Site and the adjoining sites to the east and west, and the presences of urban fill. Fill including concrete, asphalt, wood, brick, metal, sand, and gravel was identified in all test pits. Miscellaneous debris including tires, porcelain, wire, and glass were sporadically identified in the test pits.

Soil Investigation Results

Evidence of petroleum impacts (i.e., elevated PID readings, odor, or staining) were not observed in any of the soil borings completed. The Site consists of an approximately 16- to at least 25-foot-thick layer of miscellaneous fill. Fill was identified from the surface to the depth of soil boring completion between 20 and 25 feet below grade in four of the five soil borings completed. As the bottom of the fill layer was not encountered at these locations, fill may be present deeper than the soil boring completion depth. An up to 3-foot-thick ash layer was encountered in four of five soil borings at depths ranging from 10 to 20 feet below existing grade in the northern, western, and southern portions of the Site. Native sand was encountered in one of the five soil borings at 16 feet below grade.

Analytical results revealed that, with the exception of acetone in three samples, no exceedances of the NYSDEC Unrestricted Use Soil Cleanup Objections (SCOs) for VOCs were detected in any of the soil samples collected.

SVOCs, in particular a subset of SVOCs identified as polycyclic aromatic hydrocarbons (PAHs), were identified in exceedance of the NYSDEC Restricted Residential Restricted Use SCOs (RUSCOs) between 0 and 18 feet below grade on the eastern part of the Site including benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene. 2-Methylnaphthalene was also detected from 0 to 13.5 feet below grade in the northern part of the Site. The highest total concentration of SVOCs was detected at LSB-12 from 16 to 18 feet below grade.

Analytical results revealed exceedances of the NYSDEC Unrestricted Use SCOs for pesticides including 4,4'-DDD, 4,4'-DDT, and dieldrin primarily in surficial soils across the Site footprint, and also from 16 to 18 feet below grade in the southern part of the Site.

Analytical results revealed exceedances of the NYSDEC Unrestricted Use SCOs for PCBs including Aroclor 1254, Aroclor 1260, and total PCBs primarily in surficial soils across the Site footprint, and also from 11.5 to 13.5 feet and 16 to 18 feet below grade at two boring locations.

Metals including barium, cadmium, and lead were identified in exceedance of the NYSDEC Restricted Residential RUSCOs in all five boring locations. Exceedances of the Restricted Residential RUSCOs were detected in surficial soil in one boring locations, and the remaining exceedances were detected in deeper samples between 8 and 18 feet below grade.

Groundwater Investigation Results

Groundwater level was measured in two permanent monitoring well installed as part of this investigation at 13.7 and 18.8 feet below grade in LMW-6 and LMW-4, respectively. Two groundwater samples were collected as part of the Phase II investigation and the analytical results were compared to the NYSDEC Part 703 Groundwater Quality Standards and the NYSDEC Technical & Operational Guidance Series (TOGS) 1.1.1 Ambient Water Quality Standards (collectively referred to as GWQS).

Analytical results revealed no pesticides detected in exceedance of the NYSDEC GWQS. The VOC methyl tert-butl ethyl and the SVOC 3&4 methylphenol were detected in exceedance of the NYSDEC GWQS in LMW-4. The PCB Aroclor 1254 and total PCBs were detected in exceedance of the NYSDEC GWQS in LMW-6. Metals including total and dissolved iron, total

lead, total and dissolved manganese, total and dissolved selenium, and total and dissolved sodium were detected in exceedance of the NYSDEC GWQS in both LMW-4 and LMW-6.

Methane Monitoring Results

Two temporary methane monitoring points were installed adjacent to LSB-11 and LSB-13 and methane concentrations were monitored using a Honeywell MultiRae meter over a period of 5-minutes. No measurable methane concentrations were detected over the 5-minute period.

Conclusions and Recommendations

Based on the results of the May 2018 Phase II, two Areas of Concern (AOCs) related to historical site operations were identified: former on-site automobile junkyard and the presence of contaminated fill material of an unknown origin and incinerator ash throughout the Site that filled the prior on-Site marshland. These AOCs are discussed in detail as recognized environmental conditions (RECs) in the summary of the August 2018 Phase I ESA prepared by Langan, below.

<u>Phase I ESA, Langan, August 2018</u>

Langan conducted a Phase I ESA on behalf of Innovative Urban Living, LLC dated 24 August 2018 for the property identified as 12074 Flatlands Avenue in Brooklyn, NY. The following recognized environmental conditions (RECs) and Business Environmental Risks (BERs) were identified in Langan's 2018 Phase I ESA.

REC-1: Former On-Site Automobile Junkyard

Based on the review of historical Sanborn Maps, an automobile junkyard was identified on the northern portion of the subject property along Flatlands Avenue from 1967 through 2001. This historical use and its potential to have impacted the subsurface conditions was identified as an REC.

REC-2: Presence of Contaminated Fill Material

Based on the review of the 2003 Phase I ESA prepared by Soil Mechanics and the 1991 Technical Memorandum prepared by AKRF which were prepared for the entire 10-acre Christian Cultural Center property, the site was reportedly filled with ash and waste from the city solid waste incinerator. During the May 2018 Phase II Environmental Investigation, fill containing ash was observed in the subsurface and laboratory analytical results for soil revealed the presence of elevated concentrations of PAHs and metals above the NYSDEC Restricted Residential, Commercial, and Industrial RUSCOs. The presence of contaminated fill containing impacts exceeding state regulatory cleanup objectives represents a REC.

BER-1: Potential Presence of Undocumented Underground Heating Oil Storage Tanks

While no evidence or records confirming use of fuel oil USTs was observed during the site inspection or noted during this ESA, undocumented heating oil USTs may be present beneath the lot or adjacent sidewalks associated with small structures shown on historical Sanborn Maps and associated with former auto junkyard operations on the subject property. Due to the presence of these structures and this historical use of the site, it is the opinion of the environmental professional that the potential presence of heating oil USTs beneath the site or adjacent sidewalks associated with these former buildings represents a business environmental risk.

BER-2: Surrounding Sites

Potential impacts from current and historical operations conducted at adjacent and nearby properties involving automobile junkyards/dismantling facilities, automobile repair shops, and gasoline filling stations represent a business environmental risk due to the potential for offsite migration of contaminants to impact sub-slab soil and/or groundwater below the subject site.

3.0 SCOPE OF WORK

The objective of this RIWP is to investigate and characterize "the nature and extent of the contamination at and/or emanating from the brownfield site," per Environmental Conservation Law (ECL) Article 27, Title 14 (Brownfield Cleanup Program) and to address potential data gaps in the May 2018 Phase II Environmental Investigation. The field investigation will include the tasks listed below to supplement the data and findings of the previous Phase II investigation. The rationale for each sampling location and analytical parameters for each proposed sample are provided in Table 1 and the locations of the proposed borings, groundwater monitoring wells, and soil vapor sample locations are shown on Figure 6.

<u>Geophysical Survey</u>

Langan will coordinate with a private utility markout contractor to complete a full geophysical survey throughout the accessible areas of the Site to identify if any subsurface anomalies exist and to assess for the presence of subsurface structures, piping, and underground storage tanks, including previously undiscovered USTs, which may contribute to the presence or migration of contamination.

Soil Borings and Sampling

Advancement of fifteen soil borings will be completed in areas of concern that were identified as result of the previous Phase II Environmental Investigation and in areas not previously investigated. Soil boring locations are proposed across the entirety of the Site to evaluate the extents of impacts and potential remedial options based on subsurface conditions. All soil borings will be advanced to approximately between 18 and 23 feet below grade, corresponding to 5 feet into the groundwater table.

Three discrete soil samples will be collected from each soil borings to determine the extents of contaminated soil at the Site as follows:

- 0 to 2 feet below grade at all fifteen boring locations;
- The most impacted two-foot interval within the fill layer based on field observations at all fifteen boring locations;
- 13 to 15 feet below grade at eight boring locations; and,
- The two-foot interval above the groundwater interface at seven boring locations.

Fill sample depths will vary across the site based on observed conditions/impacts. Additional samples may be collected to characterize contamination at the Site.

Soil samples will be submitted for laboratory analysis of VOCs, SVOCs, PCBs, pesticides, herbicides, TAL metals, total cyanide, and trivalent/hexavalent chromium. All 48 samples will also be analyzed for perfluoroalkyl substances (PFAS) and 1,4-Dioxane analysis.

Groundwater Monitoring Well Installation and Sampling

Eleven soil borings will be completed as permanent monitoring wells to allow for the collection of groundwater samples for laboratory analysis. Two permanent wells installed during the May 2018 Phase II will also be re-sampled. Groundwater monitoring well locations are proposed across the entirety of the Site to evaluate the extents of impacts and potential remedial options based on subsurface conditions. The monitoring wells will be installed by a licensed well driller. The monitoring wells will be constructed using 2-inch diameter 0.010-slot screen for the purposes of collecting groundwater samples to assess Site groundwater conditions.

Prior to groundwater sample collection, the two previously installed monitoring wells and the eleven newly installed monitoring wells will be developed to remove fines and stagnant water within each of the wells.

Prior to groundwater sampling all wells will be gauged for the presence of LNAPL and DNAPL. If detected, NAPL samples will be collected for fingerprinting, viscosity, boiling point, and density analyses.

One week following development of the permanent groundwater monitoring wells, groundwater samples will be collected via USEPA low-flow sampling methods for analysis of VOCs, SVOCs, dissolved polycyclic aromatic hydrocarbons (PAHs), total and dissolved TAL metals, PCBs, pesticides, herbicides, total cyanide, trivalent/hexavalent chromium, PFAS, and 1,4-dioxane analyses.

Soil Vapor Point Installation and Sampling

Thirteen soil vapor points will be installed to allow for the collection of soil vapor samples for laboratory analysis. Soil vapor sampling locations are proposed across the entirety of the site to evaluate the extents of impacts and potential remedial options based on subsurface conditions. The vapor points will be installed by a licensed driller. The points will be constructed using Teflon-lined polyethylene tubing connected to a dedicated expendable six-inch stainless steel screen for the purposes of collecting soil vapor samples to assess Site conditions.

Soil vapor samples will be collected in batch-certified clean and evacuated 6-Liter stainless steel summa canisters with regulators set to collect each sample over a 2-hour sampling period (a flow rate of <200-ml per minute) as per USEPA soil vapor sampling guidance for analysis of VOCs via USEPA TO-15 Method.

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

The field investigation will be completed in accordance with the procedures specified in Langan's Health and Safety Plan (HASP) and Quality Assurance Project Plan (QAPP) provided in Appendices A and B, respectively. A Community Air Monitoring Plan will be implemented during this investigation (see Section 3.6.2).

Names, contact information, and roles of the principal personnel who will participate in the investigation, including laboratory subcontractor, are listed below. Resumes for each Langan employee are provided in the QAPP (Appendix B).

Personnel	Investigation Role	Contact Information
Amanda Forsburg, CHMM Langan	Qualified Environmental Professional	Phone – 973-560-4574 Email – aforsburg@langan.com
Ronald E. Boyer, P.E. Langan	Remedial Engineer	Phone – 973-560-4693 Email – rboyer@langan.com
Amanda Forsburg, CHMM Langan	Project Manager	Phone – 973-560-4574 Email – aforsburg@langan.com
Tony Moffa, CHMM Langan	Langan Health & Safety Officer	Phone – 215-491-6500 Email – tmoffa@langan.com
Molly Mattern Langan	Field Team Leader	Phone – 973-560-4827 Email – mmattern@langan.com
Marlena Jewett Langan	Quality Assurance Officer	Phone – 212-497-5735 Email – mjewett@langan.com
Joe Conboy Langan	Data Validator/Program Quality Assurance Monitor	Phone – 215-845-8985 Email – jconboy@langan.com
Lidya Gulizia York Analytical	Laboratory	Phone – 203-325-1371 x 833 Email – lgulizia@yorklab.com

3.1 Geophysical Survey

A full geophysical survey across all accessible portions of the site will be completed. A geophysical contractor will complete a full geophysical survey of the proposed development site via completion of a geophysical survey to clear the proposed RI boring locations and identify potential subsurface utilities and structures, including unknown USTs, prior to commencing subsurface work. The geophysical survey may be completed using a range of geophysical instruments, including electromagnetic and utility line locator instruments, and ground-penetrating radar (GPR). The results of the survey may necessitate relocation of the proposed boring locations shown on Figure 6.

3.2 Soil Investigation

3.2.1 Drilling and Logging

Five soil borings were advanced as part of Langan's May 2018 Phase II Environmental Investigation. An environmental drilling subcontractor will advance up to fifteen soil borings as discussed above in Section 3.0 to supplement the borings previously completed.

Soil borings will be completed five feet past the initial groundwater interface, corresponding to between approximately 18 and 23 feet below grade, or to beyond the depth of observed contamination if encountered deeper than 23 feet below grade. A Langan field engineer, scientist, or geologist will document the work, screen the soil samples for environmental impacts, and collect soil samples for laboratory analyses per Section 3.2.2. Soil will be screened continuously to the boring termination depth for total organic vapor (TOV) concentration using a PID equipped with a 10.6 electron volt (eV) bulb, and for visual and olfactory indications of environmental impacts (e.g., staining and odor). Soil descriptions will be recorded in boring logs.

Non-disposable, down-hole drilling equipment and sampling apparatus will be decontaminated between locations with Alconox® (or similar) and water where grossly impacted material is identified. Following sampling, each soil boring will be backfilled with granulated bentonite below the groundwater interface and/or clean sand in the vadose zone.

3.2.2 Soil Sampling and Analysis

Discrete soil samples will be collected from the 0- to 2-foot interval below grade, the most impacted two-foot interval within the fill layer based on field observations, and either the two-foot interval above the groundwater interface, the two-foot interval immediately below the proposed development depth, or from 15 to 17 feet below grade. Fill sample depths will vary across the site based on observed conditions/impacts. Soil samples will be submitted for laboratory analysis of VOCs, SVOCs, TAL metals, PCBs, pesticides, herbicides, total cyanide, hexavalent chromium, PFAS, and 1,4-dioxane. QA/QC procedures including the collection frequency and analysis of field blanks and duplicate samples are described in the QAPP provided as Appendix B.

Soil samples will be collected in laboratory-supplied containers and will be sealed, labeled, and placed in a cooler containing ice (to maintain a temperature of approximately 4 degrees Celsius) for delivery to York Analytical Laboratories, Inc. (York), a NYSDOH Environmental Laboratory Approval Program (ELAP)-certified analytical laboratory.

3.3 Groundwater Investigation

3.3.1 Monitoring Well Installation

Two permanent monitoring wells were installed as part of Langan's May 2018 Phase II Environmental Investigation. Eleven of the fifteen proposed soil boring locations will be converted into permanent groundwater monitoring wells. The two permanent wells installed during the May 2018 Phase II will also be re-sampled. Groundwater monitoring well locations are proposed across the entirety of the Site to evaluate the extents of impacts and potential remedial options based on subsurface conditions. Groundwater monitoring wells will be installed by a licensed well driller. During well installation, soil conditions will be screened, logged, and sampled as described above in Section 3.2.

The proposed monitoring wells will be constructed using 2-inch-diameter polyvinyl chloride (PVC) riser pipe attached to 10- to 15-foot long, schedule-40, 0.010-inch slotted, 2-inch-diameter PVC screen. Each monitoring well will be installed so that the well screen straddles the observed water table. The well annulus around the screen will be backfilled with clean sand to about 2 feet above the top of the screen. A minimum 2-foot bentonite seal will be installed above the sand, and the borehole annulus will be backfilled with clean sand and/or a Portland cement, bentonite slurry. The wells will be finished with flush-mounted metal manhole covers set in concrete.

Following installation, the wells will be developed by surging the newly installed sand pack with a surge block, a weighted bailer, or surge pumping techniques across the well screen to agitate and remove fine particles. The surge block, bailer, or submersible pump will be surged across the submerged well screen in 2- to 3-foot increments for approximately 2 minutes per increment. After surging, the well will be purged via pumping until the water becomes clear. The well will then be allowed to sit for a minimum of one week before sampling. The two previously installed wells will also be re-developed prior to sampling.

3.3.2 Groundwater Sampling and Analysis

Prior to completion of groundwater sample collection, all monitoring wells will be gauged for the presence of LNAPL and DNAPL. If detected, NAPL samples will be collected for fingerprinting, viscosity, boiling point, and density analyses.

One week following development of the permanent groundwater monitoring wells, groundwater samples will be collected via USEPA low-flow sampling methods for analysis of VOCs, SVOCs, dissolved PAHs, PCBs, pesticides, herbicides, total and dissolved TAL metals, total cyanide, hexavalent chromium, PFAS, and 1,4-dioxane. Groundwater samples will be collected into laboratory-supplied containers and will be sealed, labeled, and placed in a cooler containing ice (to maintain a temperature of approximately 4 degrees Celsius) for delivery to a NYSDOH ELAP-certified analytical laboratory. QA/QC procedures including the collection frequency and analysis of field blanks and duplicate samples are described in the QAPP provided as Appendix B.

3.3.3 Monitoring Well Survey and Synoptic Gauging

Langan will survey vertical locations of the monitoring wells, including ground surface elevation, outer casing elevation, and inner casing elevation. This data will be used with the groundwater well gauging data to prepare a sample location plan and a groundwater contour map depicting the elevation of the water table across the Site. Vertical control will be established by surveying performed relative to North American Vertical Datum of 1988 (NAVD88) and/or Brooklyn Highway Datum (BHD) by a New York State-licensed land surveyor. Elevations of the top of monitoring well casings and protective well casings will be surveyed to the nearest 0.01 foot. A synoptic gauging event will be performed to document static water levels. All accessible wells will be gauged during this event.

3.4 Soil Vapor Investigation

3.4.1 Soil Vapor Point Installation

Thirteen soil vapor points will be installed to allow for the collection of soil vapor samples for laboratory analysis. Soil vapor sampling locations are proposed across the entirety of the Site to evaluate the extents of impacts and potential remedial options based on subsurface conditions. The vapor points will be installed by a licensed driller and installed to a depth corresponding to approximately one-foot above the groundwater table. During vapor point installation, soil conditions will not be screened, as the points will be directly pushed to the desired depth. Subsurface conditions will be evaluated based on the adjacent soil boring or nearby soil boring conditions.

The points will be constructed using Teflon-lined polyethylene tubing connected to a dedicated expendable six-inch stainless steel screen. Quartz filter media will be used to backfill the screened interval followed by No. 2 sand to approximately 0.5 feet above the

screened interval followed by a hydrated granular bentonite clay to the ground surface. Each soil vapor sampling location will be sealed at the surface with hydrated bentonite clay.

3.4.2 Soil Vapor Sampling and Analysis

Soil vapor samples will be collected shortly after installation of the temporary probes. Each soil vapor sampling point will be tightness tested using the helium tracer gas method and purged at a flow-rate of <200-ml per minute for 5 minutes into a 1-liter tedlar bag to obtain a PID reading. Helium concentrations below 5% must be observed prior to sample collection. One to three volumes (i.e., the volume of the sample probe and tube) will be purged prior to collecting the sample to ensure a representative sample is obtained.

Soil vapor samples will be laboratory analyzed for VOCs via the USEPA TO-15 Method. Samples will be collected in batch-certified clean and evacuated 6-Liter stainless steel summa canisters with regulators supplied by York. The regulators will be set to collect each sample over a 2-hour sampling period (a flow rate of <200-ml per minute) as per USEPA soil vapor sampling guidance. Samples will be transferred to the laboratory immediately after field sampling is completed and stored at a maximum room temperature of 30° Celsius. QA/QC procedures including the collection frequency and analysis of field blanks and duplicate samples are described in the QAPP provided as Appendix B.

3.5 Data Management and Validation

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

Table 1 summarizes the anticipated samples and analytical methodology. QA/QC procedures required by the NYSDEC ASP and SW-846 methods, including initial and continuing instrument calibrations, surrogate compound spikes, and analysis of other samples (blanks, laboratory control samples, and matrix spikes/matrix spike duplicates) will be followed in accordance with the QAPP (Appendix B). The laboratory will provide pre-cleaned and preserved sample bottles in accordance with the SW-846 methods. Where there are differences in the SW-846 and NYSDEC ASP requirements, the NYSDEC ASP shall take precedence.

Data validation will be performed in accordance with the USEPA Region 2 SOPs for data validation and USEPA's National Functional Guidelines for Organic and Inorganic Data Review. Tier 1 data validation (the equivalent of USEPA's Stage 2A validation) will be performed to evaluate data quality. Tier 1 data validation is based on completeness and compliance checks of sample-related QC results including:

- Holding times;
- Sample preservation;
- Blank results (method, trip, and field blanks);
- Surrogate recovery compounds and extracted internal standards (as applicable);
- LCS and LCSD recoveries and RPDs;
- MS and MSD recoveries and RPDs;
- Laboratory duplicate RPDs; and
- Field duplicate RPDs

A DUSR will be prepared by the data validator and reviewed by the QAM before issuance. The DUSR will present the results of data validation, including a summary assessment of laboratory data packages, sample preservation and chain-of-custody procedures, and a summary assessment of precision, accuracy, representativeness, comparability, and completeness for each analytical method. Additional details on the DUSRs are provided in the QAPP in Appendix B.

3.6 Management of Investigation-Derived Waste

Investigation-derived wastes (IDW) (i.e., grossly-contaminated soil cuttings and purge water, or soil that cannot be returned to the borehole due to monitoring well construction) will be containerized and staged on-site, pending proper disposal at an off-site facility. Soil cuttings with no apparent staining, odors, or elevated PID readings will be used to backfill boring holes above the vadose zone. Soil to be disposed off-site will be placed in 55-gallon, United Nations/Department of Transportation (UN/DOT)-approved drums. Decontamination fluids, if necessary, will be placed in UN/DOT-approved fluid drums with closed tops. All drums will be properly labeled, sealed, and characterized as necessary. If RI analytical data is insufficient to gain disposal facility acceptance, waste characterization samples will be analyzed for parameters

that are typically required by disposal facilities, such as TCL VOCs, SVOCs, metals, PCBs, pesticides, herbicides, Toxicity Characteristic Leaching Procedure (TCLP) VOCs, TCLP SVOCs, TCLP metals, and Resource Conservation and Recovery Act (RCRA) characteristics including ignitability, corrosivity, and reactivity. Additional sampling and analyses may be required based on the selected disposal facility. Waste characterization samples will be submitted to York for analysis in accordance with the QAPP provided in Appendix B. Management of IDW will comply with NYSDEC DER-10 3.3(e).

3.7 Air Monitoring

Air monitoring will be conducted for site personnel and the community (Community Air Monitoring Program [CAMP]). Fugitive particulate (dust) generation that could affect site personnel or the public is not expected because intrusive work is limited to boring, monitoring well, and soil vapor point installation, which does not disturb large volumes of soil.

Dust emissions will be monitored using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10). Organic odors will be monitored with a PID equipped with a 10.6 eV bulb. Dust and odor suppression measures (e.g., water misting, odor suppressant) will be implemented as required.

3.7.1 Personnel Air Monitoring

Langan will conduct air monitoring of the breathing zone periodically during drilling and sampling activities to evaluate health and safety protection for the field personnel. Ambient air monitoring will be performed within the work area. Langan will monitor VOCs with a PID (MultiRAE 3000 or similar) in accordance with the HASP (Appendix A). If air monitoring during intrusive operations identifies the presence of VOCs or dust, on-site personnel will follow the guidelines outlined in the HASP regarding action levels, permissible exposure, suppression/engineering controls, and personal protective equipment. If the VOC action level is exceeded, work will cease and the work location will be evacuated. Monitoring will be continued until the levels drop to safe limits. At that time, work can resume with continued monitoring. If high levels persist, field activities will be halted, and the work relocated to another area. If the dust action level is exceeded, dust suppression will be applied, and monitoring will be continued. If high levels persist, field activities will be halted and re-assessed.

3.7.2 Community Air Monitoring Plan

In addition to air monitoring in the worker breathing zone, Langan will conduct community air monitoring in compliance with the NYSDOH Generic CAMP. CAMP deployment will comply with NYSDEC DER-10 Appendix 1A and Appendix 1B.

Langan will conduct monitoring for VOCs during ground-intrusive work (i.e., soil boring advancement and monitoring well installation). Upwind concentrations of VOCs and dust will be monitored continuously each day to establish background concentrations. Langan will monitor VOCs and dust at the downwind perimeter of the work zone, which will be established at a point on the Site where the general public or site employees may be present. Monitoring for VOCs will be conducted with a PID equipped with a 10.6 eV bulb. Dust emissions will be monitored using real-time monitoring equipment capable of measuring PM-10 (e.g., DustTrak).

Langan will also conduct periodic monitoring for VOCs during non-intrusive work such as the collection of groundwater samples. Periodic monitoring may include obtaining measurements upon arrival at a location, when opening a monitoring well cap, when bailing/purging a well, and upon departure from a location.

3.8 Qualitative Human Health Exposure Assessment

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

4.0 REMEDIAL INVESTIGATION REPORT

4.1 Daily Field Reports

Daily reports will be prepared and submitted to the assigned NYSDEC and NYSDOH project managers by the end of each day following the reporting period and will include:

- An update of progress made during the reporting day;
- Photographic documentation of the activities completed during the reporting day;
- Identification of samples collected during the reporting day;
- Locations and references to a site map for completed activities;

- A summary of any and all complaints with relevant details, including contact information;
- A summary of CAMP findings, including elevated concentrations and response actions, if any;
- An explanation of notable site conditions; and,
- A list of anticipated work for the following reporting day.

Daily reports are not intended to notify the NYSDEC of emergencies (e.g., accidents, spills), request changes to the RIWP, or communicate other sensitive or time-critical information. However, such conditions will also be included in the daily reports. Emergency conditions and changes to the RIWP will be communicated directly to the NYSDEC Project Manager.

4.2 Remedial Investigation Report

Following completion of the RI and receipt of analytical data, a RIR will be prepared in accordance with the applicable requirements of DER-10 Section 3.14. The report will include:

- A summary of the site history and previous investigations;
- A description of site conditions;
- Sampling methodology and field observations;
- An evaluation of the results and findings; and,
- Conclusions and recommendations for any further assessment (if warranted).

The report will summarize the nature and extent of contamination at each area of concern and identify unacceptable exposure pathways (as determined through a Qualitative Human Health Exposure Assessment).

The report will include soil boring and well construction logs, sampling logs, tabulated analytical results, figures, and laboratory data packages. The tabulated analytical results will be organized in table format and include sample location, media sampled, sample depth, field/laboratory identification numbers, analytical results and the applicable Standards, Criteria, and Guidance (SCGs) pertaining to the Site and contaminants of concern for comparison. The report will include scaled figures showing the locations of soil borings, monitoring wells, and soil vapor points, sample concentrations above SCGs for each media, groundwater elevation contours and flow direction, and, if appropriate, groundwater contaminant concentration contours.

The RIR will be provided in an electronic format to the NYSDEC.

5.0 SCHEDULE

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

Activity	Weeks (following approval of RIWP)															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Coordinate Geophysical Survey, Driller and Laboratory																
Perform Geophysical Survey																
Advance Soil Borings, Install Monitoring Wells, Install Soil Vapor Points and Collect Soil, Groundwater, and Soil Vapor Samples																
Receipt of Laboratory Results																
Data Validation																
EQuIS™ Electronic Data Deliverable																
Preparation and Submission of RIR																

\\Langan.com\data\PAR\data8\100688801\Project Data_Discipline\Environmental\Reports_Block 4434 Lot 1 (Phase 1B)\2022-10 - BCP RIWP (Lot 1)\12074 Flatlands Avenue RIWP (Rev. 2022-10-20)_FINAL.docx

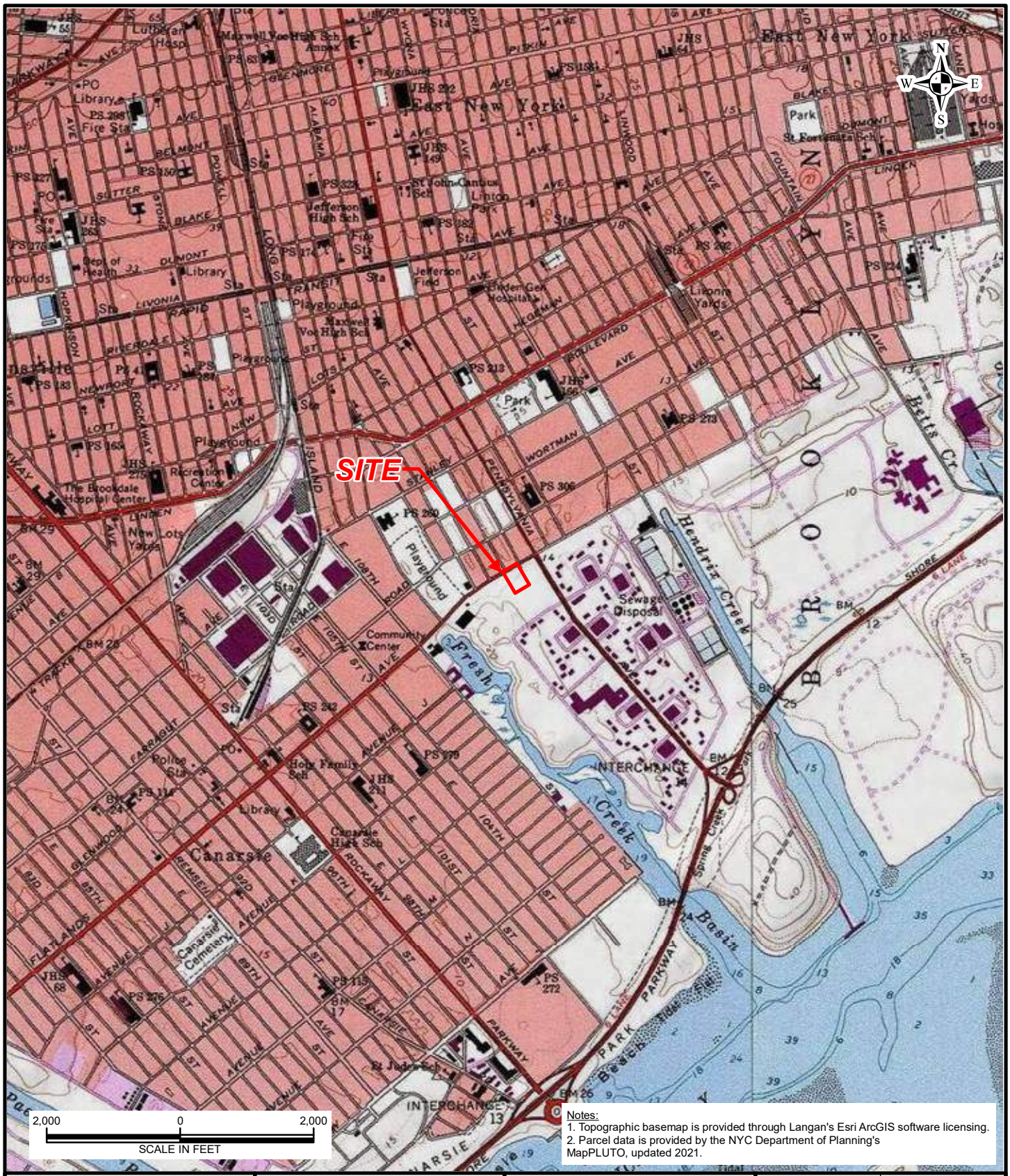
TABLES

Table 1
PROPOSED SAMPLING SUMMARY
12074 Flatlands Avenue
Brooklyn, New York

Matrix	Sample Depth (ft bgs)	Sample Location	Analysis
Soil	0 to 2-ft interval	LSB-28	TCL/Part 375 VOCs TCL/Part 375 SVOCs TCL/Part 375 PCBs TCL/Part 375 Pesticides TCL/Part 375 Herbicides TAL/Part 375 Metals Hexavalent/Trivalent Chromium Cyanide PFAS & 1,4-Dioxane
		LSB-29	
		LSB-30	
		LSB-31	
		LSB-32	
		LSB-33	
		LSB-34	
		LSB-35	
		LSB-36	
		LSB-37	
		LSB-38	
		LSB-39	
		LSB-40	
		LSB-41	
		LSB-42	
	2-ft interval within the fill layer[1], at varying depths	LSB-28	
		LSB-29	
		LSB-30	
		LSB-31	
		LSB-32	
		LSB-33	
		LSB-34	
		LSB-35	
		LSB-36	
		LSB-37	
		LSB-38	
		LSB-39	
		LSB-40	
		LSB-41	
		LSB-42	
	2-ft interval above the groundwater interface[2] or 13 to 15 ft below grade	LSB-28	
		LSB-29	
		LSB-30	
		LSB-31	
		LSB-32	
		LSB-33	
		LSB-34	
		LSB-35	
		LSB-36	
		LSB-37	
		LSB-38	
		LSB-39	
		LSB-40	
		LSB-41	
		LSB-42	
Groundwater	---	LMW-4	TCL/Part 375 VOCs TCL/Part 375 SVOCs TCL/Part 375 PCBs TCL/Part 375 Pesticides TCL/Part 375 Herbicides TAL/Part 375 Total & Dissolved Metals Hexavalent/Trivalent Chromium Cyanide PFAS & 1,4-Dioxane
		LMW-6	
		LMW-15	
		LMW-16	
		LMW-17	
		LMW-18	
		LMW-19	
		LMW-20	
		LMW-21	
		LMW-22	
		LMW-23	
		LMW-24	
		LMW-25	
Soil Vapor	2-foot interval above the groundwater interface[2]	LSV-9	VOCs via USEPA TO-15 Method
		LSV-10	
		LSV-11	
		LSV-12	
		LSV-13	
		LSV-14	
		LSV-15	
		LSV-16	
		LSV-17	
		LSV-18	
		LSV-19	
		LSV-20	
		LSV-21	

NOTES:
1 - The bottom of the fill layer is encountered between 16 and 25 feet below ground surface throughout the site.
2 - The groundwater interface is located between 13.7 feet and 18.8 feet below ground surface throughout the site.
3 - QA/QC sampling frequency and analytical methods provided in the Quality Assurance Project Plan provided as Appendix B of this report.

FIGURES



Notes:
1. Topographic basemap is provided through Langan's Esri ArcGIS software licensing.
2. Parcel data is provided by the NYC Department of Planning's MapPLUTO, updated 2021.

LANGAN
300 Kimball Drive
Parsippany, NJ 07054
T: 973.560.4900 F: 973.560.4901 www.langan.com

Langan Engineering & Environmental Services, Inc.
Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.
Langan International LLC
Collectively known as Langan

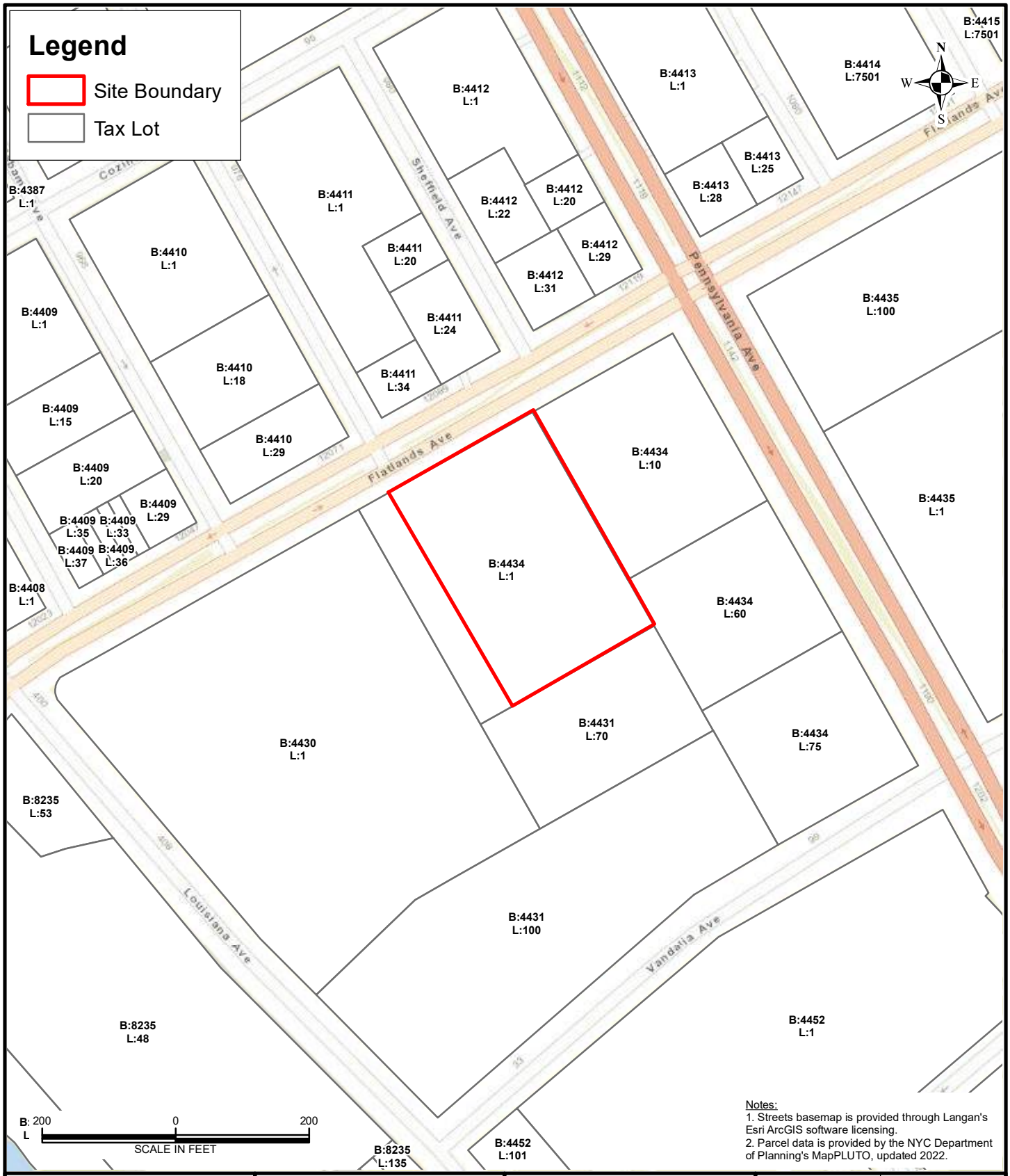
NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400

Project
12074 FLATLANDS AVENUE
BLOCK No. 4434, LOT No. 1 (Portion)
BROOKLYN
KINGS COUNTY NEW YORK

Drawing Title
SITE LOCATION MAP

Project No. 100688801	Figure 1
Date 1/19/2022	
Scale 1"=2,000'	
Drawn By IHB	

Path: \\Langan.com\data\PAR\data8\100688801\Project Data\ArcGIS\MXD\Environmental_Figures\2022-01 CCC RIWP\Figure 1 - Site Location Map.mxd



Notes:
1. Streets basemap is provided through Langan's Esri ArcGIS software licensing.
2. Parcel data is provided by the NYC Department of Planning's MapPLUTO, updated 2022.

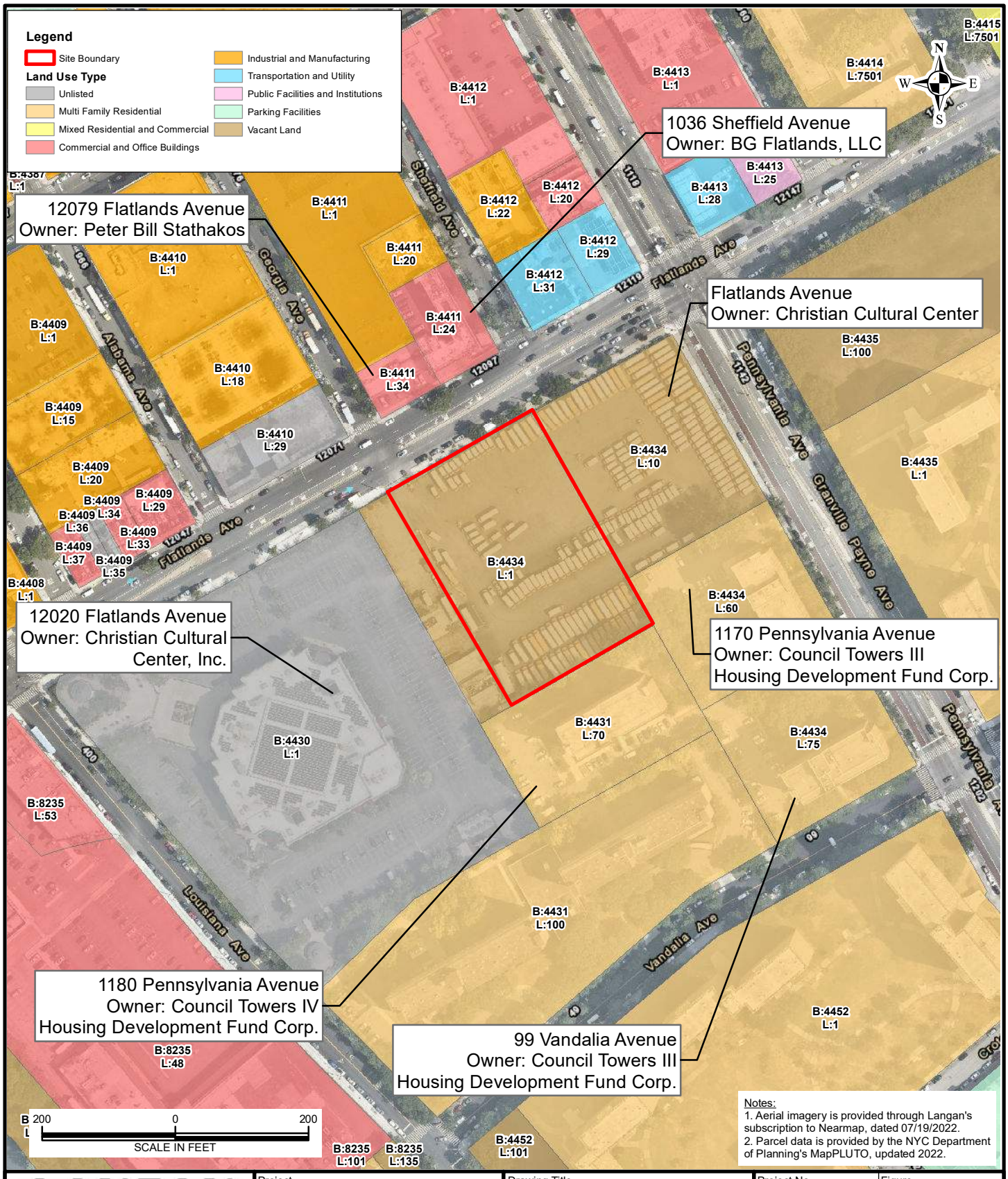
LANGAN
300 Kimball Drive
Parsippany, NJ 07054
T: 973.560.4900 F: 973.560.4901 www.langan.com
Langan Engineering & Environmental Services, Inc.
Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.
Langan International LLC
Collectively known as Langan
NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400

Project
12074 FLATLANDS AVENUE
BLOCK No. 4434, LOT No. 1
BROOKLYN
KINGS COUNTY NEW YORK

Drawing Title
TAX MAP

Project No.	100688801
Date	8/29/2022
Scale	1"=200'
Drawn By	IHB
Figure	2

Path: \\Langan.com\data\PAR\data8\100688801\Project Data\ArcGIS\MXD\Environmental_Figures\2022-08 RIWP\Figure 2 - Tax Map.mxd



LANGAN
300 Kimball Drive
Parsippany, NJ 07054
T: 973.560.4900 F: 973.560.4901 www.langan.com
Langan Engineering & Environmental Services, Inc.
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Project
12074 FLATLANDS AVENUE
BLOCK No. 4434, LOT No. 1
BROOKLYN
KINGS COUNTY NEW YORK

Drawing Title
SITE PLAN AND SURROUNDING LAND USE

Project No.	100688801
Date	8/29/2022
Scale	1"=200'
Drawn By	IHB
Figure	3

Path: \\Langan.com\data\PAR\data8\100688801\Project Data\ArcGIS\MXD\Environmental_Figures\2022-08 RIWP\Figure 3 - Surrounding Land Use.mxd

Legend

- Site Boundary
- Soil Boring Location
- Soil Boring/Monitoring Well Location
- Test Pit Location

Sample ID:	030/LSB-11A		032/LSB-11C	
Material	Hist. Fill		Fill Above Ash	
Laboratory Sample Number:	18E0514-01		18E0514-03	
Sample Date:	5/9/2018		5/9/2018	
Sample Depth/VOC Sample Depth (ft bgs):	0-2 (1-1.5)		11.5-13.5 (13-13.5)	
Units:	mg/kg	Q	mg/kg	Q
VOCs				
Acetone	0.0061	J	**0.14**	
SVOCs				
2-Methylnaphthalene	0.0445	U	**1.35**	D
Pesticides				
4,4'-DDT	**0.00673**	D	0.00193	U
PCBs				
Aroclor 1260	0.0393		**0.918**	E
Total PCBs	0.0393		**0.918**	
Metals				
Barium	191		**419**	
Copper	**80**		25.5	
Iron	**12500**		**13500**	
Lead	**241**		**489**	
Mercury	0.176		**0.287**	
Zinc	**257**		**377**	

Sample ID:	017/LSB-14A		018/LSB-14B	
Material	Hist. Fill		Fill Above Ash	
Laboratory Sample Number:	18E0411-17		18E0411-18	
Sample Date:	5/8/2018		5/8/2018	
Sample Depth/VOC Sample Depth (ft bgs):	0-2 (1.5-2)		8-10 (9-9.5)	
Units:	mg/kg	Q	mg/kg	Q
VOCs				
Acetone	0.026		**0.05**	
SVOCs				
2-Methylnaphthalene	**1.67**	D	**0.904**	D
Benzo(a)anthracene	**2.25**	D	**1.51**	D
Benzo(a)pyrene	**2.31**	D	**1.4**	D
Benzo(b)fluoranthene	**1.39**	D	**1.06**	D
Benzo(k)fluoranthene	**1.57**	D	**1.04**	D
Chrysene	**2.24**	D	**1.44**	D
Dibenzo(a,h)anthracene	**0.447**	D	0.327	D
Indeno(1,2,3-cd)pyrene	**1.05**	D	**0.7**	D
Pesticides				
4,4'-DDT	**0.0181**	D	0.00183	U
PCBs				
Aroclor 1260	**0.127**		0.044	P
Total PCBs	**0.127**		0.044	P
Metals				
Barium	171		**385**	
Cadmium	2.45		**6.82**	
Chromium, Trivalent	21.7		**44.8**	
Copper	**97.8**		**191**	
Iron	**15,900**		**27,000**	
Lead	**462**		**1,640**	
Mercury	**0.266**		**0.263**	
Nickel	**42.6**		**63.4**	
Zinc	**2,500**		**5,070**	D

Sample ID:	023/LSB-10A		024/LSB-10B	
Material	Hist. Fill		Fill Above Ash	
Laboratory Sample Number:	18E0487-03		18E0487-04	
Sample Date:	5/9/2018		5/9/2018	
Sample Depth/VOC Sample Depth (ft bgs):	0-2 (1.5-2)		15-17 (16-16.5)	
Units:	mg/kg	Q	mg/kg	Q
VOCs	No Exceedance		No Exceedance	
SVOCs	No Exceedance		No Exceedance	
Pesticides				
4,4'-DDT	**0.0223**	D	0.00177	U
PCBs				
Aroclor 1254	**0.225**		0.0179	U
Aroclor 1260	**0.113**		0.0179	U
Total PCBs	**0.338**		0.0179	U
Metals				
Chromium, Trivalent	**65.1**		18.8	
Copper	**112**		34.5	
Iron	**22000**		**11000**	
Lead	**469**		**91.3**	
Mercury	**0.587**		0.134	
Nickel	**31.5**		14.3	
Selenium	1.09	U	**8.44**	
Zinc	**439**		86	

Sample ID:	021/LSB-12A		022/LSB-12B	
Material	Hist. Fill		Fill Between Ash Layers	
Laboratory Sample Number:	18E0487-01		18E0487-02	
Sample Date:	5/9/2018		5/9/2018	
Sample Depth/VOC Sample Depth (ft bgs):	0-2 (1-1.5)		16-18 (16.5-17)	
Units:	mg/kg	Q	mg/kg	Q
VOCS				
Acetone	0.048		**0.16**	
SVOCs				
2-Methylnaphthalene	0.0458	U	**1.72**	D
Benzo(a)anthracene	0.838	D	**12.2**	D
Benzo(a)pyrene	0.935	D	**10**	D
Benzo(b)fluoranthene	0.835	D	**7.3**	D
Benzo(k)fluoranthene	0.781	D	**7.82**	D
Chrysene	0.875	D	**10.7**	D
Dibenzo(a,h)anthracene	0.221	D	**2.27**	D
Indeno(1,2,3-cd)pyrene	**0.559**	D	**5.51**	D
Pesticides				
4,4'-DDD	0.0018	U	**0.022**	D
4,4'-DDT	0.0018	U	**0.00762**	DP
Dieldrin	0.0018	U	**0.00522**	D
PCBs				
Aroclor 1260	**0.113**		0.0198	U
Total PCBs	**0.113**		**0.252**	
Metals				
Barium	156		**572**	
Copper	**112**		**225**	
Iron	**19,400**		**19,400**	
Lead	**286**		**734**	
Mercury	**0.496**		**0.689**	
Zinc	**330**		**451**	

Sample ID:	025/LSB-13A		026/LSB-13B	
Material	Hist. Fill		Hist. Fill	
Laboratory Sample Number:	18E0487-05		18E0487-06	
Sample Date:	5/9/2018		5/9/2018	
Sample Depth/VOC Sample Depth (ft bgs):	0-2 (1-1.5)		8-10 (9.5-10)	
Units:	mg/kg	Q	mg/kg	Q
VOCs	No Exceedance		No Exceedance	
SVOCs				
Benzo(a)anthracene	0.844	D	**1.77**	D
Benzo(a)pyrene	0.937	D	**1.89**	D
Benzo(b)fluoranthene	0.794	D	**1.23**	D
Benzo(k)fluoranthene	0.736	D	**1.28**	D
Chrysene	0.802	D	**1.82**	D
Dibenzo(a,h)anthracene	0.248	D	**0.371**	D
Indeno(1,2,3-cd)pyrene	**0.521**	D	**0.934**	D
Pesticides				
4,4'-DDT	**0.0247**	D	0.00202	U
Dieldrin	**0.0111**	D	0.00202	U
PCBs				
Aroclor 1254	**0.19**		0.0204	U
Aroclor 1260	**0.104**		0.0204	U
Total PCBs	**0.294**		0.0204	U
Metals				
Copper	**102**		**69.7**	
Iron	**19,700**		**68,300**	
Lead	**270**		**542**	
Mercury	**0.667**		**0.664**	
Zinc	**333**		**437**	

NYSDEC Subpart 375-6 Remedial Program SCOs	Unrestricted Use	Protection of Public Health - Restricted Use SCOs			
		Residential	Restricted - Residential	Commercial	Industrial
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
VOCs					
Acetone	0.05	100	100	500	1,000
SVOCs					
2-Methylnaphthalene	---	0.41	---	---	---
Benzo(a)anthracene	1	1	1	5.6	11
Benzo(a)pyrene	1	1	1	1	1.1
Benzo(b)fluoranthene	1	1	1	5.6	11
Benzo(k)fluoranthene	0.8	1	3.9	56	110
Chrysene	1	1	3.9	56	110
Dibenzo(a,h)anthracene	0.33	0.33	0.33	0.56	1.1
Indeno(1,2,3-cd)pyrene	0.5	0.5	0.5	5.6	11
Pesticides					
4,4'-DDD	0.0033	2.6	13	92	180
4,4'-DDT	0.0033	1.7	7.9	47	94
Dieldrin	0.005	0.039	0.2	1.4	2.8
PCBs					
Aroclor 1254	0.1	1	1	1	25
Aroclor 1260	0.1	1	1	1	25
Total PCBs	0.1	1	1	1	25
Metals					
Barium	350	350	400	400	10,000
Cadmium	2.5	2.5	4.3	9.3	60
Chromium, Trivalent	30	36	180	1500	6,800
Copper	50	270	270	270	10,000
Iron	---	2,000	---	---	---
Lead	63	400	400	1,000	3,900
Mercury	0.18	0.81	0.81	3	6
Nickel	30	140	310	310	10,000
Selenium	3.9	36	180	1500	6,800
Zinc	109	2,200	10,000	10,000	10,000

NOTES:
Soil Cleanup Objectives are taken from the NYSDEC Subpart 375-6 Remedial Program SCOs (Revised Brownfields) criteria are from the NYSDEC Soil Cleanup Objective Tables 375-6.8(a) and 375-6.8(b), last revised 14 December 2006 and the NYSDEC CP-51 Soil Cleanup Guidance dated 21 October 2010.

ft bgs: feet below ground surface

mg/kg: millograms per kilogram

--- : Indicates that no regulatory limit has been established for this analyte

Regulatory Exceedances are in **bold** and are color coded by regulation.

Q is the Qualifier Column with definitions as follows:
U: The analyte was analyzed for, but was not detected at a level greater than or equal to the level of the Limit of Detection (LOD)/Method Detection Limit (MDL) or the sample concentration for results impacted by blank contamination.

J: The analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample.

D: Compound analyzed at a secondary dilution factor.

P: this flag is used for pesticide and PCB (Aroclor) target compounds when there is a % difference for detected concentrations that exceed method dictated limits between the two GC columns used for analysis

E: The concentration indicated for this analyte is an estimated value above the calibration range of the instrument. This value is considered an estimate.

60 0 60

SCALE IN FEET

References:
1. Site survey basemap from Control Point Associates Inc. PC, last updated March 17, 2021.
2. Sample and test pit locations were collected using the ArcGIS Collector application on a tablet utilizing GPS location.

LANGAN
300 Kimball Drive
Parsippany, NJ 07054
T: 973.560.4900 F: 973.560.4901 www.langan.com

Langan Engineering & Environmental Services, Inc.
Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.
Langan International LLC
Collectively known as Langan

NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400

Project
12074 FLATLANDS AVENUE
BLOCK No. 4434, LOT No. 1 (Portion)
BROOKLYN
KINGS COUNTY NEW YORK

Drawing Title
HISTORICAL SOIL SAMPLE LOCATIONS AND RESULTS

Project No. 100688801	Figure 4
Date 8/29/2022	
Scale 1 " = 60 '	
Drawn By IHB	

Path: \\Langan.com\data\PAR\data8\100688801\Project Data\ArcGIS\MXD\Environmental_Figures\2022-08 RIWP\Figure 4 - Historical Soil Sample Locations and Results.mxd

Legend

- Site Boundary
- Soil Boring Location
- Soil Boring/Monitoring Well Location
- Test Pit Location

LSB-11/LMW-6

LSB-14

LTP-5

LSB-13/LMW-4

LSB-10

LTP-8

LSB-12

Sample ID:	055/LMW-6	
Langan Sample Number:	055	
Laboratory Sample Number:	18E0702-03	
Sampling Date:	5/14/2018	
Units:	ug/L	Q
VOCs	No Exceedances	
SVOCs	No Exceedances	
PCBs		
Pcb-1254 (Aroclor 1254)	**0.3410**	
Total PCBs	**0.3410**	
Metals		
Iron	**34400.00**	
Lead	**117**	
Manganese	**877**	
Sodium	**181000.00**	**B**
Dissolved Metals		
Iron	**9800**	
Manganese	**513**	
Sodium	**87800.00**	

Sample ID:	059/LMW-4	
Langan Sample Number:	059	
Laboratory Sample Number:	18E0702-07	
Sampling Date:	5/14/2018	
Units:	ug/L	Q
VOCs		
Methyl tert-butyl ether	**19.900**	
SVOCs		
3- & 4-Methylphenols	**6.430**	
PCBs	No Exceedances	
Metals		
Iron	**532.00**	
Manganese	**439**	
Selenium	**20.90**	
Sodium	**76100.00**	**B**
Dissolved Metals		
Iron	**2940**	
Manganese	**309**	
Selenium	**14.60**	
Sodium	**123000.00**	

Groundwater Part 703 and TOGS 1.1.1 Combined	Ground Water Quality Standards ug/L
VOCs	
Methyl tert-butyl ether	10
SVOCs	
3- & 4-Methylphenols	1
PCBs	
Pcb-1254 (Aroclor 1254)	0.09
Total PCBs	0.09
Total Metals	
Iron	300
Lead	25
Manganese	300
Selenium	10
Sodium	20,000
Dissolved Metals	
Iron	300
Manganese	300
Selenium	10
Sodium	20,000

NOTES:
Exceedances of regulatory criteria are highlighted and **bold**.
ug/L: micrograms per liter
B: Analyte present in the analysis batch blank

NYSDEC Technical & Operational Guidance Series (TOGS) 1.1.1 Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations, last revised June 2004.
http://www.dec.ny.gov/regulations/2652.html

50 0 50
SCALE IN FEET

References:
1. Site survey basemap from Control Point Associates Inc. PC, last updated March 17, 2021.
2. Sample and test pit locations were collected using the ArcGIS Collector application on a tablet utilizing GPS location.

LANGAN
300 Kimball Drive
Parsippany, NJ 07054
T: 973.560.4900 F: 973.560.4901 www.langan.com
Langan Engineering & Environmental Services, Inc.
Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.
Langan International LLC
Collectively known as Langan
NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400

Project
12074 FLATLANDS AVENUE
BLOCK No. 4434, LOT No. 1 (Portion)
BROOKLYN
KINGS COUNTY NEW YORK

Drawing Title
HISTORICAL GROUNDWATER SAMPLE LOCATIONS AND RESULTS

Project No. 100688801
Date 8/29/2022
Scale 1 " = 50 '
Drawn By IHB
Figure 5

Path: \\Langan.com\data\PAR\data8\100688801\Project Data\ArcGIS\MXD\Environmental_Figures\2022-08 RIWP\Figure 5 - Historical Groundwater Sample Locations and Results.mxd

Legend

- Historical Soil Boring Location
- Historical Soil Boring/Monitoring Well Location
- Historical Test Pit Location
- Site Boundary
- Proposed Soil Boring/ Monitoring Well Location
- Proposed Soil Vapor Point

LSV-9
LSV-10
LSB-29/LMW-25
LSB-28/LMW-15
LSB-30/LMW-16
LSV-11
LSB-11/LMW-6
LSB-14
LSV-21
LSB-32/LMW-24
LSB-33
LSB-31
LTP-5
LSV-12
LSV-13
LSV-14
LSB-34/LMW-17
LSB-35/LMW-18
LSB-36/LMW-19
LSB-13/LMW-4
LSV-15
LSB-10
LSV-20
LSV-16
LSB-38/LMW-20
LSB-39
LSB-37
LTP-8
LSB-12
LSV-19
LSV-17
LSV-18
LSB-40/LMW-21
LSB-42/LMW-23
LSB-41/LMW-22

FORMERLY THE BED OF GEORGIA AVE.
PARCEL D BLOCK 4434 LOT 80 STREET BEDS
N/F LANDS OF CHRISTIAN CULTURAL CENTER, INC. CRFN #2003000210219
FORMERLY THE BED OF GEORGIA AVE.
PARCEL E BLOCK 4434 LOTS 1&21
N/F LANDS OF CHRISTIAN CULTURAL CENTER, INC. CRFN #2003000210219
BLOCK 4434 LOTS 1&21 N/F LANDS OF CHRISTIAN CULTURAL CENTER, INC.
BLOCK 4434 LOT 1 N/F LANDS OF CHRISTIAN CULTURAL CENTER, INC. CRFN #2004000147827
BLOCK 4431 LOT 21
BLOCK 4330 LOTS 1&200 N/F LANDS OF CHRISTIAN CULTURAL CENTER, INC. REEL 3608 PG 9429
BLOCK 4434 LOT 60 N/F LANDS OF COUNCIL TOWER II HOUSING DEVELOPMENT FUND CORP CRFN #2008000412129
BLOCK 4431 N/F LANDS OF COUNCIL TOWERS II HOUSING DEVELOPMENT

1053.39'
290.91'
300.94'
235.32'
90°00'
ZONE X

50 0 50
SCALE IN FEET

References:
1. Site survey basemap from Control Point Associates Inc. PC, last updated March 17, 2021.
2. Sample and test pit locations were collected using the ArcGIS Collector application on a tablet utilizing GPS location.

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Project
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BROOKLYN
KINGS COUNTY NEW YORK

Drawing Title
PROPOSED SAMPLE LOCATION PLAN

Project No.	100688801
Date	9/12/2022
Scale	1 " = 50 '
Drawn By	IHB
Figure	6

Path: \\Langan.com\data\PAR\data8\100688801\Project Data\ArcGIS\MXD\Environmental_Figures\2022-08 RIWP\Figure 6 - Proposed Sample Location Plan.mxd

APPENDIX A

HEALTH AND SAFETY PLAN

HEALTH AND SAFETY PLAN

for

ENVIRONMENTAL SOIL INVESTIGATION

12074 Flatlands Avenue
New York, New York

NYSDEC BCP No. C224353

Prepared For:

Innovative Urban Living, LLC
c/o Gotham Organization, LLC
432 Park Avenue South, Second Floor
New York, New York

Prepared By:

Langan Engineering, Environmental, Surveying,
Landscape Architecture and Geology, D.P.C.
300 Kimball Drive
Parsippany, New Jersey 07054

March 2022
Revised September 2022

100688801

LANGAN

ENVIRONMENTAL HEALTH AND SAFETY PLAN

Client:	**Innovative Urban Living, LLC**
Project:	**NYSDEC BCP Remedial Investigation**
Location:	**12074 Flatlands Avenue**
Chemical Hazards:	**VOCs, SVOCs, Metals, Pesticides, PCBs, Historic Fill**
Prepared By:	**LANGAN ENGINEERING, ENVIRONMENTAL, SURVEYING, LANDSCAPE ARCHITECTURE AND GEOLOGY, D.P.C.**
Version:	**1**
Date:	**September 2022**

Client Contact:	**Bryan Kelly**	**(212) 716-2502**
Langan Project Manager (PM):	**Amanda Forsburg**	**(973) 560-4574**
Langan Health & Safety Manager (HSM):	**Tony Moffa, CHMM**	**(215) 491-6545**
Langan Health and Safety Officer (HSO):	**Field Personnel**	
Langan Incident/Injury Hotline:	**1-800-952-6426 or (973) 560-4699**	

LANGAN ENGINEERING, ENVIRONMENTAL, SURVEYING, LANDSCAPE ARCHITECTURE AND GEOLOGY, D.P.C., (LANGAN), AND LANGAN SUBCONTRACTORS, DO NOT GUARANTEE THE HEALTH OR SAFETY OF ANY PERSON ENTERING THIS SITE. DUE TO THE NATURE OF THIS SITE AND THE ACTIVITY OCCURRING THEREON, IT IS NOT POSSIBLE TO DISCOVER, EVALUATE, AND PROVIDE PROTECTION FOR ALL POSSIBLE HAZARDS WHICH MAY BE ENCOUNTERED. STRICT ADHERENCE TO THE HEALTH AND SAFETY GUIDELINES SET FORTH HEREIN WILL REDUCE, BUT NOT ELIMINATE, THE POTENTIAL FOR INJURY AT THIS SITE. THE HEALTH AND SAFETY GUIDELINES IN THIS PLAN WERE PREPARED SPECIFICALLY FOR THIS SITE AND SHOULD NOT BE USED ON ANY OTHER SITE WITHOUT PRIOR RESEARCH AND EVALUATION BY A TRAINED HEALTH AND SAFETY SPECIALIST. THIS HASP HAS BEEN PREPARED FOR LANGAN EMPLOYEES ONLY. ALL OTHER PARTIES WORKING ON THE SITE THAT HAVE THE POTENTIAL TO BE EXPOSED TO HAZARDOUS MATERIALS MUST DEVELOP AND IMPLEMENT THEIR OWN HASP FOR USE BY THEIR EMPLOYEES.

APPROVALS

By signature, the personnel identified below hereby acknowledge that they have reviewed this Health and Safely Plan (HASP) and agree to comply with the requirements contained therein as well as the applicable provisions of 29 CFR Parts 1910 and 1926. Furthermore, in reviewing and accepting this HASP, as currently written, the undersigned agree that to the best of their knowledge, this HASP adequately identifies the activities and hazards associated with work at this site and describes the appropriate and necessary precautions and protections for site workers required by the applicable OSHA statutes and regulations.

LANGAN Project Manager - PM (Amanda Forsburg, CHMM)	3/1/2022 Date
LANGAN Health and Safety Manager (Tony Moffa, CHMM)	Date
LANGAN Health and Safety Officer – HSO	Date

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LANGAN

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(Continued)

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(Continued)

TABLES

FIGURES

ATTACHMENTS

1.0 INTRODUCTION

1.1 Purpose and Policy

This Health and Safety Plan (HASP) has been developed to comply with the regulations under Occupational Safety and Health Administration (OSHA) 29 CFR 1910.120(b)(4), Hazardous Waste Operations and Emergency Response. It addresses foreseeable activities associated with the Remedial Investigation activities to be conducted at 12074 Flatlands Avenue in Brooklyn, New York (see Figure 1). This HASP establishes personnel protection standards and mandatory safety practices and procedures. Additionally, it assigns responsibilities, establishes standard operating procedures, and provides for contingencies that may arise while operations are being conducted at known or suspected hazardous waste sites.

Langan personnel involved with Remedial Investigation activities which involve the displacement of soil and/or material during the soil, groundwater, and soil vapor investigation and sampling in the identified Area of Concern (AOC) during the proposed investigation shall comply with the requirements of this HASP. All Langan personnel engaged in onsite activities will read this document carefully and complete the Safety Briefing Form (Attachment A), a copy of which will be provided to Langan's Project files. Contractors and subcontractors conducting investigation activities which will disturb or displace soil in the identified AOC are required to develop and follow their own HASP based on the identified hazards. All sampling data and environmental reports pertaining to the site that are available to Langan will be provided upon request to the Langan PM. Contractors and subcontractors are responsible for their own workers Health and Safety and providing a safe working environment in accordance with all applicable federal, state and local requirements. Each Subcontractor will have a designated Site Health and Safety Manager who will be responsible for ensuring that the designated procedures are implemented in the field. Personnel who have any questions or concerns regarding implementation of this plan are encouraged to request clarification from the Langan PM. Field personnel must follow the designated health and safety procedures, be alert to the hazards associated with working close to vehicles and equipment, and use common sense and exercise reasonable caution at all times.

This HASP covers investigation-related field activities which have the potential to disturb and/or displace potentially contaminated soil, soil vapor, and groundwater. These activities include, but are not limited to: the completion of soil borings and collection of soil samples, the installation of permanent monitoring wells and collection of groundwater samples, and the installation of soil vapor points and collection of soil vapor samples.

This HASP was prepared in accordance with the following documents and/or guidelines:

- Occupational Safety and Health Administration (OSHA) regulations for hazardous site workers (29 CFR 1910.120 and 29 CFR 1926); and,
- NIOSH/OSHA/USCG/USEPA *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities.*

Langan's Health and Safety Program and Safe Operating Procedures support this site-specific HASP.

The level of protection and the procedures specified in this HASP represent the minimum health and safety requirements to be observed by Langan site personnel engaged in the referenced investigation and inspection of investigation activities. Unknown conditions may exist, and known conditions may change. Should an employee find himself or herself in a potentially hazardous situation, the employee will immediately discontinue the hazardous procedure(s) and either personally effect appropriate preventative or corrective measures, or immediately notify the Health and Safety Officer or the Langan PM of the nature of the hazard. In the event of an immediately dangerous or life threatening situation, the employee always has "stop work" authority. Any necessary revision to the Health and Safety procedures will be recorded in the Field Procedure Change Authorization Form (Attachment B), and will require authorization from the Langan Health and Safety Manager and Langan PM.

The provisions of this HASP address worker health and safety within defined contaminant zones and assume that work will be completed within a vacant lot which is periodically used for parking. Additional provisions including modifications to drilling techniques to further limit potential exposure to sensitive populations will be required if work is to be conducted within occupied building areas or in occupied areas that may be impacted by the proposed work.

Additional provisions including the use of traffic control measures will be employed in order to avoid possible hazards associated with vehicular traffic and pedestrians, as needed.

THE ULTIMATE RESPONSIBILITY FOR THE HEALTH AND SAFETY OF THE INDIVIDUAL EMPLOYEE RESTS WITH THE EMPLOYEE AND HIS OR HER COLLEAGUES. Each employee is responsible for exercising the utmost care and good judgment in protecting his or her own health and safety and that of fellow employees. Should any employee observe a potentially unsafe condition or situation, it is the responsibility of that employee to immediately bring the observed condition to the attention of the appropriate health and safety personnel as designated above and to follow-up the verbal notification by completing the Unsafe Conditions and Practices Form provided in Attachment C, a copy of which will be provided to the Langan Health and Safety Officer.

"Extenuating" circumstances such as budget or time constraints, equipment breakdown, changing or unexpected conditions, never justify unsafe work practices or procedures. In fact, the opposite is true. Under stressful circumstances all project personnel must be mindful of the potential to consciously or unconsciously compromise health and safety standards, and be especially safety conscious. **ALL SITE PERSONNEL ARE EXPECTED TO CONSIDER "SAFETY FIRST" AT ALL TIMES.**

1.2 Site Descriptions

The site is an approximately ±2.084-acre parcel consisting of a gravel lot currently used for surplus parking for the Christian Cultural Center (CCC) building, located to the west of the site.

The site is bound to the north by Flatlands Avenue followed by an automobile dismantling company and used automobile parts business, medical offices, and the Oasis Hotel. The Site is bound to the east by a twelve-story multi-family residential apartment building and Block 4434 Lot 10, which also consists of a RCA-covered lot used for parking, followed by Pennsylvania Avenue. The Site is bound to the south by a twelve-story multi-family residential apartment building and to the west by an offsite extension of the RCA-covered parking lot followed by the CCC building and the surrounding asphalt-paved parking lot.

1.3 Scope of Work

The site work activities which will require the oversight by a Langan Engineer include the following scope and will include the completion of:

- Task 1: Completion of environmental soil borings and installation of monitoring wells and soil vapor points;
- Task 2: Soil sample collection,
- Task 3: Groundwater sample collection; and,
- Task 4: Soil vapor sample collection.

2.0 PROJECT TEAM ORGANIZATION AND RESPONSIBILITIES

This section specifies the Langan Project Organization.

2.1 Langan Project Manager

The Langan Project Manager (PM) is Amanda Forsburg. The PM responsibilities include:

- Prepares and organizes the background review of site conditions, the site HASP, and the field team;
- Obtains permission for site access and coordinates activities with appropriate officials;
- Briefs the field team on their specific assignments;
- Coordinates with the Health and Safety Officer (HSO) to ensure that health and safety requirements are met;
- Serves as the liaison with public officials;
- Ensuring that this HASP is developed and approved prior to on-site activities;
- Ensuring that all the tasks in the project are performed in a manner consistent with Langan's comprehensive Health and Safety Program for Hazardous Waste Operations and this HASP.

2.2 Health and Safety Manager (HSM)

The Langan Corporate Health and Safety Manager (HSM) is Tony Moffa. His responsibilities include:

- Serving as a resource in the development and implementation of HASPs;
- Assist in reviewing results of Jobsite Safety Inspections;
- Assisting site Health and Safety Officer (HSO) with development of the HASP, updating HASP as dictated by changing conditions, jobsite inspection results, etc.;
- Maintaining all records on personnel (medical evaluation results, training and certifications, accident investigation results, etc.).

2.3 Langan Health and Safety Officer (HSO)

The Langan Health and Safety Officer (HSO) is to be identified prior to the start of field work. The HSO responsibilities include:

- Participating in the development and implementation of this HASP;
- Conducting Jobsite Safety Inspections (Attachment G) and correcting any shortcomings in a timely manner;
- Helping to select proper Personal Protective Equipment (PPE) and periodically inspecting it;
- Ensuring that PPE is properly stored and maintained;
- Controlling entry into and exit from the contaminated areas or zones of the site;
- Confirming each team member's suitability for work based on a current physician's recommendation;
- Monitoring the work parties for signs of stress, such as heat stress, fatigue, and cold exposure;
- Monitoring site hazards and conditions;
- Knowing (and ensuring that all site personnel also know) emergency procedures, evacuation routes, and the telephone numbers of the ambulance, local hospital, poison control center, fire department, and police department;
- Resolves conflicting situations which may arise concerning safety requirements and working conditions.

- Conducting daily tailgate meetings to review applicable Hazard Analyses (Table 3) as well as check-in with site personnel.

3.0 HAZARDS ANALYSIS

This section presents an assessment of the general, chemical, physical, and biological hazards that may be encountered during the tasks specified under this HASP (Section 1.3). A detail on types of potential contaminants of concerns Langan anticipates to encounter at different locations during the intrusive investigation is listed in Tables 1 and 2 of this HASP.

3.1 General Hazard Assessment

A general hazard assessment was conducted for the required field work described in Section 1.3 and the following potential hazards have been identified:

- Inhalation of volatile organic compounds (VOCs) including methane and semi-volatile organic compounds (SVOCs) with low volatilization potential;
- Skin and eye contact with contaminants;
- Ingestion of contaminants;
- Inhalation of dusts impacted with polycyclic aromatic hydrocarbons, metals and pesticides;
- Physical hazards associated with the use of heavy equipment;
- Excavation hazards;
- Tripping hazards;
- Noise exposure;
- Heat stress (depending on weather conditions);
- Cold exposure (depending on weather conditions);
- Flammable hazards;
- Electrical hazards; and,
- Use of personal protective equipment.

These hazards are further described in the task-by-task hazard analysis in Table 3. Specific chemical, physical and biological hazards are discussed below.

Mitigation and controls will include as needed work procedures, work/rest regiment, dust control measures, personal protective equipment, and respiratory protection as appropriate.

3.2 Chemical Exposure Hazards

The following chemical hazard evaluation for the proposed investigation activities is based on the previous Phase I and Phase II environmental investigation of the site, compounds typically associated with historic urban fill, and the potential presence of methane at the site. The evaluation has been conducted to identify chemicals/materials that potentially may be present at the site, and to ensure that work activities, personnel protection, and emergency response are consistent with the specific contaminants that potentially could be encountered.

3.2.1 Specific Chemical Hazards Previously Detected at the Site

Analytical results from the 2018 Phase II Environmental Investigation (EI) revealed that soil at the site is impacted with SVOCs, pesticides, PCBs, and metals associated with previous site operations and/or historic urban fill. Table 1 lists Contaminants of Concern and potentially affected media. Exposure limits for potential contaminants that might be encountered in the field are listed in Table 2.

Based on Langan's findings in the 2018 Phase I ESA, methane was reported to have been encountered during excavation for construction of the current Christian Cultural Center building. As such, a methane venting system is incorporated into the current site building. Methane was screened for but not detected during the 2018 Phase II EI. The Lower Explosive Limit (LEL) for methane is 5% of the total air volume, whereas the Upper Explosive Limit (UEL) for methane is 15%. Methane action levels are provided in Table 2.

3.2.2 Chemical Hazard Exposure Routes

Potential hazards and their exposure routes include:

- Inhalation of organic vapors due to the presence of volatile organic compounds in soil and from diesel-powered equipment and minimal volatilization potential related to the presence of SVOCs in soil.
- Inhalation of dust impacted with SVOCs, pesticides, PCBs, or metals associated with soil borings, soil sampling activity, and construction activity.

- Inadvertent ingestion of potentially toxic substances via hand to mouth contact or deliberate ingestion of materials inadvertently contaminated with potentially toxic materials.
- Dermal exposure and possible percutaneous (skin) absorption of certain lipophilic (readily absorbed through the skin) SVOCs and pesticides.
- Skin and eye contact with contaminants at the site and decontamination activities.

Exposure limits and health effects of selected chemicals are in Table 2. The probability of exposure for each task is outlined in Table 3.

3.2.3 Control of Exposure to Chemical Hazards

To protect potentially exposed personnel the following procedures and protocols will be adopted and used as needed: work procedures will be adhered to, work zones will be established, dust control will be utilized, respirators (if required) and personal protective equipment will be worn, Dust monitoring will be conducted during times of disturbance of the impacted soil to assess the potential inhalation pathway of exposure and strict personnel decontamination procedures will be followed.

3.3 Physical Hazards

3.3.1 Temperature Extremes

Hot Temperatures

Heat stress is a significant potential hazard, which is greatly exacerbated with the use of PPE, in hot environments. The potential hazards of working in hot environments include dehydration, cramps, heat rash, heat exhaustion, and heat stroke. If onsite workers exhibit the signs of heat exhaustion or heat stroke, they should seek immediate medical attention.

Cold Temperatures

Workers may be exposed to the hazard of working in a cold environment. Potential hazards in cold environments include frostbite, trench foot or immersion foot, hypothermia, as well as slippery surfaces, brittle equipment, poor judgment, and unauthorized procedural changes. In order to prevent frostbite, hypothermia, trench foot and immersion foot,

the workers are responsible for dressing warmly in layers with thick socks, gloves, and appropriate head and face gear. Upon the onset of discomfort due to the cold, onsite workers should take regular five to ten minute breaks to warm up inside nearby buildings and to drink warm fluids. Please note that the NYCDEP statute prohibits idling an engine for more than three minutes (one-minute if adjacent to a school). This statue includes the use of a vehicle for the purpose of warming up employees. As such, all contractors and employees shall identify a place to warm up in advance. If discomfort continues and the onsite workers start to exhibit the signs of frostbite, hypothermia, trench foot or immersion foot, they should seek immediate medical attention.

3.3.2 Noise and Air Resources

Noise is a potential hazard associated with the operation of heavy equipment, power tools, pumps and generators. Hearing protection is required and shall be used in designated areas of the site as indicated by the posted signs.

3.3.3 Hand and Power Tools

In order to complete the various tasks for the project, personnel will utilize hand and power tools. The use of hand and power tools can present a variety of hazards, including physical harm from being struck by flying objects, being cut or struck by the tool, fire, and electrocution. Hand and power tools will be inspected prior to use. Proper personal protective equipment shall be worn while utilizing hand and power tools. Ground Fault Circuit Interrupters (GFCIs) are required for all portable electric tools.

3.3.4 Slips, Trips, and Falls

Working in and around the site will pose slip, trip and fall hazards due to equipment, piping, slippery surfaces that may be oil covered, or from surfaces that are wet from rain or ice. Potential adverse health effects include falling to the ground and becoming injured or twisting an ankle. Good housekeeping at the site must be maintained at all times.

3.3.5 Fire and Explosion

Prior to starting all excavation work, a review of appropriate New York City maps will be conducted to identify potential hazards. The possibility of encountering fire and explosion hazards exists from under- ground utilities and gases. Therefore, all excavation equipment must be grounded.

Smoking is not permitted within the Exclusion Zone (EZ). The neighboring building contains a sub-slab passive gas venting system for methane mitigation. LEL monitoring will be completed during all invasive activity. Do not smoke or operate spark-ignition equipment within 50 feet of explosive or flammable storage or where flammable liquid or vapor is present;

3.3.6 Material Handling

Manual lifting of heavy objects may be required. Failure to follow proper lifting techniques can result in back injuries and strains. Back injuries are a serious concern as they are the most common workplace injury, often resulting in lost or restricted work time, and long treatment and recovery periods.

Whenever possible, heavy objects must be lifted and moved by mechanical devices rather than by manual effort. The mechanical devices will be appropriate for the lifting or moving task and will be operated only by trained and authorized personnel. Objects that require special handling or rigging will only be moved under the guidance of a person who has been specifically trained to move such objects, such as a Master Rigger or equivalent. Lifting devices, including equipment, slings, ropes, chains, and straps, will be inspected, certified, and labeled to confirm their weight capacities. Defective equipment will be taken out of service immediately and repaired or destroyed.

The lift and swing path of a crane/equipment will be watched and maintained clear of obstructions. Personnel will not pass under a raised load, nor will a suspended load be left unattended. Personnel will not be carried on lifting equipment, unless it is specifically designed to carry passengers.

All reciprocating, rotating, or other moving parts will be guarded at all times. Accessible fire extinguishers will be made available in all mechanical lifting devices. All material must be stored in tiers, racked, blocked, or otherwise secure to prevent sliding, falling, or collapse. All loads/material will be verified to be secure before transportation.

3.3.7 Confined Space/Excavation Hazards

Personnel entry into trenches or unshored (*e.g.,* lagging) excavations within the designated areas of concern will not be permitted. No other confined spaces are known to exist on Site. If entry into trenches or excavations is required, all work will stop until the HASP has been revised to address the new hazards.

3.3.8 Working Near Equipment

Personnel working in the immediate vicinity of heavy equipment (*e.g.*, excavators, loaders, etc.) may encounter physical hazards resulting from contact with equipment. Field personnel should be aware of the presence of these hazards at all times and take appropriate action to avoid them. Due to the limited ability to communicate when wearing respiratory protection, the risk is increased. Workers must be careful to communicate with heavy equipment operators regarding their location, and should maintain a safe distance from operating equipment at all times. Prior to working around equipment, the site personnel will review appropriate hand signals with the operator.

Equipment will be equipped with back up alarms.

3.3.9 Drill Rig Operations

In order to complete soil borings, a track-mounted direct push drill rig will be used. Working with and near this equipment and associated power generators pose many potential hazards, including being struck by or against, or pinched/caught by moving parts. These hazards can result in serious physical harm. Other hazards include electrocution and explosion due to encountering overhead or underground utilities.

Drill rigs for hollow stem auger drilling and other machinery with exposed moving parts must be equipped with an operational emergency stop device. Drillers and other field personnel must be aware of the location of this device. This device must be tested prior to job initiation and periodically thereafter. The driller and helper shall not simultaneously handle augers unless there is a standby person to activate the emergency switch. Only equipment that has been approved by the manufacturer may be used in conjunction with site equipment and specifically to attach sections of drilling tools together. Pins that protrude excessively from augers shall not be allowed.

The driller must never leave the controls while the tools are rotating unless all personnel are kept clear of rotating equipment. A remote sampling device must be used to sample drill cuttings if the tools are rotating or if the tools are readily capable of rotating. Samplers must not reach into or near the rotating equipment. Drillers, helpers, and other field personnel must secure all loose clothing when in the vicinity of drilling operations. No person shall climb the drill mast while tools are rotating or without the use of ANSI-approved fall protection (approved belts, lanyards and a fall protection slide rail) or portable ladder that meets the requirement of the OSHA standard.

3.3.10 Electrical Safety

The use of hand and power tools can present a variety of hazards, including physical harm from being struck by flying objects, being cut or struck by the tool, fire, and electrocution. Ground Fault Circuit Interrupters (GFCIs) are required for all portable electric tools.

3.3.11 Utilities

Prior to the start of any intrusive work, the location of above-ground and underground utilities and other structures will be completed by the contractor/subcontractor responsible for completing investigation activities.

3.3.12 Vehicular Traffic

Investigation activities will be conducted in a parking lot so vehicular and pedestrian traffic will be present. Appropriate precautions to protect the on-site workers and civilians should be used including the use of cones and traffic vests as appropriate.

3.4 Biological Hazards

During the course of the project, there is a potential for workers to come into contact with biological hazards such as animals and insects. As the potential for exposure to blood borne pathogens during site investigation is anticipated to be low, a Blood Borne Pathogen Exposure Plan (BBPEP) is not required. A BBPEP will be prepared if site operation requires its implementation.

3.4.1 Animals

During site operations, animals such as dogs, cats, pigeons, mice, and rats may be encountered. Workers shall use discretion and avoid all contact with animals. Bites and scratches from dogs and cats can be painful and if the animal is rabid, the potential for contracting rabies exists. Contact with rat and mice droppings may lead to contracting hantavirus. Inhalation of dried pigeon droppings may lead to psittacosis. Cryptococcosis and histoplasmosis are also diseases associated with exposure to dried bird droppings but these are less likely to occur in this occupational setting.

3.4.2 Insects

Insects, including bees, wasps, hornets, mosquitoes, spiders, and ticks may be present at the site. Some individuals may have a severe allergic reaction to an insect bite or sting that can result in a life threatening condition. In addition, mosquito bites may lead to St. Louis encephalitis or West Nile encephalitis.

3.4.3 Wound Care

A source of occupational exposure may occur when an employee gives First Aid and or CPR to an individual who had infectious blood. The occupational exposure occurs when there is the possibility for an employee's eyes, mucous membranes, non-intact skin (i.e., cut and abraded skin) to come into contact with potentially infectious materials from another employee. If an accident were to occur where First Aid would need to be administered, the person administering the First Aid will presume that any wounds and materials used are contaminated with BBP and should wear the appropriate PPE to prevent contact with these materials. Additionally, should the use of First Aid materials and or clothing that was potentially contaminated with BBP be encountered these materials should be property containerized and transported to the nearest hospital for proper disposal.

3.5 Coronavirus

General Preventative Measures

Field personnel must follow general proper hygiene measures while in the field including:

- Avoid touching eyes, nose and mouth.
- Cover cough or sneeze with tissue, and throw in trash.
- Wash hands often with soap and water for 20 seconds after going to bathroom, before eating, after blowing nose, coughing or sneezing.
- Use hand sanitizer with at least 60% alcohol if soap and water are not available.
- Avoid physical contact with other people (e.g., no handshakes).
- Maintain a safe distance of at least 6 feet from other people (social distancing).
- Wear face coverings when around other worker to minimize spread of COVID-19. (May be required in certain states or locations.)

Construction Trailers

Employees should avoid use of shared construction trailers or where employees cannot maintain a safe distance (minimum 6 feet) from other workers. If trailer use is needed, areas such as desks, phones, chairs and other common areas, should be cleaned and disinfected before and after use. Protocols should be developed to minimize trailer use to essential personal, restrict use from any workers who are ill or showing symptoms of being ill, use if face coverings and ensure a safe distance of 6 feet can be established between workers.

Communication

Include Coronavirus topics and prevention topics in daily tailgate meetings to ensure Coronavirus awareness is communicated daily. Discussions can focus on general topics including: social distancing, prevention measures for field personnel, signs and symptoms and recent news on the Coronavirus. Site-specific topics should include minimizing face-to-face contact, disinfecting/sterilizing field equipment, use of PPE to reduce exposure, site security, use of face coverings and other potential exposure issues/concerns.

Sick/Ill Workers

No Langan employee is permitted to be onsite when ill and/or showing potential symptoms of the Coronavirus. Symptoms of the Coronavirus may appear 2-14 days after exposure and can range from mild to severe. The most common symptoms include: fever, fatigue, dry cough, shortness of breath chills, repeated shaking with chills, muscle pain, headache, sore throat, or new loss of taste or smell. If an employee or subcontractor is observed being ill or exhibiting symptoms of Coronavirus, employees must immediately utilize their Stop Work Authority and contact their project manager to address the situation. If an employee observes another worker onsite exhibiting symptoms of Coronavirus, immediately utilize Stop Work Authority and notify their project manager and site construction manager or safety officer. Work should resume when the safety and health of Langan and subcontractors is adequately addressed.

3.6 Task Hazard Analysis

The tasks to be completed during the proposed site work activities, as summarized in Section 1.3, are listed in Table 3 with a Hazard Analysis for each task.

Activities will be conducted in Level D, but personnel should be prepared to upgrade to Level C, as appropriate, based on field screening criteria. If evidence of historical contamination is encountered during the investigation other than what is part of the intended investigation, work will be stopped and emergency contacts listed in Attachment E of this HASP will be immediately notified.

3.6.1 Soil Boring, Monitoring Well, and Soil Vapor Monitoring Point Installation

Special attention shall be given to establishing the location of any underground utilities prior to boring or drilling. Prior to beginning the site investigation work, the N.Y. One Call Center will be contacted by the boring/drilling contractor for utility mark-outs. Additionally, a private utility clearance subcontractor has been retained to complete a geophysical survey in the vicinity of each boring location within the asphalt paved parking area to identify the potential presence of underground utility lines. Pressure safety valves and hose whip prevention devices will be installed and operational on any air compressors, hoses, and their tools to be used on site. Additionally, all appropriate and current FDNY Certificates of Fitness (C of F) cards must be on site for those workers using equipment where C of Fs are required.

Chemical exposure may also occur as soil cuttings are handled.

3.6.2 Soil Sample Collection

Chemical exposure may occur as soil samples are collected.

3.6.3 Groundwater Sample Collection

Permanent monitoring wells will be installed for the collection of groundwater samples. Chemical exposure may occur as groundwater samples are collected.

3.6.4 Soil Vapor Sample Collection

Soil vapor points will be installed for the collection of soil vapor samples. Chemical exposure may occur as soil vapor samples are collected.

4.0 PERSONAL PROTECTIVE EQUIPMENT (PPE)

4.1 Levels of Protection

PPE must protect workers from the specific hazards they are likely to encounter on site. Selection of the appropriate PPE must take into consideration: (1) identification of the hazards or suspected hazards; (2) potential exposure routes; and, (3) the performance of the PPE construction (materials and seams) in providing a barrier to these hazards. Based on anticipated site conditions and the proposed work activities to be performed at the site, Level D Protection will be used for work completed within the defined exclusion zone. This will include any work within the defined investigation areas. Level D Protection will be required for all personnel working outside the investigation area but engaged with investigation activities. The upgrading/downgrading of these levels of protection will be based on continuous air monitoring results as described in Section 5.0. The decision to modify standard PPE will be made by the HSO after conferring with the Project Manager. The levels of protection are described below.

- **Level D Protection**

  a. Safety glasses w/ sideshields or chemical splash goggles
  b. Safety boots/shoes (toe-protected)
  c. Hard hat
  d. Long sleeve work shirt and work pants
  e. Nitrile gloves
  f. Hearing protection (as needed)
  g. Reflective traffic vest

- **Level D Protection (Modified)**

  a. Safety glasses w/ sideshields or chemical splash goggles
  b. Safety boots/shoes (toe-protected)
  c. Disposable chemical-resistant boot covers
  d. Coveralls Tyvek or equivalent to be worn when contact with contaminated soil or groundwater, or non-aqueous phase liquids is anticipated)
  e. Hard hat
  f. Long sleeve work shirt and work pants
  g. Nitrile gloves

h. Hearing protection (as needed)
i. Reflective traffic vest

- **Level C Protection**

a. Full face-piece, air-purifying, cartridge*-equipped, NIOSH-approved respirator [*combo cartridge P100/OV/CL/HC/SD/CD/HS (escape)]
b. Inner (latex) and outer (nitrile) chemical-resistant glove
c. Chemical-resistant safety boots/shoes (toe-protected)
d. Disposable chemical-resistant boot covers
e. Hard hat
f. Long sleeve work shirt and work pants
g. Coveralls (Tyvek or equivalent, poly-coated Tyvek will be worn when contact, or anticipated contact with wet contaminated soils, ground water, and/or non-aqueous phase liquids (NAPL) is anticipated)
h. Hearing protection (as needed)
i. Reflective traffic vest

The action levels used in determining the necessary levels of respiratory protection and upgrading to Level C are summarized in Table 4. The written Respiratory Protection Program is maintained by Langan's H&S Department in Langan's Doylestown, Pennsylvania office. The monitoring procedures and equipment are outlined in Section 5.0.

4.2 Respirator Fit-Test

All Langan employees and subcontractors performing site work who could be exposed to hazardous substances at the work site are in possession of a full face-piece, air-purifying respirator and have been successfully quantitative fit-tested within the past year. Quantitative fit-test records are maintained by Langan's H&S Department.

4.3 Respirator Cartridge Change-Out Schedule

Respiratory protection is required to be worn when certain action levels (Table 2) are reached. A respirator cartridge change-out schedule has been developed in order to comply with 29 CFR 1910.134. The respirator cartridge change-out schedule for this project is as follows:

- Cartridges shall be removed and disposed of at the end of each shift, when cartridges become wet or wearer experiences breakthrough, whichever occurs first.
- If the humidity exceeds 85%, then cartridges shall be removed and disposed of after 4 hours of use.

Respirators shall not be stored at the end of the shift with contaminated cartridges left on. Cartridges shall not be worn on the second day, no matter how short the time period was the previous day they were used.

5.0 AIR QUALITY MONITORING AND ACTIONS LEVELS

5.1 Monitoring During Site Operations

Atmospheric air monitoring results are used to provide data to determine when exclusion zones need to be established and when certain levels of personal protective equipment are required. For all instruments there are Site-specific action level criteria which are used in making field health and safety determinations. Other data, such as the visible presence of contamination or the steady state nature of air contaminant concentration, are also used in making field health and safety decisions. Therefore, the Langan Health and Safety Officer may expand the exclusion zone beyond the extents of the excavation or sampling area or require a person to wear a respirator even though atmospheric air contaminant concentrations are below established HASP action levels.

During site work involving disturbance of impacted soils, real time air monitoring will be conducted to assess the potential for exposure to airborne contaminants of concern including VOCs and SVOCs. The presence of methane has also historically been documented in the vicinity or the site. A photoionization detector (PID) and/or flame ionization detector (FID) will be used to monitor concentrations of VOCs at personnel breathing-zone height to assess the potential exposure to petroleum related VOCs related to use of machinery including backhoes, drill rigs, compressors etc. A LEL meter will be used to monitor for the presence of methane. Air monitoring will be the responsibility of the Langan Health and Safety Officer or designee. Air monitoring will be conducted during intrusive activities associated with the completion of soil borings, collection of soil samples, and oversight of investigation activities on the

project site. All manufacturers' instructions for instrumentation and calibration will be available onsite.

Subcontractors' air monitoring plans must be equal or more stringent as the Langan plan.

An air monitoring calibration log is provided in Attachment D of this HASP.

5.1.1 Volatile Organic Compounds and Methane

Monitoring with a MultiRAE PID/LEL meter will occur during investigation activities within the work zone and at the downwind perimeter of the investigation area. Colormetric Indicator Tubes for benzene may be used as backup for the PID/LEL, if measurements remain above background monitor every 2 hours. The HSO will monitor the employee breathing zone at least every 30 minutes, or whenever there is any indication that concentrations may have changed (odors, visible gases, appearance of drill cuttings, etc.) since the last measurement. Instrument action levels for monitored gases are provided in Table 4.

5.1.2 Dust

The soil at the site is impacted with SVOCs, pesticides, PCBs, and metals. Additionally, the soil at the site consists of historic fill. During invasive procedures which have the potential for creating airborne dust, such as excavation of dry soils, a real time airborne dust monitor such as a Thermo MEI person DataRAM-1000 (pDR-1000) should be used to monitor for air particulates within the work zone and a Dustrak Aerosol Monitor should be used to monitor for air particulates at the downwind perimeter of the work zone.

The HSO will monitor the employee breathing zone at least every 30 minutes, or whenever there is any indication that concentrations may have changed (appearance of visible dust) since the last measurement. If dust levels are observed to be greater than 0.150 mg/m^3 or visible dust is observed for longer than 15 minutes or if the site PPE is upgraded to Level C, the HSO will begin monitoring the site perimeter at a location downwind of the work zone every 30 minutes in addition to the

employee breathing zone. Instrument action levels for dust monitoring are provided in Table 4.

5.1.3 Determination of Background Levels

Background (BKD) levels for VOCs, methane, and dust will be established prior to intrusive activities within the work zone. A notation of BKD levels will be referenced in the daily monitoring log. BKD levels are a function of prevailing conditions. BKD levels will be taken in an appropriate upwind location as determined by the Langan Health and Safety Officer.

5.2 Monitoring Equipment Calibration and Maintenance

Instrument calibration shall be documented and included in a dedicated safety and health logbook or on separate calibration pages of the field book. All instruments shall be calibrated before and after each shift. Calibration checks may be used during the day to confirm instrument accuracy. Duplicate readings may be taken to confirm individual instrument response.

All instruments shall be operated in accordance with the manufacturers' specifications. Manufacturers' literature, including an operations manual for each piece of monitoring equipment will be maintained on site by the HSO for reference.

5.3 Noise Monitoring

As a standard work practice, hearing protection will be worn within the area that exceeds 85 dBA created by any loud machinery as a precaution. Work areas or tasks which pose an exposure risk greater than 85 dBA will require hearing protection. Hearing protection is required and should be used in the exclusion zone while the drill rig is operating.

6.0 COMMUNITY HEALTH AND SAFETY CONSIDERATIONS

Community air monitoring will be conducted in compliance with the NYSDOH Generic CAMP provided as Attachment J. Special CAMP requirements for work within 20 feet of potentially exposed individuals or structures, if determined to be necessary, will be implemented as described in Attachment K.

Langan will conduct monitoring for VOCs during ground-intrusive work (i.e., soil boring advancement and monitoring well installation). Upwind concentrations of VOCs and dust will be monitored continuously each day to establish background concentrations. Langan will monitor VOCs and dust at the downwind perimeter of the work zone, which will be established at a point on the Site where the general public or site employees may be present. Monitoring for VOCs will be conducted with a PID equipped with a 10.6 eV bulb. Dust emissions will be monitored using real-time monitoring equipment capable of measuring PM-10 (e.g., DustTrak).

Sustained concentrations of VOCs or PM10 will be reported to the NYSDEC and NYSDOH Project Managers and included in the daily report. In addition, a map showing the location of the downwind and upwind CAMP stations will be included in the daily report.

7.0 WORK ZONES AND DECONTAMINATION

7.1 Site Control

Work zones are intended to control the potential spread of contamination throughout the site and to assure that only authorized individuals are permitted into potentially hazardous areas.

Any person working in an area where the potential for exposure to site contaminants exists will only be allowed access after providing the HSO with proper training and medical documentation.

Exclusion Zone (EZ) - All activities which may involve exposure to site contaminants, hazardous materials and/or conditions should be considered an EZ. Decontamination of field equipment will also be conducted in the Contaminant Reduction Zone (CRZ) which will be located on the perimeter of the EZ. The EZ and the CRZ will be clearly delineated by cones, tapes or other means. The Langan Health and Safety Officer may establish more than one EZ where different levels of protection may be employed or different hazards exist. The size of the EZ shall be determined by the Langan Health and Safety Officer allowing adequate space for the activity to be completed, field members and emergency equipment. For purposes of this HASP the exclusion zones are defined by a 10-foot buffer around each soil boring, monitoring well location, and soil vapor point but may be expanded based on the results of air monitoring or any other field conditions identified by the HSO. All personnel working in the EZ

must have 40 hours HAZWOPER training and be enrolled in a medical monitoring program prior to conducting any site activities.

7.2 Contamination Control

7.2.1 Personnel Decontamination Station

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

7.2.2 Minimization of Contact with Contaminants

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

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

7.2.3 Personnel Decontamination Sequence

Decontamination will be performed by removing all PPE used in EZ and placing it in drums/trash cans at the CRZ. Baby wipes shall be available for wiping hands and face. Drums/trash cans will be labeled by the field crews in accordance with all local, state, and federal requirements. Management plans for contaminated PPE, tools and investigative-derived waste (i.e., soil cutting) are provided below.

7.2.4 Emergency Decontamination

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

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

7.2.5 Hand-Held Equipment Decontamination

Hand-held equipment includes all monitoring instruments as stated earlier, samples, hand tools, and notebooks. The hand-held equipment is dropped at the first decontamination station to be decontaminated by one of the decontamination team members. These items must be decontaminated or discarded as waste prior to removal from the CRZ.

To aid in decontamination, monitoring instruments can be sealed in plastic bags or wrapped in polyethylene. This will also protect the instruments against contaminants. The instruments will be wiped clean using wipes or paper towels if contamination is visually evident. Sampling equipment, hand tools, etc. will be cleaned with non-phosphorous soap to remove any potentially contaminated soil, and rinsed with deionized water. All decontamination fluids will be containerized and stored on-site pending waste characterization sampling and appropriate off-site disposal.

7.2.6 Heavy Equipment Decontamination

All heavy equipment and vehicles arriving at the work site will be free from contamination from offsite sources. Any vehicles arriving to work that are suspected of being impacted will not be permitted on the work site. Potentially contaminated heavy equipment will not be permitted to leave the EZ unless it has been thoroughly decontaminated and visually inspected by the HSO or his designee.

7.3 Communications

The following communications equipment will be utilized as appropriate.

- Telephones - A cellular telephone will be located with the HSO for communication with the HSM and emergency support services/facilities.
- Hand Signals - Hand signals shall be used by field teams, along with the buddy system. The entire field team shall know them before operations commence and their use covered during site-specific training. Typical hand signals are the following:

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

8.0 MEDICAL SURVEILLANCE

All personnel who will be performing field work involving potential exposure to toxic and hazardous substances will be required to have passed an initial baseline medical examination, with annual follow-up medical exams thereafter, consistent with 29 CFR 1910.120(f). Medical evaluations will be performed by, or under the direction of, a physician board-certified in occupational medicine. Results of medical evaluations are maintained by Langan's H&S Department.

9.0 EMERGENCY RESPONSE PLAN

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

emergency site evacuation procedures. In case of emergency, in addition to 911 the Langan Incident/Injury Hotline (1-800-952-6426 or 973-560-4699) should be called as soon as possible.

9.1 Responsibilities

9.1.1 Langan Health and Safety Officer (HSO)

The HSO is responsible for ensuring that all personnel are evacuated safely and that machinery and processes are shut down or stabilized in the event of a stop work order or evacuation. The HSO is responsible for ensuring the HSM are notified of all incidents, all injuries, near misses, fires, spills, releases or equipment damage. The HSO is required to immediately notify the HSM of any fatalities or catastrophes (three or more workers injured and hospitalized) so that the HSM can notify OSHA within the required time frame.

9.1.2 Emergency Coordinator

For this project the Emergency Coordinator is the HSO.

The Emergency Coordinator shall locate emergency phone numbers and identify hospital routes prior *to beginning* work on the sites. The Emergency Coordinator shall make necessary arrangements to be prepared for any emergencies that could occur.

The Emergency Coordinator is responsible for implementing the Emergency Response/ Contingency Plan whenever conditions resulting from the Site Investigation warrant such action.

9.1.3 Site Personnel

Project site personnel are responsible for knowing the Emergency Response Plan and the procedures contained herein. Personnel are expected to notify the Emergency Coordinator of situations that could constitute a site emergency. Project site personnel, including all subcontractors will be trained in the Emergency Response Plan.

9.2 Communications

Once an emergency situation has been stabilized or as soon as practically possible, the HSO will contact the Langan Incident/Injury Hotline (1-800-952-6426 or 973-560-4699) and Project Manager to identify any emergency situation.

9.3 Local Emergency Support Units

In order to be able to deal with any emergency that might occur during investigative activities at the site, Attachment E Emergency Notification Numbers, will be available in the field vehicles and provided to all personnel conducting work within the EZ.

Figure 2 is the hospital route map. Outside emergency number 911 and local ambulance should be relied on for response to medical emergencies and transport to emergency rooms. Due to traffic congestion that is prevalent in the New York metropolitan area, alternate hospital routes will need to be considered. The Emergency Coordinator will determine the appropriate route based on time of day and traffic patterns. Changes in the referenced primary facilities shall be documented with the HASP Field Change Authorization Request Form (Attachment B).

The Emergency Phone Numbers listed are preliminary. Upon mobilization, the HSO shall verify all numbers and document the changes in the Site Logbook. Any changes shall also be documented with the HASP Field Change Authorization Request Form.

Hospital route maps will be provided to all field personnel.

9.4 Pre-Emergency Planning

Langan will communicate directly with administrative personnel from the emergency room at the hospital in order to determine whether the hospital has the facilities and personnel needed to treat cases of trauma resulting from any of the contaminants expected to be found on the site. Instructions for finding the hospital will be posted conspicuously in the site office and in each site vehicle.

9.5 Emergency Medical Treatment

The procedures and rules in this HASP are designed to prevent employee injury. However, should an injury occur, no matter how slight, it will be reported to the HSO on site immediately. First-aid equipment will be available on site at the following locations:

First Aid Kit:	Vehicles
Emergency Eye Wash:	Vehicles

During the site safety briefing, project personnel will be informed of the location of the first aid station(s) that has been set up. Unless they are in immediate danger, severely injured persons will not be moved until paramedics can attend to them. Some injuries, such as severe cuts and lacerations or burns, may require immediate treatment. Any first aid instructions that can be obtained from doctors or paramedics, before an emergency-response squad arrives at the site or before the injured person can be transported to the hospital, will be followed closely.

Personnel with current first aid and CPR certification will be identified.

Only in non-emergency situations will an injured person be transported to the hospital by means other than an ambulance.

Nearest hospital: **Brookdale University Hospital**
1 Brookdale Plaza
Brooklyn, NY 11212
(718) 240-5363
(directions from site to hospital found on Figure 2)

9.6 Emergency Site Evacuation Routes and Procedures

All project personnel will be instructed on proper emergency response procedures and locations of emergency telephone numbers during the initial site safety meeting. If an emergency occurs as a result of the site investigation activities, including but not limited to fire, explosion or significant release of toxic gas into the atmosphere, the Langan Project Manager will be verbally notified immediately. All heavy equipment will be shut down and all personnel will evacuate the work areas and assemble at the nearest intersection to be accounted for and to receive further instructions.

9.7 Fire Prevention and Protection

In the event of a fire or explosion, procedures will include immediately evacuating the site and notification of the Langan Project Manager of the investigation activities. Portable fire extinguishers will be provided at the work zone. The extinguishers located in the various locations should also be identified prior to the start of work. No personnel will fight a fire beyond the stage where it can be put out with a portable extinguisher (incipient stage).

9.7.1 Fire Prevention

Fires will be prevented by adhering to the following precautions:

- Good housekeeping and storage of materials.
- Storage of flammable liquids and gases away from oxidizers.
- Shutting off engines to refuel.
- Grounding and bonding metal containers during transfer of flammable liquids.
- Use of UL approved flammable storage cans.
- Fire extinguishers rated at least 10 pounds ABC located on all heavy equipment, in all trailers and near all hot work activities.

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

9.8 Significant Vapor Release

Based on the proposed tasks, the potential for a significant vapor release is low. However, if a release occurs, the following steps will be taken:

- Move all personnel to an upwind location. All non-essential personnel shall evacuate.
- Upgrade to Level C Respiratory Protection.
- Downwind perimeter locations shall be monitored for volatile organics.
- If methane is encountered above the 5% lower explosive limit, abandon equipment and move upwind; monitor downwind conditions until concentrations fall below 5%.

- If the release poses a potential threat to human health or the environment in the community, the Emergency Coordinator shall notify the Langan Project Manager.
- Local emergency response coordinators will be notified.

9.9 Overt Chemical Exposure

The following are standard procedures to treat chemical exposures. Other, specific procedures detailed on the Safety Data Sheet (SDS) will be followed, when necessary.

SKIN AND EYE: Use copious amounts of soap and water from eye-wash kits and portable hand wash stations.

CONTACT: Wash/rinse affected areas thoroughly, then provide appropriate medical attention. Skin shall also be rinsed for 15 minutes if contact with caustics, acids or hydrogen peroxide occurs. Affected items of clothing shall also be removed from contact with skin.

Providing wash water and soap will be the responsibility of each individual contractor or subcontractor on-site.

9.10 Decontamination During Medical Emergencies

If emergency life-saving first aid and/or medical treatment is required, normal decontamination procedures may need to be abbreviated or omitted. The HSO or designee will accompany contaminated victims to the medical facility to advise on matters involving decontamination when necessary. The outer garments can be removed if they do not cause delays, interfere with treatment or aggravate the problem. Respiratory equipment must always be removed. Protective clothing can be cut away. If the outer contaminated garments cannot be safely removed on site, a plastic barrier placed between the injured individual and clean surfaces should be used to help prevent contamination of the inside of ambulances and/or medical personnel. Outer garments may then be removed at the medical facility. No attempt will be made to wash or rinse the victim if his/her injuries are life threatening, unless it is known that the individual has been contaminated with an extremely toxic or corrosive material which could

also cause severe injury or loss of life to emergency response personnel. For minor medical problems or injuries, the normal decontamination procedures will be followed.

9.11 Incident Reporting

Once first aid and/or emergency response needs have been met, the following parties are to be contacted:

- Langan Incident/Injury Report Hotline 1-800-952-6426 or (973-560-4699)
- Langan Project Manager, Chris McMahon (973-560-4861) or Steve Ciambruschini (973-560-4982)
- Langan Health and Safety Manager, Tony Moffa (215-491-6500)
- The employer of any injured worker who is not a Langan employee

For emergencies involving personal injury and/or exposure including near-misses, the HSO or designee will complete and submit an Accident/Incident Report Form (Attachment F) within 24 hours. If the employee involved is not a Langan employee, his employer shall receive a copy of the report.

9.12 Adverse Weather Conditions

In the event of adverse weather conditions, the HSO will determine if work will continue without potentially risking the safety of all field workers. Some of the items to be considered prior to determining if work should continue are:

- Potential for heat stress and heat-related injuries.
- Potential for cold stress and cold-related injuries.
- Treacherous weather-related working conditions (hail, rain, snow, ice, high winds).
- Limited visibility (fog).
- Potential for electrical storms.
- Earthquakes.
- Other major incidents.

Site activities will be limited to daylight hours, or when suitable artificial light is provided, and acceptable weather conditions prevail. The HSO will determine the need to cease field operations or observe daily weather reports and evacuate, if necessary, in case of severe inclement weather conditions.

9.13 Spill Control and Response

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

All contractor vehicles shall have spill kits on them with enough material to contain and absorb the worst-case spill from that vehicle. All vehicles and equipment shall be inspected prior to be admitted on site. Any vehicle or piece of equipment that develops a leak will be taken out of service and removed from the job site.

The following seven steps shall be taken by the Emergency Coordinator:

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

In addition to the spill control and response procedures described in this HASP, Langan personnel will coordinate with the designated project manager relative to spill response and control actions. Notification to the Project Manager must be immediate and, to the extent possible, include the following information:

- Time and location of the spill.
- Type and nature of the material spilled.
- Amount spilled.
- Whether the spill has affected or has a potential to affect a waterway or sewer.
- A brief description of affected areas/equipment.
- Whether the spill has been contained.
- Expected time of cleanup completion. If spill cleanup cannot be handled by Langan's on-site personnel alone, such fact must be conveyed to the Project Manager immediately.

Langan shall not make any notification of spills to outside agencies. The client will notify regulatory agencies as per their reporting procedures.

9.14 Emergency Equipment

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

- Industrial first aid kit.
- Fire extinguishers (one per site).
- Absorbent material.

9.15 Restoration and Salvage

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

- Refilling fire extinguishers.
- Refilling medical supplies.

- Recharging eyewashes and/or showers.
- Replenishing spill control supplies.

10.0 TRAINING

10.1 General Health and Safety Training

Completion of an initial 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training program (or its equivalent) as detailed in OSHA's 29 CFR 1910.120(e) is required for all employees who will perform work in areas where the potential for a toxic exposure exists. Annual 8-hour refresher training is also required to maintain competencies to ensure a safe work environment.

10.2 Site Specific Training

Prior to commencement of site activities, all field personnel assigned to the project will have completed training that will specifically address the activities, procedures, monitoring, and equipment used in the site operations. It will include a documented verbal review of the entire HASP and all the provisions within the HASP document. Should any new employees arrive on-site, they will also be given a documented full HASP review – or one that address the appropriate tasks that remain at the time of the new employee's arrival.

10.3 Onsite Safety Briefings

Project personnel and visitors will participate in documented daily on-site health and safety briefings ("Tailgate Talks") led by the HSO to assist site personnel in safely conducting their work activities. The briefings will include information on operations to be conducted that shift, changes in work practices or changes in the site's environmental conditions, as well as periodic reinforcement of previously discussed topics. The briefings will also provide a forum to facilitate conformance with safety requirements and to identify performance deficiencies related to safety during daily activities or as a result of safety inspections. The meetings will also be an opportunity for the work crews to be updated on monitoring results. Prior to starting any new activity, a training session will be held for crew members involved in the activity. The Health and Safety Briefing Statement (Attachment A) can be used to facilitate this effort.

10.4 Hazard Communication

All material brought on-site will be in the appropriate containers and will be properly labeled. The SDS for contaminants documented at the site, typically associated with historic fill, and methane are attached. Langan's written Hazard Communication program, in compliance with 29 CFR 1910.1200, is maintained by Langan's H&S Department.

11.0 RECORDKEEPING

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

11.1 Field Change Authorization Request

A Field Procedures Change Authorization Request Form is to be completed for requesting a change to this HASP (Attachment B). Any changes to the work to be performed that is not included in the HASP will require an Addendum that is approved by the Langan Project Manager and Langan HSM to be prepared. Approved changes will be reviewed with all field personnel at a safety briefing.

11.2 Medical and Training Records

Copies or verification of training (40-hour, 8-hour, supervisor, site-specific training, documentation of three-day OJT, and respirator fit-test records) and medical clearance for Site work and respirator use will be maintained in the office and available upon request. Records for all subcontractor employees must also be available upon request. All employee medical records will be maintained by Langan's H&S Department.

11.3 Onsite Log

A log of personnel on site each day will be kept by the Site Supervisor or designee.

11.4 Daily Safety Meetings ("Tailgate Talks")

Completed Safety Briefing forms will be maintained by the HSO.

11.5 Exposure Records

All personal monitoring results, laboratory reports, calculations and air sampling data sheets are part of an employee exposure record. These records will be maintained by the HSO during site work. At the end of the project they will be maintained according to 29 CFR 1910.1020.

11.6 Hazard Communication Program/SDS

Safety Data Sheets (SDS) have been obtained for applicable substances and are included in this HASP (Attachment H). Langan's written Hazard Communication program, in compliance with 29 CFR 1910.1200, is maintained by Langan's H&S Department.

11.7 Documentation

Immediately following an incident or near miss, unless emergency medical treatment is required, either the employee or a coworker must contact the Langan Incident/Injury Hotline at 1-800-952-6426 ext. 4699 or (973)560-4699 and the client representative to report the incident or near miss. A written report must be completed and submitted to the client representative within 24 hours of the incident. For emergencies involving personnel injury and/or exposure, employee will complete and submit the Langan Incident/Injury Report to the Langan Corporate Health and Safety Manager as soon as possible following the incident. Accidents will be investigated in-depth to identify all causes and to recommend hazard control measures.

12.0 FIELD PERSONNEL REVIEW

This form serves as documentation that field personnel have been verbally given a full HASP review by Langan personnel, and understand the provisions of this EHS Plan. It is maintained on site by the HSO as a project record.

Each field team member shall sign this section after Site-specific training is completed and before being permitted to work onsite.

Name (Print and Sign)	***Company***	***Date***

TABLES

TABLE 1
SUSPECTED CONTAMINANTS OF CONCERN
12074 FLATLANDS AVENUE
BROOKLYN, NEW YORK

Contaminant Of Concern	Affected Media
VOLATILES	
Benzene	Soil / Groundwater / Soil Vapor
Toluene	Soil / Groundwater / Soil Vapor
Ethylbenzene	Soil / Groundwater / Soil Vapor
Xylenes (m,p-Xylene, and o-Xylene)	Soil / Groundwater / Soil Vapor
Methane	Soil Vapor
Tetrachloroethylene	Soil / Groundwater / Soil Vapor
Trichloroethylene	Soil / Groundwater / Soil Vapor
Chlorinated VOCs	Soil / Groundwater / Soil Vapor
Total Volatiles	Soil / Groundwater / Soil Vapor
SEMI-VOLATILES	
Common Historic Fill Contaminants:	
Benzo(a)anthracene	Soil / Groundwater
Benzo(b)fluoranthene	Soil / Groundwater
Benzo(k)fluoranthene	Soil / Groundwater
Benzo(a)pyrene	Soil / Groundwater
Chrysene	Soil / Groundwater
Dibenzo(a,h)anthracene	Soil / Groundwater
Indeno (1,2,3-cd) pyrene	Soil / Groundwater
Fluoranthene	Soil / Groundwater
Pyrene	Soil / Groundwater
2-Methylnapthalene	Soil
Diesel Fuel / Fuel Oils	Soil / Groundwater
Hydraulic Oil	Soil / Groundwater
Miscellaneous TBD	Soil / Groundwater
PESTICIDES	
4,4'-DDE	Soil
4,4'-DDT	Soil
Dieldrin	Soil
PCBS	
Aroclor 1254	Soil
Aroclor 1260	Soil
METALS	
Lead	Soil / Groundwater
Arsenic	Soil / Groundwater
Chromium	Soil / Groundwater
Mercury	Soil / Groundwater
Copper	Soil / Groundwater
Nickel	Soil / Groundwater
Barium	Soil
Cadmium	Soil
Iron	Soil/ Groundwater
Manganese	Groundwater
Zinc	Soil

TABLE 2
SELECTED POTENTIAL CHEMICAL EXPOSURE LIMITS AND HEALTH EFFECTS
12074 FLATLANDS AVENUE
BROOKLYN, NEW YORK

Chemical	Permissible Exposure Limit	IDLH Limit	Exposure Routes	Exposure Symptoms
Benzene	1 ppm	50 ppm	Inhalation, Skin Absorption, Ingestion, skin and/or eye contact	Irritate eyes, skin, nose; respiratory system; giddiness; head, nausea, staggered gait; fatigue, anorexia, lassitude; dermatitis; bone marrow depression; [carcinogenic]
Toluene	200 ppm	500 ppm	Inhalation, Skin Absorption, Ingestion, skin and/or eye contact	Irritate eyes, nose; fatigue, weakness, confusion, euphoria, dizziness, headache; dilated pupils, lacrimation; nervousness, muscle fatigue, insomnia; paresthesia; dermatitis; liver, kidney damage; mucous membrane; narcosis, coma
Ethylbenzene	100 ppm	800 ppm (10% LEL)	Inhalation, Ingestion, skin and/or eye contact	Irritate eyes, skin, mucous membrane ;headache, dermatitis; narcosis, coma
Xylenes	100 ppm	900 ppm	Inhalation, Skin Absorption, Ingestion, skin and/or eye contact	Irritate eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; corn vacuolization; anorexia, nausea, vomit, abdominal pain; dermatitis
Methane	5% of total air volume (lower explosive limit) Oxygen > 19.5% of total air volume	15% of total air volume (upper explosive limit)	Inhalation	Headache, dizziness, incoordination, staggering gait
Tetrachloroethene	15 ppm	150 ppm	Inhalation, Skin Absorption, Ingestion, skin and/or eye contact	Nausea, vomiting, abdominal pain, tremor fingers, jaundice, hepatitis, liver tenderness, dermatitis, monocytosis, kidney damage [potential occupational carcinogen]

TABLE 2
SELECTED POTENTIAL CHEMICAL EXPOSURE LIMITS AND HEALTH EFFECTS
12074 FLATLANDS AVENUE
BROOKLYN, NEW YORK

Chemical	Permissible Exposure Limit	IDLH Limit	Exposure Routes	Exposure Symptoms
Trichloroethene	100 ppm	1,000 ppm	Inhalation, Skin Absorption, Ingestion, skin and/or eye contact	Irritation eyes, skin; headache, visual disturbance, lassitude (weakness, exhaustion), dizziness, tremor, drowsiness, nausea, vomiting; dermatitis; cardiac arrhythmias, paresthesia; liver injury; [potential occupational carcinogen]
Total Volatile Organics	15 ppm	150 ppm	Inhalation, Skin Absorption, Ingestion	Irritation eyes, skin, nose, throat, respiratory system; nausea; flush face, neck; dizziness, incoordination; headache, drowsiness; skin erythema (skin redness); liver damage; [potential occupational carcinogen]
Benzo(a)anthracene	0.2 mg/m3	80 mg/m3	Inhalation, Skin Absorption, Ingestion	Irritate eyes, skin, upper respiratory system, cough
Benzo(b)fluoranthene	0.2 mg/m3	80 mg/m3	Inhalation, Skin Absorption, Ingestion	Irritate eyes, skin, upper respiratory system, cough
Benzo(k)fluoranthene	0.2 mg/m3	80 mg/m3	Inhalation, Skin Absorption, Ingestion	Irritate eyes, skin, upper respiratory system, cough
Benzo(a)pyrene	0.2 mg/m3	80 mg/m3	Inhalation, Skin Absorption, Ingestion	Irritate eyes, skin, upper respiratory system, cough
Chrysene	0.2 mg/m3	80 mg/m3	Inhalation, Skin Absorption, Ingestion	Irritate eyes, skin, upper respiratory system, cough
Dibenzo(a,h)anthracene	0.2 mg/m3	80 mg/m3	Inhalation, Skin Absorption, Ingestion	Irritate eyes, skin, upper respiratory system, cough
Flouranthene	0.2 mg/m3	80 mg/m3	Inhalation, Skin Absorption, Ingestion	Irritate eyes, skin, upper respiratory system, cough
Indeno (1,2,3-cd) pyrene	0.2 mg/m3	80 mg/m3	Inhalation, Skin Absorption, Ingestion	Irritate eyes, skin, upper respiratory system, cough

TABLE 2
SELECTED POTENTIAL CHEMICAL EXPOSURE LIMITS AND HEALTH EFFECTS
12074 FLATLANDS AVENUE
BROOKLYN, NEW YORK

Chemical	Permissible Exposure Limit	IDLH Limit	Exposure Routes	Exposure Symptoms
Pyrene	0.2 mg/m3	80 mg/m3	Inhalation, Skin Absorption, Ingestion	Irritate eyes, skin, upper respiratory system, cough
2-Methylnaphthalene	---	---	Inhalation, ingestion, skin and/or eye contact	Irritate eyes; headache, confusion, excitement, malaise (vague feeling of discomfort); nausea, vomiting, abdominal pain; irritation bladder; profuse sweating; jaundice; hematuria (blood in the urine), renal shutdown; dermatitis, optical neuritis, corneal damage
Pesticides	1 mg/m3	500 mg/m3	Inhalation, Skin Absorption, Ingestion, skin and/or eye contact	Irritation eyes, skin; paresthesia tongue, lips, face; tremor; anxiety, dizziness, confusion, malaise (vague feeling of discomfort), headache, lassitude (weakness, exhaustion); convulsions; paresis hands; vomiting; [potential occupational carcinogen]
Total PCBs	0.05 mg/mg3	5 mg/m3	Inhalation, Skin Absorption, Ingestion, skin and/or eye contact	Irritation eyes, chloracne; liver damage; reproductive effects; [potential occupational carcinogen]
Lead	0.05 mg/mg3	100 mg/mg3	Inhalation, Ingestion, Skin and/or Eye Contact	Lassitude (weakness, exhaustion), insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; paralysis wrist, ankles; encephalopathy; kidney disease; irritation eyes; hypertension
Arsenic	0.010 mg/m3	5 mg/m3	Inhalation, Ingestion, Skin Absorption, Skin and/or Eye Contact	Ulceration of nasal septum, dermatitis, gastrointestinal disturbances, peripheral neuropathy, respiration, hyperpigmentation of skin, [potential occupational carcinogen]

TABLE 2
SELECTED POTENTIAL CHEMICAL EXPOSURE LIMITS AND HEALTH EFFECTS
12074 FLATLANDS AVENUE
BROOKLYN, NEW YORK

Chemical	Permissible Exposure Limit	IDLH Limit	Exposure Routes	Exposure Symptoms
Hexavalent Chromium	5 mg/m3	250 mg/m3	Inhalation, Ingestion, Skin and/or Eye Contact	Irritation eyes, skin; lung fibrosis (histologic)
Total Chromium	5 mg/m3	250 mg/m3	Inhalation, Ingestion, Skin and/or Eye Contact	Irritation eyes, skin; lung fibrosis (histologic)
Mercury	0.1 mg/m3	10 mg/m3	Inhalation, Ingestion, Skin Absorption, Skin and/or Eye Contact	Irritation eyes, skin; cough, chest pain, dyspnea (breathing difficulty), bronchitis, pneumonitis; tremor, insomnia, irritability, indecision, headache, lassitude (weakness, exhaustion); stomatitis, salivation; gastrointestinal disturbance, anorexia, weight loss; proteinuria
Copper	1 mg/m3	100 mg/m3	Inhalation, Ingestion, skin and/or eye contact	Irritation eyes, respiratory system; cough, dyspnea (breathing difficulty), wheezing; [potential occupational carcinogen]
Nickel	1 mg/m3	10 mg/m3	Inhalation, Skin Absorption, Ingestion, skin and/or eye contact	Irritation eyes, skin; cough, chest pain, dyspnea (breathing difficulty), bronchitis, pneumonitis; tremor, insomnia, irritability, indecision, headache, lassitude (weakness, exhaustion); stomatitis, salivation; gastrointestinal disturbance, anorexia, weight loss; proteinuria
Barium	0.5 mg/m3	50 mg/m3	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, upper respiratory system; skin burns; gastroenteritis; muscle spasm; slow pulse, extrasystoles; hypokalemia

TABLE 2
SELECTED POTENTIAL CHEMICAL EXPOSURE LIMITS AND HEALTH EFFECTS
12074 FLATLANDS AVENUE
BROOKLYN, NEW YORK

Chemical	Permissible Exposure Limit	IDLH Limit	Exposure Routes	Exposure Symptoms
Cadmium	0.005 mg/m3	9 mg/m3	Inhalation, ingestion	Pulmonary edema, dyspnea (breathing difficulty), cough, chest tightness, substernal (occurring beneath the sternum) pain; headache; chills, muscle aches; nausea, vomiting, diarrhea; anosmia (loss of the sense of smell), emphysema, proteinuria, mild anemia; [potential occupational carcinogen]
Iron	10 mg/m3	2500 mg/m3	Inhalation	Benign pneumoconiosis with X-ray shadows indistinguishable from fibrotic pneumoconiosis (siderosis)
Manganese	5 mg/m3	500 mg/m3	Inhalation, ingestion	Manganism; asthenia, insomnia, mental confusion; metal fume fever: dry throat, cough, chest tightness, dyspnea (breathing difficulty), rales, flu-like fever; low-back pain; vomiting; malaise (vague feeling of discomfort); lassitude (weakness, exhaustion); kidney damage
Zinc	5 mg/m3	500 mg/m3	Inhalation	Metal fume fever: chills, muscle ache, nausea, fever, dry throat, cough; lassitude (weakness, exhaustion); metallic taste; headache; blurred vision; low back pain; vomiting; malaise (vague feeling of discomfort); chest tightness; dyspnea (breathing difficulty), rales, decreased pulmonary function

--- No exposure limits listed in the NIOSH Pocket Guide to Chemical Hazards dated November 2010.

TABLE 3
HAZARD ANALYSIS
12074 FLATLANDS AVENUE
BROOKLYN, NEW YORK

Task	Potential Risk	Description	Control Measure
1, 2, 3, 4	Lifting equipment	Improper lifting/carrying of equipment and materials	Follow safe lifting and general material handling
1, 2	Noise	Loud sounds caused by the machines during drilling, or excavation	Wear proper PPE (hearing protection)
1, 2	Working near heavy machinery	Close proximity to drill rig and/or construction equipment	Be aware of surroundings, wear safety vest and hard hat
1, 2, 3, 4	Slips, trips, and falls	Any number of injuries from slips, trips, and falls in carrying out these tasks	Good housekeeping at site, constant awareness and focus on the task
1, 2	Inhalation of Dust	Breathing in visible dust from earthwork using drills or excavators	Wear proper PPE, monitor air for dust concentrations, use dust suppression techniques
1, 2, 3, 4	Inhalation of Volatiles	Breathing in volatiles from earthwork using drills or excavators causing dust	Wear proper PPE, monitor air for volatile concentrations, use dust suppression techniques
1	Utilities	Hitting utility lines during drilling and or excavating	Use proper mark out of underground utilities before beginning earthwork
1, 2, 3, 4	Skin contact with contaminated material	Material falls on skin; gets in eye	Wear proper PPE; follow safe work practices
1, 2, 3	Ingestion of contaminated material	Material falls on skin; gets into mouth	Wear proper PPE; follow safe work practices
1, 2, 3, 4	Heat Stress	Stress or exhaustion related to high temperatures	Hydrate and rest as needed
1, 2, 3, 4	Cold Stress	Stress or exhaustion related to low temperatures; hypothermia	Wear proper PPE; follow safe work practices
1, 2, 3, 4	Bites and stings	Bee stings, ticks, snake bites	Wear proper PPE, be watchful, follow safe work practices
1, 2, 3, 4	Lacerations and abrasions	Many opportunities working with hand tools	Inspect equipment being used for sharp edges, wear proper PPE; follow safe work practices

TABLE 4
INSTRUMENTATION ACTION LEVELS
12074 FLATLANDS AVENUE
BROOKLYN, NEW YORK

Instrument	Action Level	Level of Protection / Action Required
MultiRAE PID/LEL	Background to 5 ppm	Level D/No respirator; no further action required
	> 5 ppm for > 5 minutes	1. Temporarily discontinue all activities and evaluate potential causes of the excessive readings. If these levels persist and cannot be mitigated (i.e., by slowing drilling or excavation activities), contact HSO to review conditions and determine source and appropriate response action. 2. If PID readings remain above 5 ppm, temporarily discontinue work and upgrade to Level C protection. 3. If sustained PID readings fall below 1 ppm, downgrading to Level D protection may be permitted
	> 5 ppm but < 150 ppm for > 5 minutes	Level C/ 1. Discontinue all work; all workers shall move to an area upwind of the jobsite. 2. Evaluate potential causes of the excessive readings and allow work area to vent until VOC concentrations fall below 5 ppm. 3. Level C protection will continue to be used until PID readings fall below 1 ppm.
	> 30 ppm (steady state condition) within AOC zone	Stop Work / Suppress Emissions / Evacuate and re-evaluate.
	> 150 ppm	Evacuate the work area
MultiRAE PID/LEL	Background to 5% Methane	Level D; no further action required
	> 5% Methane for > 5 minutes	1. Temporarily discontinue all activities. If these levels persist contact HSO to review conditions and determine source and appropriate response action. 2. If readings remain above 5% methane, temporarily discontinue work and move up wind. 3. If sustained readings fall below 5% methane, work may be resumed.
	> 5% Methane < 10% Methane for > 5 minutes	1. Discontinue all work; all workers shall move to an area upwind of the exclusion zone. 2. Allow for area to vent until methane readings fall below 5%. 3. If sustained readings fall below 5% methane, work may be resumed.

Instrument	Action Level	Level of Protection / Action Required
	> 10% Methane < 15% Methane	Stop Work / Suppress Emissions / Evacuate and re-evaluate.
	> 15% Methane	Evacuate the work area
Total Dust Aerosol Monitor	> 0.100 mg/m3 above BKD (steady state condition) at perimeter of AOC zone for 15-minutes or visible dust.	Stop Work / Implement dust control / Continue dust monitoring if dust levels are less than 150 mg/m3
	< 0.150 mg/m3 above BKD (following dust suppression measures)	Stop Work / implement dust control, continue work once levels are <150 mg/m3
	>5 mg/m3	Level C

Notes:

1. 1 ppm level based on OSHA Permissible Exposure Limit (PEL) for benzene.
2. 5 ppm level based on OSHA Short Term Exposure Limit (STEL) maximum exposure for vinyl chloride for any 15 minute period.
3. 150 ppm level based on NIOSH Immediately Dangerous to Life and Health (IDLH) for tetrachloroethylene
4. 5% methane based on the ASTM Standard for the Lower Explosive Limit (LEL) of methane
5. 15% methane based on the ASTM standard for the Upper Explosive Limit (UEL) of methane

TABLE 5
PERSONAL PROTECTIVE EQUIPMENT
12074 FLATLANDS AVENUE
BROOKLYN, NEW YORK

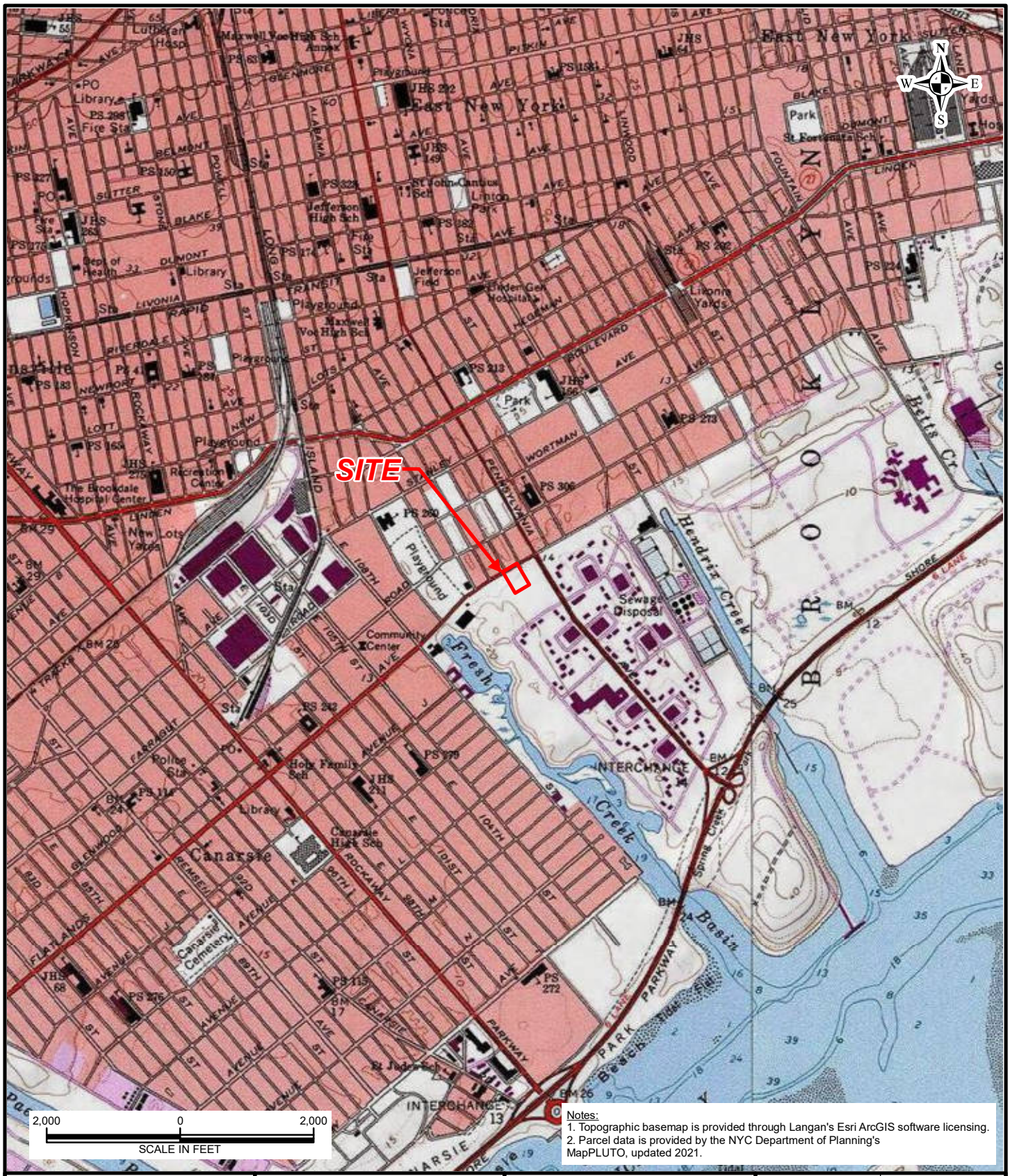
Respiratory Protection*:*

Level D:	No respirator required.
Level C:	Half-face, Air Purifying Respirator (APR) with combination HEPA (dusts, fumes, aerosols) and organic vapor cartridges. The respirator will be NIOSH-approved.
Level C - supplemental by task	Fullface, Air Purifying Respirator (APR) with combination HEPA (dusts, fumes, aerosols), acid gas, organic vapor cartridges. The respirator will be NIOSH-approved.

Personal Protective Clothing*:*

Level D:	Hard-hat, traffic vest (if working on or adjacent to the roadway), long sleeve work shirt & work pants of natural fibers, safety glasses or goggles, steel-toed boots, hearing protection (if needed), nitril inner gloves and leather outer gloves.
Level D - supplemental PPE by task	Tyvek disposal suit
Level C:	Chemically resistant outer boots and Chemical resistant Tyvek disposal suite.

FIGURES



Notes:
1. Topographic basemap is provided through Langan's Esri ArcGIS software licensing.
2. Parcel data is provided by the NYC Department of Planning's MapPLUTO, updated 2021.

LANGAN
300 Kimball Drive
Parsippany, NJ 07054
T: 973.560.4900 F: 973.560.4901 www.langan.com

Langan Engineering & Environmental Services, Inc.
Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.
Langan International LLC
Collectively known as Langan

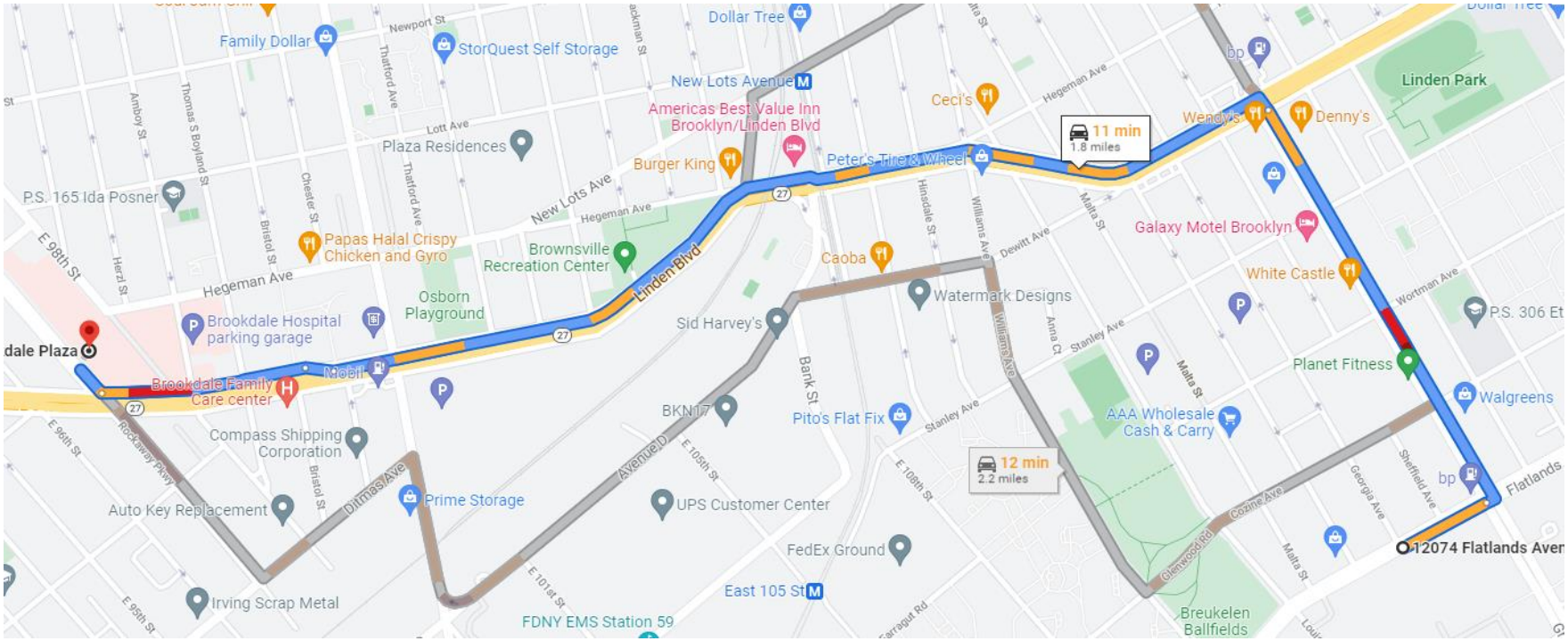
NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400

Project
12074 FLATLANDS AVENUE
BLOCK No. 4434, LOT No. 1
BROOKLYN
KINGS COUNTY NEW YORK

Drawing Title
SITE LOCATION MAP

Project No. 100688801	Figure 1
Date 1/19/2022	
Scale 1"=2,000'	
Drawn By IHB	

Path: \\Langan.com\data\PAR\data8\100688801\Project Data\ArcGIS\MXD\Environmental_Figures\2022-01 CCC RIWP\Figure 1 - Site Location Map.mxd



Emergency Route to Brookdale University Hospital Emergency Room (Phone # (718) 240-5363) :

1 Head northeast on Flatlands Ave toward Granville Payne Ave/Pennsylvania Ave
2 Turn left at the 1st cross street onto Granville Payne Ave/Pennsylvania Ave
3 Turn left onto Linden Blvd
4 Use the left 3 lanes to turn slightly left onto Gregory "Jocko" Jackson Blvd/Linden Blvd
5 Exit to stay on Linden Blvd
6 Emergency room entrance will be on your right

MAP REFERENCE: Google Maps

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Project

12074 Flatlands Avenue
EMERGENGY HOSPITAL ROUTE MAP

Brooklyn **New York**

Project	DATE	SCALE	FIGURE NO.
100688801	**1/19/2022**	**NTS**	**2**

ATTACHMENT A

Health and Safety Briefing Statement

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ATTACHMENT A

HEALTH AND SAFETY BRIEFING STATEMENT

The following personnel were present at a pre-job safety briefing conducted at _____(time) on _____ (date) at _____(location), and have read this Health and Safety Plan for the above Site and are familiar with its provisions:

Name	Signature
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Fully charged ABC class fire extinguisher available on Site? _____
Fully stocked First Aid Kit available on Site? _____
All project personnel advised of location of nearest phone? _____
All project personnel advised of location of designated medical facility? _____

_____
Name of Field Team Leader or Site Safety Officer

_____
Signature Date

ATTACHMENT B

Field Procedures Change Authorization Form

ATTACHMENT B

FIELD PROCEDURES CHANGE AUTHORIZATION FORM

Section to be changed:_____

Duration of Authorization Requested Date:_____

_____ Today only

_____ Duration of Task

_____ Other_____

_____

_____

Description of Procedures Modification:

_____

_____

_____

Justification:

_____ _____

Person Requesting Change Verbal Authorization Received From:

_____ _____

Name Name Time

_____ _____

Title Title

_____

Signature

Approvals:

_____

_____

_____

ATTACHMENT C

Unsafe Conditions and Practices Form

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ATTACHMENT C

UNSAFE CONDITIONS AND PRACTICES FORM

DESCRIPTION OF CIRCUMSTANCES REGARDING UNSAFE CONDITION OR PRACTICE:

_____

_____

_____

_____

_____

_____

_____

IS THIS CONDITION EXISTING OR POTENTIAL?_____

REPORTED TO: _____

REPORTED BY:_____

DATE REPORTED:_____

COMMENTS:_____

_____

_____

ATTACHMENT D

Calibration Log

ATTACHMENT D

PROJECT:_____

DATE:_____

CALIBRATION LOG

Time	Inst Type	Inst #	Media	Initial Reading	Span #	Calib Reading	Performed By:

ATTACHMENT E

Emergency Notification Numbers

ATTACHMENT E

EMERGENCY NOTIFICATION NUMBERS

The following list provides names and telephone numbers for emergency contact personnel.

ORGANIZATION	CONTACT		TELEPHONE
New York City Police			911
New York City Fire			911
Brookdale University Hospital			718-240-5363
Langan Incident/Injury Hotline			1-800-952-6426 or (973)560-4699
Langan Project Manager	Amanda Forsburg		973-560-4574
National Response Center			800-424-8802
Center for Disease Control			404-488-4100
CHEMTREC			800-424-9300
TSCA HOTLINE			202-554-1404
RCRA HOTLINE			800-424-9346
CDC		(DAY) (NIGHT)	404-452-4100 404-329-2888
BUREAU OF ALCOHOL, TOBACCO & FIREARMS			800-424-9555 202-566-7777
NATIONAL RESPONSE CENTER			800-424-8802
PESTICIDE INFORMATION SERVICE			800-424-9346
BUREAU OF EXPLOSIVES, A.A. RAILWAYS			202-835-9500
FEDERAL EXPRESS - HAZARDOUS MATERIAL INFO			901-922-1666

ATTACHMENT F

Accident / Incident Report Form

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ATTACHMENT F

INCIDENT REPORT

LANGAN EMPLOYEE EXPOSURE/INJURY INCIDENT REPORT
(Submit a Separate Report for Each Employee and/or Incident)

Date: _____

Employee's Name:_____ Employee No:_____

Sex: M _____ F _____ Age: _____

Region: _____ Location:_____

Project: _____ Project No: _____

Incident:_____

Type: Possible Exposure _____ Exposure _____ Physical Injury _____

Location: _____

Date of Incident: _____ Time of Incident: _____

Date of Report Incident: _____

Person(s) to Whom Incident was Reported: _____

Weather Conditions During Incident: Temperature _____ Humidity _____

Wind Speed and Direction: _____ Cloud Cover: _____

Clear: _____ Precipitation: _____

Materials Potentially Encountered: _____

Chemical (give name of description - liquid, solid, gas, vapor, fume, mist):

_____

_____

Radiological:_____

Other: _____

Nature of the Exposure/Injury: (State the nature of the exposure/injury in detail and list the parts of the body affected. Attach extra sheets if necessary).

_____

_____

_____

_____

_____

Did you receive medical care? Yes _____ No _____ If so, when _____

Where? On-Site _____ Off-Site _____

By Whom: Name of Paramedic: _____

Name of Physician: _____

Other: _____

If Off-Site, name facility (hospital, clinic, etc):_____

_____

Length of stay at the facility?_____

Was the Site Safety Officer contacted? Yes _____ No _____ When?_____

Was the Corporate Health and Safety Officer contacted? Yes _____ No _____

If so, who was the contact?_____

Did the exposure/injury result in permanent disability? Yes _____ No _____

If so, explain:_____

_____

_____

_____

Has the employee returned to work? Yes _____ No _____

List the names of other persons affected during this incident:

_____

_____

_____

_____

_____

_____

List the names of persons who witnessed the exposure/injury incident:

_____

_____

_____

_____

_____

_____

_____

Possible cause of the exposure/injury incident: _____

_____

_____

_____

_____

_____

What was the name and title of the field team leader or immediate supervisor at the site of the incident?

_____

Was the operation being conducted under an established Health and Safety Plan?

Yes _____ No _____ If yes, attach a copy. If no, explain

_____

_____

_____

_____

_____

_____

Describe protective equipment and clothing used by the employee:

_____

_____

_____

_____

_____

_____

Did any limitations in safety equipment or protective clothing contribute to or affect exposure? If so, explain:

_____

_____

_____

What was the employee doing when the exposure/injury occurred? (Describe briefly as Site Reconnaissance, Site Characterization, or Sampling, etc.):

_____

_____

_____

_____

Where exactly on site or off site did the exposure/injury occur?

_____

_____

_____

_____

_____

How did the exposure/injury occur? (Describe fully what factors led up to and/or contributed to the incident):

_____

_____

_____

_____

_____

Name of person(s) initiating report, job title, phone number:

_____

_____

_____

_____ _____

Employee Signature Date

_____ _____

Site Safety Officer Signature or Field Team Leader Signature Date

ATTACHMENT G

Jobsite Safety Inspection Checklist

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JOBSITE SAFETY INSPECTION CHECKLIST

Client: _____ Inspection Date: _____

Site: _____ Inspector: _____

Employees: _____

Notes:_____
_____
_____

Check one of the following: **A:** Acceptable **NA**: Not Applicable **D**: Deficiency

	A	NA	D	Remarks
GENERAL				
Appropriate PPE being worn by Langan employees and subcontractors?				
Air monitoring instruments calibrated daily and results recorded on the Daily Instrument Calibration check sheet?				
Air monitoring readings recorded on the air monitoring data sheet/field log book?				
Incident reporting procedures known?				
Site security an issue?				
Vehicle /pedestrian traffic issue?				
Adequate size/type fire extinguisher supplied?				
Evidence that drilling operator is responsible for the safety of his rig.				
First Aid kit available?				
PERSONAL PROTECTIVE EQUIPMENT				
Eye Protection?				
Head protection?				
Safety Shoes?				
Safety vests?				
Hand protection?				
Other?				
Deficiencies??				
HOUSEKEEPING				
Work area kept clean/tidy to minimize potential hazards?				
Waste being disposed of quickly and properly				
Adequate lighting for job?				
Portable water available?				
HAND TOOLS				
Are tools in good condition and properly used? (INSPECT)				
Are proper tools being used?				
Are tools safety stored when not in use?				
Have tools been inspected prior to use?				
Are employees familiar with using tools?				
Is additional PPE required for tools? Available?				
POWER TOOLS				
Are tools in good condition and properly used? (INSPECT)				
Are tools properly grounded?				
Safety guards in place and used correctly?				
Competent instruction / supervision?				
Cords include in inspection?				

HAZWOPER				
Employees have current 40-hr./8-hr./Supervisor HAZWOPER training?				
Project staff medically cleared to work in hazardous waste sites and fit-tested to wear respirators, if needed?				
Respiratory protection readily available?				
Subcontract workers have current 40-hr./8-hr./Spvsr. HAZWOPER training, as appropriate?				
Subcontract workers medically cleared to work on site, and fit-tested for respirator wear?				
Subcontract workers have respirators readily available?				
HEALTH & SAFETY PLAN				
HASP available on site for inspection?				
Health & Safety Compliance agreement (in HASP) appropriately signed by Langan employees and subcontractors?				
Hospital route map with directions posted on site?				
Emergency Notification List posted on site?				
Personnel trained in CPR/First Aid on site?				
MSDSs readily available, and all workers knowledgeable about the specific chemicals and compounds to which they may be exposed?				
Project site safe practices ("Standing Orders") posted?				
Health & Safety Incident Report forms available?				
Decontamination procedures being followed as outlined in HASP?				
UNDERGROUND UTILITY				
Mark outs of underground utilities done prior to initiating any subsurface activities?				
Underground utilities located and authorities contacted before digging?				
Visually observed mark-outs?				
Is subsurface work within three feet of underground utilities?				
- Is so, is or was soft dig techniques used?				
Drilling performed in areas free from underground utilities?				
EXCAVATION / TRENCH				
Are excavations/trenches over 5 feet deep sloped, shored or a trench box used?				
Operations supervised by a Competent Person?				
Is Competent Person preforming daily inspections of excavation/trench?				
Adequate barricades in place?				
Have underground utilities been identified?				
Ladders / means of egress in trench with 25-foot of every worker?				
Has PE designed or approved protective system?				
Excavated material and other objects placed more than 2 feet away from excavation edge?				
Public protected from exposure to open excavation?				
CONFINED / PERMIT-ENTRY CONFINED SPACE				
People entering the excavation regarding it as a permit-required confined space and following appropriate procedures?				
Confined space entry permit is completed and posted?				
All persons knowledgeable about the conditions and characteristics of the confined space?				
All persons engaged in confined space operations have been trained in safe entry and rescue (non-entry)?				
Full body harnesses, lifelines, and hoisting apparatus available for rescue needs?				
Attendant and/or supervisor certified in basic first aid and CPR?				
Confined space atmosphere checked before entry and continuously while the work is going on?				
Results of confined space atmosphere testing recorded?				
Evidence of coordination with off-site rescue services to perform entry rescue, if needed?				
ELECTRICAL SAFETY				
Equipment at least 10 feet from overhead power lines?				
Is equipment grounded?				
GFCI used and tested where required?				
Are extension cords rated for this work being used and are they properly maintained?				
Electrical dangers posted at site?				

FLAMMABLE LIQUIDS				
Are flammable liquids used at site?				
Are flammable liquids stored in appropriate containers?				
Are flammable liquids kept away from combustion sources?				
Do flammable liquid containers have warning labels?				
LADDERS				
Are ladders used at site?				
Were ladders inspected prior to use?				
Are ladders in good working condition?				
Are ladders secured to prevent slipping, sliding or falling?				
Do side rails extend three feet above top of landing area?				
Are top two steps of stepladders being used?				
Is extension on ladder facing out?				
Are ladders sufficient for task?				
Are ladders sufficient for task?				

Unsafe acts observed? _____

Additional remarks _____

Notes:_____

Distribution: Project Manager - Name: _____
Health & Safety Officer - Name: _____
Health & Safety Manager- Name: Anthony Moffa, CHMM

ATTACHMENT H

Safety Data Sheets
(SDS)

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ATTACHMENT H

MATERIAL SAFETY DATA SHEETS

SAFETY DATA SHEETS

All Langan Field Personnel Completing This Work Plan Are To Have Real Time Accessibility To Material Safety Data Sheet (MSDs) or Safety Data Sheet (SDSs) Through Their Smart Phone.

The link is http://www.msds.com/
The login name is "drapehead"
The password is "2angan987"

If You Are Unable To Use the Smart Phone App, You Are To Bring Printed Copies of the MSDs/SDSs to the Site

ATTACHMENT I

Langan Guidelines

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ATTACHMENT I

LANGAN GUIDELINES

GENERAL

- No smoking, eating, or drinking in this work zone.
- Upon leaving the work zone, personnel will thoroughly wash their hands and face.
- Minimize contact with contaminated materials through proper planning of work areas and decontamination areas, and by following proper procedures. Do not place equipment on the ground. Do not sit on contaminated materials.
- No open flames in the work zone.
- Only properly trained and equipped personnel are permitted to work in potentially contaminated areas.
- Always use the appropriate level of personal protective equipment (PPE).
- Maintain close contact with your buddy in the work zone
- Contaminated material will be contained in the Exclusion Zone (EZ).
- Report any unusual conditions.
- Work areas will be kept clear and uncluttered. Debris and other slip, trip, and fall hazards will be removed as frequently as possible.
- The number of personnel and equipment in the work zone will be kept to an essential minimum.
- Be alert to the symptoms of fatigue and heat/cold stress, and their effects on the normal caution and judgment of personnel.
- Conflicting situations which may arise concerning safety requirements and working conditions must be addressed and resolved quickly by the site HSO.

TOOLS AND HEAVY EQUIPMENT

- Do not, under any circumstances, enter or ride in or on any backhoe bucket, materials hoist, or any other device not specifically designed to carrying passengers.
- Loose-fitting clothing or loose long hair is prohibited around moving machinery.
- Ensure that heavy equipment operators and all other personnel in the work zone are using the same hand signals to communicate.
- Drilling/excavating within 10 feet in any direction of overhead power lines is prohibited.
- The locations of all underground utilities must be identified and marked out prior to initiating any subsurface activities.
- Check to insure that the equipment operator has lowered all blades and buckets to the ground before shutting off the vehicle.
- If the equipment has an emergency stop device, have the operator show all personnel its location and how to activate it.
- Help the operator ensure adequate clearances when the equipment must negotiate in tight quarters; serve as a signalman to direct backing as necessary.
- Ensure that all heavy equipment that is used in the Exclusion Zone is kept in that zone until the job is done, and that such equipment is completely decontaminated before moving it into the clean area of the work zone.
- Samplers must not reach into or get near rotating equipment such as the drill rig. If personnel must work near any tools that could rotate, the equipment operator must completely shut down the rig prior to initiating such work. It may be necessary to use a remote sampling device.

ATTACHMENT J

Appendix 1A of NYSDEC DER-10
NYSDOH Generic CAMP

And

Appendix 1B of NYSDEC DER-10
Fugitive Dust and Particulate Monitoring

LANGAN

Appendix 1A
New York State Department of Health
Generic Community Air Monitoring Plan

Overview

A Community Air Monitoring Plan (CAMP) requires real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area when certain activities are in progress at contaminated sites. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air.

The generic CAMP presented below will be sufficient to cover many, if not most, sites. Specific requirements should be reviewed for each situation in consultation with NYSDOH to ensure proper applicability. In some cases, a separate site-specific CAMP or supplement may be required. Depending upon the nature of contamination, chemical- specific monitoring with appropriately-sensitive methods may be required. Depending upon the proximity of potentially exposed individuals, more stringent monitoring or response levels than those presented below may be required. Special requirements will be necessary for work within 20 feet of potentially exposed individuals or structures and for indoor work with co-located residences or facilities. These requirements should be determined in consultation with NYSDOH.

Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

Community Air Monitoring Plan

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for VOCs and/or particulate levels at the perimeter of the exclusion zone or work area will be necessary. Most sites will involve VOC and particulate monitoring; sites known to be contaminated with heavy metals alone may only require particulate monitoring. If radiological contamination is a concern, additional monitoring requirements may be necessary per consultation with appropriate DEC/NYSDOH staff.

Continuous monitoring will be required for all ground intrusive activities and during the demolition of contaminated or potentially contaminated structures. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. “Periodic” monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or

overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) must 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, particularly if wind direction changes. 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.

1. 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.

2. 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.

3. If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.

4. All 15-minute readings must be recorded and be available for State (DEC and NYSDOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations should be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring should be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment must be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

1. If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/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 mcg/m^3 above the upwind level and provided that no visible dust is migrating from the work area.

2. If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m^3 above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m^3 of the upwind level and in preventing visible dust migration.

3. All readings must be recorded and be available for State (DEC and NYSDOH) and County Health personnel to review.

December 2009

Appendix 1B
Fugitive Dust and Particulate Monitoring

A program for suppressing fugitive dust and particulate matter monitoring at hazardous waste sites is a responsibility on the remedial party performing the work. These procedures must be incorporated into appropriate intrusive work plans. The following fugitive dust suppression and particulate monitoring program should be employed at sites during construction and other intrusive activities which warrant its use:

1. Reasonable fugitive dust suppression techniques must be employed during all site activities which may generate fugitive dust.

2. Particulate monitoring must be employed during the handling of waste or contaminated soil or when activities on site may generate fugitive dust from exposed waste or contaminated soil. Remedial activities may also include the excavation, grading, or placement of clean fill. These control measures should not be considered necessary for these activities.

3. Particulate monitoring must be performed using real-time particulate monitors and shall monitor particulate matter less than ten microns (PM10) with the following minimum performance standards:

(a) Objects to be measured: Dust, mists or aerosols;
(b) Measurement Ranges: 0.001 to 400 mg/m3 (1 to 400,000 :ug/m3);
(c) Precision (2-sigma) at constant temperature: +/- 10 :g/m3 for one second averaging; and +/- 1.5 g/m3 for sixty second averaging;
(d) Accuracy: +/- 5% of reading +/- precision (Referred to gravimetric calibration with SAE fine test dust (mmd= 2 to 3 :m, g= 2.5, as aerosolized);
(e) Resolution: 0.1% of reading or 1g/m3, whichever is larger;
(f) Particle Size Range of Maximum Response: 0.1-10;
(g) Total Number of Data Points in Memory: 10,000;
(h) Logged Data: Each data point with average concentration, time/date and data point number
(i) Run Summary: overall average, maximum concentrations, time/date of maximum, total number of logged points, start time/date, total elapsed time (run duration), STEL concentration and time/date occurrence, averaging (logging) period, calibration factor, and tag number;
(j) Alarm Averaging Time (user selectable): real-time (1-60 seconds) or STEL (15 minutes), alarms required;
(k) Operating Time: 48 hours (fully charged NiCd battery); continuously with charger;
(l) Operating Temperature: -10 to 50^{o} C (14 to 122^{o} F);
(m) Particulate levels will be monitored upwind and immediately downwind at the working site and integrated over a period not to exceed 15 minutes.

4. In order to ensure the validity of the fugitive dust measurements performed, there must be appropriate Quality Assurance/Quality Control (QA/QC). It is the responsibility of the remedial party to adequately supplement QA/QC Plans to include the following critical features: periodic instrument calibration, operator training, daily instrument performance (span) checks, and a record keeping plan.

5. The action level will be established at 150 ug/m3 (15 minutes average). While conservative,

this short-term interval will provide a real-time assessment of on-site air quality to assure both health and safety. If particulate levels are detected in excess of 150 ug/m3, the upwind background level must be confirmed immediately. If the working site particulate measurement is greater than 100 ug/m3 above the background level, additional dust suppression techniques must be implemented to reduce the generation of fugitive dust and corrective action taken to protect site personnel and reduce the potential for contaminant migration. Corrective measures may include increasing the level of personal protection for on-site personnel and implementing additional dust suppression techniques (see paragraph 7). Should the action level of 150 ug/m3 continue to be exceeded work must stop and DER must be notified as provided in the site design or remedial work plan. The notification shall include a description of the control measures implemented to prevent further exceedances.

6. It must be recognized that the generation of dust from waste or contaminated soil that migrates off-site, has the potential for transporting contaminants off-site. There may be situations when dust is being generated and leaving the site and the monitoring equipment does not measure PM10 at or above the action level. Since this situation has the potential to allow for the migration of contaminants off-site, it is unacceptable. While it is not practical to quantify total suspended particulates on a real-time basis, it is appropriate to rely on visual observation. If dust is observed leaving the working site, additional dust suppression techniques must be employed. Activities that have a high dusting potential--such as solidification and treatment involving materials like kiln dust and lime--will require the need for special measures to be considered.

7. The following techniques have been shown to be effective for the controlling of the generation and migration of dust during construction activities:

(a) Applying water on haul roads;
(b) Wetting equipment and excavation faces;
(c) Spraying water on buckets during excavation and dumping;
(d) Hauling materials in properly tarped or watertight containers;
(e) Restricting vehicle speeds to 10 mph;
(f) Covering excavated areas and material after excavation activity ceases; and
(g) Reducing the excavation size and/or number of excavations.

Experience has shown that the chance of exceeding the 150ug/m3 action level is remote when the above-mentioned techniques are used. When techniques involving water application are used, care must be taken not to use excess water, which can result in unacceptably wet conditions. Using atomizing sprays will prevent overly wet conditions, conserve water, and provide an effective means of suppressing the fugitive dust.

8. The evaluation of weather conditions is necessary for proper fugitive dust control. When extreme wind conditions make dust control ineffective, as a last resort remedial actions may need to be suspended. There may be situations that require fugitive dust suppression and particulate monitoring requirements with action levels more stringent than those provided above. Under some circumstances, the contaminant concentration and/or toxicity may require additional monitoring to protect site personnel and the public. Additional integrated sampling and chemical analysis of the dust may also be in order. This must be evaluated when a health and safety plan is developed and when appropriate suppression and monitoring requirements are established for protection of health and the environment.

ATTACHMENT K

CAMP Special Requirements

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Special Requirements for Work Within 20 Feet of Potentially Exposed Individuals or Structures

When work areas are within 20 feet of potentially exposed populations or occupied structures, the continuous monitoring locations for VOCs and particulates must reflect the nearest potentially exposed individuals and the location of ventilation system intakes for nearby structures. The use of engineering controls such as vapor/dust barriers, temporary negative-pressure enclosures, or special ventilation devices should be considered to prevent exposures related to the work activities and to control dust and odors. Consideration should be given to implementing the planned activities when potentially exposed populations are at a minimum, such as during weekends or evening hours in non-residential settings.

- If total VOC concentrations opposite the walls of occupied structures or next to intake vents exceed 1 ppm, monitoring should occur within the occupied structure(s). Background readings in the occupied spaces must be taken prior to commencement of the planned work. Any unusual background readings should be discussed with NYSDOH prior to commencement of the work.

- If total particulate concentrations opposite the walls of occupied structures or next to intake vents exceed 150 mcg/m^3, work activities should be suspended until controls are implemented and are successful in reducing the total particulate concentration to 150 mcg/m^3 or less at the monitoring point.

- Depending upon the nature of contamination and remedial activities, other parameters (e.g., explosivity, oxygen, hydrogen sulfide, carbon monoxide) may also need to be monitored. Response levels and actions should be pre-determined, as necessary, for each site.

Special Requirements for Indoor Work With Co-Located Residences or Facilities

Unless a self-contained, negative-pressure enclosure with proper emission controls will encompass the work area, all individuals not directly involved with the planned work must be absent from the room in which the work will occur. Monitoring requirements shall be as stated above under "Special Requirements for Work Within 20 Feet of Potentially Exposed Individuals or Structures" except that in this instance "nearby/occupied structures" would be adjacent occupied rooms. Additionally, the location of all exhaust vents in the room and their discharge points, as well as potential vapor pathways (openings, conduits, etc.) relative to adjoining rooms, should be understood and the monitoring locations established accordingly. In these situations, it is strongly recommended that exhaust fans or other engineering controls be used to create negative air pressure within the work area during remedial activities. Additionally, it is strongly recommended that the planned work be implemented during hours (e.g. weekends or evenings) when building occupancy is at a minimum.

APPENDIX B

QUALITY ASSURANCE PROJECT PLAN

LANGAN

QUALITY ASSURANCE PROJECT PLAN

for

12074 FLATLANDS AVENUE
BROOKLYN, NEW YORK
NYSDEC BCP No. C224353

Prepared For:

Innovative Urban Living, LLC
c/o Gotham Organization, LLC
432 Park Avenue South, Second Floor
New York, New York 10016

Prepared By:

Langan Engineering, Environmental, Surveying,
Landscape Architecture and Geology, D.P.C.
300 Kimball Drive
Parsippany, New Jersey 07054

October 2022
100688801

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1.0 PROJECT DESCRIPTION

1.1 Introduction

Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C. (Langan) has prepared this Quality Assurance Project Plan (QAPP) on behalf of Innovative Urban Living, LLC c/o Gotham Organization, LLC for the parcel located at 12074 Flatlands Avenue (Block 4434, Lot 1) in Brooklyn, New York (the Site).

This QAPP specifies analytical methods to be used to ensure that data collected during the Remedial Investigation (RI) are precise, accurate, representative, comparable, complete, and meet the sensitivity requirements of the project.

1.2 Project Objectives

The RI Work Plan involves the following, as outlined in the March 2022 RIWP:

- Soil boring installation and soil sample collection;
- Groundwater monitoring well installation and groundwater sample collection;
- Synoptic gauging and sampling of two previously installed monitoring wells and eleven monitoring wells installed as part of the RI;
- Soil vapor point installation and soil vapor sample collection.

This QAPP addresses sampling and analytical methods that will be necessary in support of RI activities. These objectives have been established in order to meet standards that will protect public health and the environment for the site.

1.3 Scope of Work

The specific scope of work covered in this QAPP includes any sampling that will occur during implementation of the RI Work Plan. The RI Work Plan requires collection of soil, groundwater, and soil vapor samples to supplement the data and findings of a previous investigation.

2.0 DATA QUALITY OBJECTIVES AND PROCESS

Data Quality Objectives (DQOs) are qualitative and quantitative statements to help ensure that data of known and appropriate quality are obtained during the project. The overall objectives are:

- To evaluate the quality of soil through the collection of soil samples;
- To evaluate the quality of groundwater through the collection of groundwater samples; and,
- To evaluate the quality of soil vapor through the collection of soil vapor samples.

DQOs for sampling activities are determined by evaluating five factors:

- Data needs and uses: The types of data required and how the data will be used after it is obtained.
- Parameters of Interest: The types of chemical or physical parameters required for the intended use.
- Level of Concern: Levels of constituents, which may require remedial actions or further investigations.
- Required Analytical Level: The level of data quality, data precision, and quality assurance/quality control (QA/QC) documentation required for chemical analysis.
- Required Detection Limits: The detection limits necessary based on the above information.

The quality assurance and quality control objectives for all measurement data include:

- Precision – an expression of the reproducibility of measurements of the same parameter under a given set of conditions. Field sampling precision will be determined by analyzing coded duplicate samples and analytical precision will be determined by analyzing internal QC duplicates and/or matrix spike duplicates.
- Accuracy – a measure of the degree of agreement of a measured value with the true or expected value of the quantity of concern. For soil samples, accuracy will be determined through the assessment of the analytical results of field blanks and trip blanks for each sample set. Analytical accuracy will be assessed by examining the percent recoveries of surrogate compounds that

are added to each sample (organic analyses only), internal standards, laboratory method blanks, instrument calibration, and the percent recoveries of matrix spike compounds added to selected samples and laboratory blanks.

- Representativeness – expresses the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Representativeness is dependent upon the adequate design of the sampling program and will be satisfied by ensuring that the scope of work is followed and that specified sampling and analysis techniques are used. Representativeness in the laboratory is ensured by compliance to nationally-recognized analytical methods, meeting sample holding times, and maintaining sample integrity while the samples are in the laboratory's possession. This is accomplished by following all applicable methods, laboratory-issued standard operating procedures (SOPs), the laboratory's Quality Assurance Manual, and this QAPP. The laboratory is required to be properly certified and accredited.
- Completeness – the percentage of measurements made which are judged to be valid. Completeness will be assessed through data validation. The QC objective for completeness is generation of valid data for at least 90 percent of the analyses requested.
- Comparability – expresses the degree of confidence with which one data set can be compared to another. The comparability of all data collected for this project will be ensured using several procedures, including standard methods for sampling and analysis as documented in the QAPP, using standard reporting units and reporting formats, and data validation.
- Sensitivity – the ability of the instrument or method to detect target analytes at the levels of interest. The project manager will select, with input from the laboratory and QA personnel, sampling and analytical procedures that achieve the required levels of detection.

3.0 PROJECT ORGANIZATION AND RESPONSIBILITY

Implementation of the RI Work Plan will be overseen by Langan for Innovative Urban Living, LLC. The environmental consultant will also arrange data analysis and reporting tasks. The analytical services will be performed by an Environmental Laboratory Approval Program (ELAP)-certified laboratory. Data validation services will be performed by approved data validation contractor(s).

For the required sampling as stated in the RI Work Plan, sampling will be conducted by Langan, the analytical services will be performed by York Analytical Laboratories, Inc. of Stratford, Conn. (New York State Department of Health [NYSDOH] ELAP certification number 10854). Data validation services will be performed by Joseph Conboy; résumé attached (Attachment A).

Key contacts for this project are as follows:

Innovative Urban Living, LLC c/o Gotham Organization, LLC:	Bryan Kelly Telephone: (212) 716-2502
Langan Project Manager:	Amanda Forsburg Telephone: (973) 560-4900
Langan Quality Assurance Officer (QAO):	Marlena Jewett Telephone: (212) 479-5735
Langan Remedial Engineer:	Ron Boyer Telephone: (973) 560-4900
Data Validator / Program Quality Assurance Monitor:	Joe Conboy Telephone: (215) 845-8985
Laboratory Representative:	York Analytical Laboratories, Inc. Lidya Gulizia Telephone: (203) 325-1371 x833

4.0 QUALITY ASSURANCE OBJECTIVES FOR COLLECTION OF DATA

The overall quality assurance objective is to develop and implement procedures for sampling, laboratory analysis, field measurements, and reporting that will provide data of sufficient quality to evaluate soil impacts at the site. The sample set, chemical analysis results, and interpretations must be based on data that meet or exceed quality assurance objectives established for the site. Quality assurance objectives are usually expressed in terms of accuracy or bias, sensitivity, completeness, representativeness, comparability, and sensitivity of analysis. Variances from the quality assurance objectives at any stage of the investigation will result in the implementation of appropriate corrective measures and an assessment of the impact of corrective measures on the usability of the data.

Precision

Precision is a measure of the degree to which two or more measurements are in agreement. Field precision is assessed through the collection and measurement of field duplicates. Laboratory precision and sample heterogeneity also contribute to the uncertainty of field duplicate measurements. This uncertainty is taken into account during the data assessment process. For field duplicates, results less than 2x the reporting limit (RL) meet the precision criteria if the absolute difference is less than ±2X the RL. For results greater than 2X the RL, the acceptance criteria is a relative percent difference (RPD) of ≤50% (soil), and <30% (groundwater). RLs and method detection limits (MDL) are provided in Attachment B.

Accuracy

Accuracy is the measurement of the reproducibility of the sampling and analytical methodology. It should be noted that precise data may not be accurate data. For the purpose of this QAPP, bias is defined as the constant or systematic distortion of a measurement process, which manifests itself as a persistent positive or negative deviation from the known or true value. This may be due to (but not limited to) improper sample collection, sample matrix interferences, poorly calibrated analytical or sampling equipment, or limitations or errors in analytical methods and techniques.

Accuracy in the field is assessed through the use of field blanks and through compliance to all sample handling, preservation, and holding time requirements. All field blanks should be non-detect when analyzed by the laboratory. Any contaminant detected in an associated field blank was evaluated against laboratory blanks (preparation or method) and evaluated against field samples collected on the same day to determine potential for bias.

Laboratory accuracy is assessed by evaluating the percent recoveries of MS/MSD samples, LCS/LCSDs, surrogate compound recoveries, internal standard responses and the results of method preparation blanks. MS/MSD, LCS/LCSD, internal standard responses and surrogate percent recoveries were compared to either method-specific control limits or laboratory-derived control limits. Sample volume permitting, samples displaying outliers should be reanalyzed. All associated method blanks should be non-detect when analyzed by the laboratory.

Completeness

Laboratory completeness is the ratio of total number of samples analyzed and verified as acceptable compared to the number of samples submitted to the fixed-base laboratory for analysis, expressed as a percent. Three measures of completeness are defined:

- Sampling completeness, defined as the number of valid samples collected relative to the number of samples planned for collection;
- Analytical completeness, defined as the number of valid sample measurements relative to the number of valid samples collected; and
- Overall completeness, defined as the number of valid sample measurements relative to the number of samples planned for collection.

Soil and groundwater data will meet a 90% completeness criterion. If the criterion is not met, sample results will be evaluated for trends in rejected and unusable data. The effect of unusable data required for a determination of compliance will also be evaluated.

Representativeness

Representativeness expresses the degree to which data accurately and precisely represents a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition within a defined spatial and/or temporal boundary. Representativeness is dependent upon the adequate design of the sampling program and was satisfied by ensuring that the scope of work is followed and that specified sampling and analysis techniques are used. This is performed by following applicable standard operating procedures (SOPs) and this QAPP. All field technicians will be given copies of appropriate documents prior to sampling events and will be required to read, understand, and follow each document as it pertains to the tasks at hand.

Representativeness in the laboratory is ensured by compliance to nationally-recognized analytical methods, meeting sample holding times, and maintaining sample integrity while the samples are in the laboratory's possession. This is performed by following all applicable EPA and standard methods, laboratory-issued SOPs, the laboratory's Quality Assurance Manual, and this QAPP. The laboratory is required to be properly certified and accredited.

Comparability

Comparability is an expression of the confidence with which one data set can be compared to another. Comparability is dependent upon the proper design of the sampling program and was satisfied by ensuring that the sampling plan is followed and that sampling is performed according to the SOPs or other project-specific procedures. Analytical data were comparable when similar sampling and analytical methods are used as documented in the QAPP. Comparability was controlled by requiring the use of specific nationally-recognized analytical methods and requiring consistent method performance criteria. Comparability is also dependent on similar quality assurance objectives. Previously collected data were evaluated to determine whether they may be combined with contemporary data sets.

Sensitivity

Sensitivity is the ability of the instrument or method to detect target analytes at the levels of interest (e.g., at the NJDEP SRS). The Project Manager will select, with input from the laboratory and QA personnel, sampling and analytical procedures that achieve the required levels of detection and QC acceptance limits that meet established performance criteria. Concurrently, the Project Manager will select the level of data assessment to ensure that only data meeting the project DQOs are used in decision-making.

Field equipment will be used that can achieve the required levels of detection for analytical measurements in the field. In addition, the field sampling staff will collect and submit full volumes of samples as required by the laboratory for analysis, whenever possible. Full volume aliquots will help ensure achievement of the required limits of detection and allow for reanalysis if necessary. The concentration of the lowest level check standard in a multi-point calibration curve will represent the reporting limit.

Analytical methods and quality assurance parameters associated with the sampling program are presented in Attachment C. The frequency of associated field blanks and duplicate samples will be based on the recommendations listed in DER-10 and as described in Section 5.3.

5.0 SAMPLE COLLECTION AND FIELD DATA ACQUISITION PROCEDURES

Sampling will be conducted in accordance with the established NYSDEC protocols contained in DER-10/Technical Guidance for Site Investigation and Remediation (May 2010). The following sections describe procedures to be followed for specific tasks.

5.1 Field Documentation Procedures

Field documentation procedures will include summarizing field data in field books and proper sample labeling. These procedures are described in the following sections.

5.1.1 Field Data and Notes

Field notebooks contain the documentary evidence regarding procedures conducted by field personnel. Hard cover, bound field notebooks will be used because of their compact size, durability and secure page binding. The pages of the notebook will not be removed.

Entries will be made in waterproof, permanent blue or black ink. No erasures will be allowed. Incorrect entries will be crossed out with a single strike mark and the change initialed and dated by the team member making the change.

Each entry will be dated. Entries will be legible and contain accurate and complete documentation of the individual or sampling team's activities or observations made. The level of detail will be sufficient to explain and reconstruct the activity conducted. Each entry will be signed by the person(s) making the entry.

The following types of information will be provided for each sampling task, as appropriate:

- Project name and number;
- Reasons for being on-site or taking the sample;
- Date and time of activity;
- Sample identification numbers;

- Geographical location of sampling points with references to the site, other facilities or a map coordinate system. Sketches were made in the field logbook when appropriate;
- Physical location of sampling locations such as depth below ground surface;
- Description of the method of sampling including procedures followed, equipment used and any departure from the specified procedures;
- Description of the sample including physical characteristics, odor, etc.;
- Readings obtained from health and safety equipment;
- Weather conditions at the time of sampling and previous meteorological events that may affect the representative nature of a sample;
- Photographic information including a brief description of what was photographed, the date and time, the compass direction of the picture and the number of the picture on the camera;
- Other pertinent observations such as the presence of other persons on the site, actions by others that may affect performance of site tasks, etc.; and,
- Names of sampling personnel and signature of persons making entries.

Field records will also be collected on field data sheets including digital boring logs, which will be used for geologic and drilling data during soil boring activities, groundwater parameter logs which will be used to track groundwater chemical parameter readings during groundwater sampling, and soil vapor sampling sheets which will be used to note soil vapor seal conditions, PID readings, and sample specific information. Field data sheets will include the project-specific number and be stored in the field project files when not in use. At the completion of the field activities, the field data sheets will be maintained digitally in the central project file.

5.1.2 Sample Labeling

Each sample collected will be assigned a unique identification number and placed in an appropriate sample container. Each sample container will have a sample label affixed to the outside with the date and time of

sample collection and project name. In addition, the label will contain the sample identification number, analysis required and chemical preservatives added, if any. All documentation will be completed in waterproof ink. Sample nomenclature procedures are included in Attachment D.

5.2 Equipment Calibration and Preventative Maintenance

A photoionization detector (PID) will be used during the sampling activities to evaluate work zone action levels and screen soil samples. Field calibration and/or field checking of the PID will be the responsibility of the field team leader and the site HSO, and will be accomplished by following the procedures outlined in the operating manual for the instrument. At a minimum, field calibration and/or field equipment checking will be performed once daily, prior to use. Field calibration will be documented in the field notebook. Entries made into the logbook regarding the status of field equipment will include the following information:

- Date and time of calibration
- Type of equipment serviced and identification number (such as serial number)
- Reference standard used for calibration
- Calibration and/or maintenance procedure used
- Other pertinent information

Equipment that fails calibration or becomes inoperable during use will be removed from service and segregated to prevent inadvertent utilization. The equipment will be properly tagged to indicate that it is out of calibration. Such equipment will be repaired and recalibrated to the manufacturer's specifications by qualified personnel. Equipment that cannot be repaired will be replaced.

Off-site calibration and maintenance of field instruments will be conducted as appropriate throughout the duration of project activities. All field instrumentation, sampling equipment and accessories will be maintained in accordance with the manufacturer's recommendations and specifications and established field equipment practice. Off-site calibration and maintenance will be performed by qualified personnel. A logbook will be kept to document that established

calibration and maintenance procedures have been followed. Documentation will include both scheduled and unscheduled maintenance.

5.3 Sample Collection

5.3.1 Soil Samples

Soil samples will be visually classified and field screened using a PID to assess potential impacts from VOCs and for health and safety monitoring. Soil samples collected for analysis of VOCs will be collected using Terra Core® sampling equipment. For analysis of non-volatile parameters, samples will be homogenized and placed into glass jars. After collection, all sample jars will be capped and securely tightened, and placed in iced coolers and maintained at 4°C ±2°C until they are transferred to the laboratory for analysis, in accordance with the procedures outlined in Section 5.4. Analysis and/or extraction and digestion of collected soil samples will meet the holding times required for each analyte as specified in Attachment C. In addition, analysis of collected soil sample will meet all quality assurance criteria set forth by this QAPP and DER-10.

Soil samples analyzed for per- and poly-fluoro alkyl substances (PFAS) will be collected in 250-milliliter (mL) high-density polyethylene (HDPE) containers provided by the laboratory and analyzed by using USEPA Method 537 modified. The reporting limit for PFAS in soil is 1 microgram per kilogram (ug/kg). The laboratory standard operating procedures (SOP) for the analysis of PFAS is included in Attachment E. Soil samples analyzed for 1,4-dioxane will be collected in an 8 ounce jar provided by the laboratory and analyzed using USEPA Method 8270. The reporting limit for 1,4-dioxane in soil is 0.1 milligram per kilogram (mg/kg).

5.3.1.1 Sample Field Blanks and Duplicates

Use of dedicated sampling equipment is planned; therefore, collection of field blanks is not anticipated. If the use of reusable sampling equipment is required, proper decontamination procedures will be employed (as further described in Section 5.7) and field blanks will be collected for quality assurance purposes at a rate of one per 20 investigative

soil samples. If required, field blanks will be obtained by pouring laboratory-demonstrated analyte-free water on or through a decontaminated sampling device following use and implementation of decontamination protocols. The water will be collected off of the sampling device into a laboratory-provided sample container for analysis. Field blanks will be collected at a rate of one per 20 samples and will be analyzed for the complete list of analytes on the day of sampling. If less than 20 samples are collected during a particular sampling event, one field blank sample will be collected. Equipment blanks will be collected at a rate of one per day when soil samples are analyzed for PFAS. Trip blanks will be collected at a rate of one per day if soil samples are analyzed for VOCs during that day.

Duplicate soil samples will be collected and analyzed for quality assurance purposes. Duplicate samples will be collected at a frequency of 1 per 20 investigative soil samples and will be submitted to the laboratory as "blind" samples. If less than 20 samples are collected during a particular sampling event, one duplicate sample will be collected.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) samples (MS/MSD for organics; MS and laboratory duplicate for inorganics) will be taken at a frequency of one pair per 20 field samples. If less than 20 samples are collected during a particular sampling event, one MS/MSD sample will be collected. These samples are used to assess the effect of the sample matrix on the recovery of target compounds or target analytes.

5.3.2 Groundwater Samples

Groundwater samples will be collected into laboratory-supplied containers and will be sealed, labeled, and placed in a cooler containing ice (to maintain a temperature of approximately 4 degrees Celsius) for delivery to a NYSDOH ELAP-certified analytical laboratory. Analysis and/or extraction and digestion of collected groundwater samples will meet the holding times required for each analyte as specified in

Attachment C. In addition, analysis of collected groundwater samples will meet all quality assurance criteria set forth by this QAPP and DER-10.

Groundwater samples analyzed for PFAS will be collected in two 250-mL HDPE containers provided by the laboratory and analyzed using USEPA Method 537 modified. The reporting limit for PFAS in groundwater is 2 nanograms per liter (ng/L). The laboratory SOP for the analysis of PFAS is included in Attachment E. Groundwater samples also be analyzed for 1,4-dioxane will be collected in a one-liter amber glass jar and analyzed using USEPA Method 8270 SIM. The reporting limit for 1,4-dioxane in groundwater is 0.35 micrograms per liter (ug/L).

5.3.2.1 Sample Field Blanks and Duplicates

Use of dedicated sampling equipment is planned; therefore, collection of field blanks is not anticipated. If the use of reusable sampling equipment is required, proper decontamination procedures will be employed (as further described in Section 5.7) and field blanks will be collected for quality assurance purposes at a rate of one per 20 investigative groundwater samples. If required, field blanks will be obtained by pouring laboratory-demonstrated analyte-free water on or through a decontaminated sampling device following use and implementation of decontamination protocols. The water will be collected off of the sampling device into a laboratory-provided sample container for analysis. Field blanks will be collected at a rate of one per 20 samples and will be analyzed for the complete list of analytes on the day of sampling. If less than 20 samples are collected during a particular sampling event, one field blank sample will be collected. Equipment blanks will be collected at a rate of one per day when groundwater samples are analyzed for PFAS. Trip blanks will be collected at a rate of one per day if soil or groundwater samples are analyzed for VOCs during that day.

Duplicate groundwater samples will be collected and analyzed for quality assurance purposes. Duplicate samples will be collected at a frequency of 1 per 20 investigative soil samples and will be submitted to the laboratory as "blind" samples. If less than 20 samples are collected during a particular sampling event, one duplicate sample will be collected.

MS/MSD samples (MS/MSD for organics; MS and laboratory duplicate for inorganics) will be taken at a frequency of one pair per 20 field samples. If less than 20 samples are collected during a particular sampling event, one MS/MSD sample will be collected. These samples are used to assess the effect of the sample matrix on the recovery of target compounds or target analytes.

5.3.3 Soil Vapor Samples

Samples will be collected in accordance with the Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York (NYSDOH October 2006).

Soil vapor implants will be set at a depth of approximately 11 to 16 feet below current site grades which corresponds to approximately the two-foot interval directly above the groundwater interface. Each vapor probe will consist of a new, dedicated stainless steel screen implant connected to polyethylene or Teflon™ tubing extending to the target depth. About 1 foot of clean sand filter pack will be placed around the screen implant, and the remaining annular space will be backfilled to grade with hydrated bentonite. Sampling will occur for the duration of 2 hours.

Samples will be collected in appropriate sized Summa canisters that have been batch-certified clean by the laboratory and samples will be analyzed by using USEPA Method TO-15. Flow rate for both purging and sampling will not exceed 0.2 L/min. Soil vapor samples will be collected shortly after installation of the temporary probes. One to three volumes (i.e., the volume of the sample probe and tube) will be purged prior to collecting the sample to ensure a representative sample is obtained. A sample log sheet will be maintained summarizing sample identification, date and

time of sample collection, sampling depth, identity of samplers, sampling methods and devices, soil vapor purge volumes, volume of the soil vapor extracted, vacuum of canisters before and after the samples are collected, apparent moisture content of the sampling zone, and chain of custody protocols.

As part of the vapor intrusion evaluation, a tracer gas will be used in accordance with NYSDOH protocols to serve as a quality assurance/ quality control (QA/QC) device to verify the integrity of the soil vapor probe seal. A container (box, plastic pail, etc.) will serve to keep the tracer gas in contact with the probe during testing. A portable monitoring device will be used to analyze a sample of soil vapor for the tracer gas prior to sampling. If the tracer sample results show a significant presence of the tracer, the probe seals will be adjusted to prevent infiltration. At the conclusion of the sampling round, tracer monitoring will be performed a second time to confirm the integrity of the probe seals.

Additionally, an ambient air sample will be collected each day soil vapor samples are collected. Samples will be collected in appropriate sized Summa canisters that have been batch-certified clean by the laboratory and samples will be analyzed by using USEPA Method TO-15. Flow rate for sampling will not exceed 0.6 L/min.

5.3.3.1 Soil Vapor Sample Duplicates

Duplicate soil samples will be collected and analyzed for quality assurance purposes. Duplicate samples will be collected at a frequency of 1 per 20 investigative soil samples and will be submitted to the laboratory as "blind" samples. If less than 20 samples are collected during a particular sampling event, one duplicate sample will be collected.

5.3.4 PFAS Sampling Procedures

Sampling for PFAS will take place in both soil and groundwater during the remedial investigation. All 48 soil samples and 11 groundwater samples collected during the proposed sampling event will be analyzed for PFAS. Field personnel conducting PFAS sampling will wear clothing and use equipment which does not contain PFAS materials including: powderless

nitrile gloves, natural rubber overboots, and synthetic and natural fiber clothing. Clothing advertised as waterproof, water-repellant, and/or dirt and/or stain resistant will not be worn. Personal hygiene products with conditioning agents will be avoided prior to the sampling event. Insect repellent and sunscreen will be avoided. Consumption of food and/or beverages will be strictly prohibited during sampling activities, excluding bottled water for hydration. Ballpoint pens will be used as the sole writing instrument to complete labels and record field notes. Waterproof field books, including "Rite-in-Rain"™ will be avoided.

Only sampling equipment known to be devoid of PFAS containing materials will be used. In general, PFAS-free pumps, tubing, interface probes, soil sampling equipment, and bottleware will be considered prior to the sampling event. It is anticipated that peristaltic pumps will be utilized as the depth of groundwater is less than 20-feet. If groundwater is determined to be greater than 20 feet deep, bladder pumps (QED Sample Pro, or equivalent) with a fluoropolymer-free bladder will be used. HDPE will be used for tubing, soil sampling equipment, and bottleware.

Field personnel will follow standard discrete soil sampling and low flow procedures when sampling for PFAS. When possible, disposable and dedicated equipment will be used for each sample location to avoid potential cross contamination and limit errors from inadequate decontamination between samples. Bladder pumps and/or peristaltic pump tubing will not be re-used and therefore decontamination of sampling equipment between samples will not be necessary. Nitrile gloves will be changed between each step during set up and sampling.

Whenever an action occurs outside of procedure, such as the writing of field notes, nitrile gloves will be changed. Sampling equipment will be staged 5-feet away from the boring or open wellhead. Equipment not directly related to sampling will be staged in a separate area away from the boring or open wellhead. When inserting the tubing into the well, the surrounding platform will be avoided as a source of transference. While stabilizing the well, the pump will not be allowed to stop as backflow from the water quality meter can pose a risk to cross contamination.

Once stability has been achieved, sampling will occur. PFAS sample bottleware must be made of HDPE and bottleware must be filled to the container neck. Soil sample bottleware must only be filled half-way. The PFAS field and equipment blanks will be collected immediately following completion of PFAS sampling at the frequency discussed above (Sections 5.3.1.1 and 5.3.2.1).

The PFAS compounds to be analyzed includes: perfluorobutanesulfonic acid, perfluorohexanesulfonic acid, perfluoroheptanesulfonic acid, perfluorooctanessulfonic acid, perfluorodecanesulfonic acid, perfluorobutanoic acid, perfluoropentanoic acid, perfluorohexanoic acid, perfluoroheptanoic acid, perfluorooctanoic acid, perfluorononanoic acid, perfluorodecanoic acid, perfluoroundecanoic acid, perfluorododecanoic acid, perfluorotridecanoic acid, perfluorotetradecanoic acid, 6:2 fluorotelomer sulfonate, 8:2 fluorotelomer sulfonate, perfluroroctanesulfonamide, n-methyl perfluorooctanesulfonamidoacetic acid, and n-ethyl perfluorooctanesulfonamidoacetic acid.

5.4 Sample Containers and Handling

Certified, commercially clean sample containers will be obtained from the analytical laboratory. The laboratory will also prepare and supply the required field blank sample containers and reagent preservatives for soil and groundwater. Sample containers for soil and groundwater, including the field blank containers, will be placed in plastic coolers by the laboratory. These coolers will be received by the field sampling team within 24 hours of their preparation in the laboratory. Prior to the commencement of field work, Langan field personnel will fill the plastic coolers with ice in Ziploc® bags (or equivalent) to maintain a temperature of 4°C(±2°C). Soil vapor samples do not need to be placed on ice for preservation.

Soil and/or groundwater samples collected in the field for laboratory analysis will be placed directly into the laboratory-supplied sample containers. These samples will then be placed and stored on-ice in laboratory provided coolers until shipment to the laboratory. The temperature in the coolers containing samples and associated field blanks will be maintained at a temperature of 4°C(±2°C) while on-site and during sample shipment to the analytical laboratory.

Possession of samples collected in the field will be traceable from the time of collection until they are analyzed by the analytical laboratory or are properly disposed. Chain-of-custody procedures, described in Section 5.9, will be followed to maintain and document sample possession. Samples will be packaged and shipped as described in Section 5.6.

5.5 Sample Preservation

Sample preservation measures will be used in an attempt to prevent sample decomposition by contamination, degradation, biological transformation, chemical interactions and other factors during the time between sample collection and analysis. Preservation will commence at the time of sample collection and will continue until analyses are performed. Should chemical preservation be required, the analytical laboratory will add the preservatives to the appropriate sample containers before shipment to the office or field. Samples will be preserved according to the requirements of the specific analytical method selected, as shown in Attachment C.

5.6 Sample Shipment

5.6.1 Packaging

Sample containers will be placed in plastic coolers. Ice in Ziploc® bags (or equivalent) will be placed around sample containers. Cushioning material will be added around the sample containers if necessary. Chains-of-custody and other paperwork will be placed in a Ziploc® bag (or equivalent) and placed inside the cooler and custody seals will be affixed to one side of the cooler at a minimum. If the samples are being shipped by an express delivery company (third-party courier, e.g., FedEx) then laboratory address labels will be placed on top of the cooler.

5.6.2 Shipping

Standard procedures to be followed for shipping environmental samples to the analytical laboratory are outlined below.

- All environmental samples will be transported to the laboratory from the site, Langan office, or secure laboratory transfer station by a laboratory provided courier under the chain-of-custody

protocols described in Section 5.9. A third-party courier may be used if necessary.

- Prior notice will be provided to the laboratory regarding when to expect shipped samples. If the number, type or date of shipment changes due to site constraints or program changes, the laboratory will be informed.

5.7 Decontamination Procedures

Though not anticipated, decontamination procedures will be used if non-dedicated sampling equipment is utilized during the RI. Decontamination of field personnel is discussed in the site-specific Health and Safety Plan (HASP) included in Appendix B of the RI Work Plan. Field sampling equipment that is to be reused will be decontaminated in the field in accordance with the following procedures:

1. Laboratory-grade glassware detergent and tap water scrub to remove visual contamination
2. Generous tap water rinse
3. Distilled/de-ionized water rinse

5.8 Residuals Management

Debris (e.g., paper, plastic and disposable PPE) will be collected in plastic garbage bags and disposed of as non-hazardous industrial waste. Debris is expected to be transported to a local municipal landfill for disposal. If applicable, residual solids (e.g., leftover soil cuttings) will be placed back in the borehole from which it was sampled. If gross contamination is observed, soil will be collected and stored in Department of Transportation (DOT)-approved 55-gallon drums in a designated storage area at the site. The residual materials stored in a designated storage area at the site for further characterization, treatment or disposal.

5.9 Chain of Custody Procedures

A chain-of-custody protocol has been established for collected samples and will be followed during sample handling activities in both field and laboratory operations. The primary purpose of the chain-of-custody procedures is to document the possession of the samples from collection through shipping,

storage and analysis to data reporting and disposal. Chain-of-custody refers to actual possession of the samples. Samples are considered to be in custody if they are within sight of the individual responsible for their security or locked in a secure location. Each person who takes possession of the samples, except for third-party shipping couriers, is responsible for sample integrity and safe keeping. Chain-of-custody procedures are provided below:

- Chain-of-custody will be initiated by the laboratory supplying the pre-cleaned and prepared sample containers. Chain-of-custody forms will accompany the sample containers.
- Following sample collection, the chain-of-custody form will be completed for the samples collected. The sample identification number, date and time of sample collection, analysis requested and other pertinent information (e.g., preservatives) will be recorded on the form. Entries will be made in waterproof, permanent blue or black ink.
- Langan field personnel will be responsible for the care and custody of the samples collected until the samples are transferred to another party, dispatched to the laboratory, or disposed. The sampling/Field Team Leader will be responsible for enforcing chain-of-custody procedures during field work.
- When the form is full or when all samples have been collected that will fit in a single cooler, the sampling/Field Team Leader will check the form for possible errors and sign the chain-of-custody form. Any necessary corrections will be made to the record with a single strike mark, dated, and initialed.

Samples will be packaged for shipment or pickup via courier to the laboratory with the appropriate chain-of-custody form. If applicable, a shipping bill will be completed for each cooler and the shipping bill number recorded on the chain-of-custody form. A copy of the form will be retained by the Langan sampling team for the project file, and the original will be sent to the laboratory with the samples. Bills of lading will also be retained as part of the documentation for the chain-of-custody records, if applicable. When transferring custody of the samples, the individuals relinquishing and receiving custody of the samples will verify sample numbers and condition and will document the sample acquisition and transfer by signing and dating the chain-of-custody form. This process documents sample custody transfer from the sampler to the analytical laboratory.

Laboratory chain-of-custody will be maintained throughout the analytical processes as described in the laboratory's Quality Assurance Manual. The analytical laboratory will provide a copy of the chain-of-custody in the analytical data deliverable package. The chain-of-custody becomes the permanent record of sample handling and shipment.

5.10 Laboratory Sample Storage Procedures

The subcontracted laboratory will use a laboratory information management system (LIMS) to track and schedule samples upon receipt by the analytical laboratories. Any sample anomalies identified during sample log-in must be evaluated on individual merit for the impact upon the results and the data quality objectives of the project. When irregularities do exist, Langan must be notified to discuss recommended courses of action and documentation of the issue must be included in the project file.

For samples requiring thermal preservation, the temperature of each cooler will be immediately recorded. Each sample and container will be assigned a unique laboratory identification number and secured within the custody room walk-in coolers designated for new samples. Samples will be, as soon as practical, disbursed in a manner that is functional for the operational team. The temperature of all coolers and freezers will be monitored and recorded using a certified temperature sensor. Any temperature excursions outside of acceptance criteria (i.e., below 2°C or above 6°C) will initiate an investigation to determine whether any samples may have been affected. Following analysis, the laboratory's specific procedures for retention and disposal will be followed as specified in the laboratory's SOPs and/or QA manual.

6.0 DATA REDUCTION, VALIDATION, AND REPORTING

6.1 Introduction

Data collected during the field investigation will be reduced and reviewed by the laboratory QA personnel, and a report on the findings will be tabulated in a standard format. The criteria used to identify and quantify the analytes will be those specified for the applicable methods in the USEPA SW-846 and subsequent updates. The data package provided by the laboratory will contain all items specified in the USEPA SW-846 appropriate for the analyses to be performed, and be reported in standard format.

The completed copies of the chain-of-custody records (both external and internal) accompanying each sample from time of initial bottle preparation to completion of analysis shall be attached to the analytical reports.

6.2 Data Reduction

The Analytical Services Protocol (ASP) Category B data packages and an electronic data deliverable (EDD) will be provided by the laboratory after receipt of a complete sample delivery group. The Project Manager will immediately arrange for archiving the results and preparation of result tables. These tables will form the database for assessment of the site contamination condition.

Each EDD deliverable must be formatted using a Microsoft Windows operating system and the NYSDEC data deliverable format for EQuIS. To avoid transcription errors, data will be loaded directly into the American Standard Code for Information Interchange (ASCII) format from the LIMS. If this cannot be accomplished, the consultant should be notified via letter of transmittal indicating that manual entry of data is required for a particular method of analysis. All EDDs must also undergo a QC check by the laboratory before delivery. The original data, tabulations, and electronic media are stored in a secure and retrievable fashion.

The Project Manager or Task Manager will maintain close contact with the QA reviewer to ensure all non-conformance issues are acted upon prior to data manipulation and assessment routines. Once the QA review has been completed, the Project Manager may direct the Team Leaders or others to initiate and finalize the analytical data assessment.

6.3 Data Validation

Data validation will be performed in accordance with the USEPA Region 2 SOPs for data validation and USEPA's National Functional Guidelines for Organic and Inorganic Data Review. Tier 1 data validation (the equivalent of USEPA's Stage 2A validation) will be performed to evaluate data quality. Tier 1 data validation is based on completeness and compliance checks of sample-related QC results including:

- Holding times;
- Sample preservation;
- Blank results (method, trip, and field blanks);
- Surrogate recovery compounds and extracted internal standards (as applicable);
- LCS and LCSD recoveries and RPDs;
- MS and MSD recoveries and RPDs;
- Laboratory duplicate RPDs; and
- Field duplicate RPDs

A DUSR will be prepared by the data validator and reviewed by the QAM before issuance. The DUSR will present the results of data validation, including a summary assessment of laboratory data packages, sample preservation and chain-of-custody procedures, and a summary assessment of precision, accuracy, representativeness, comparability, and completeness for each analytical method.

Based on the results of data validation, the validated analytical results reported by the laboratory will be assigned one of the following usability flags:

- "U" - Not detected. The associated number indicates the approximate sample concentration necessary to be detected significantly greater than the level of the highest associated blank;
- "UJ" - Not detected. Quantitation limit may be inaccurate or imprecise;
- "J" - Analyte is present. Reported value may be associated with a higher level of uncertainty than is normally expected with the analytical method
- "R" – Unreliable result; data is rejected or unusable. Analyte may or may not be present in the sample; and
- No Flag - Result accepted without qualification.

7.0 QUALITY ASSURANCE PERFORMANCE AUDITS AND SYSTEM AUDITS

7.1 Introduction

Quality assurance audits may be performed by the project quality assurance group under the direction and approval of the QAO. These audits will be implemented to evaluate the capability and performance of project and subcontractor personnel, items, activities, and documentation of the measurement system(s). Functioning as an independent body and reporting directly to corporate quality assurance management, the QAO may plan, schedule, and approve system and performance audits based upon procedures customized to the project requirements. At times, the QAO may request additional personnel with specific expertise from company and/or project groups to assist in conducting performance audits. However, these personnel will not have responsibility for the project work associated with the performance audit.

7.2 System Audits

System audits may be performed by the QAO or designated auditors, and encompass a qualitative evaluation of measurement system components to ascertain their appropriate selection and application. In addition, field and laboratory quality control procedures and associated documentation may be system audited. These audits may be performed once during the performance of the project. However, if conditions adverse to quality are detected or if the Project Manager requests, additional audits may occur.

7.3 Performance Audits

The laboratory may be required to conduct an analysis of Performance Evaluation samples or provide proof that Performance Evaluation samples submitted by USEPA or a state agency have been analyzed within the past twelve months.

7.4 Formal Audits

Formal audits refer to any system or performance audit that is documented and implemented by the QA group. These audits encompass documented activities performed by qualified lead auditors to a written procedure or checklists to objectively verify that quality assurance requirements have been developed, documented, and instituted in accordance with contractual and project criteria.

Formal audits may be performed on project and subcontractor work at various locations.

Audit reports will be written by auditors who have performed the site audit after gathering and evaluating all data. Items, activities, and documents determined by lead auditors to be in noncompliance shall be identified at exit interviews conducted with the involved management. Non-compliances will be logged, and documented through audit findings, which are attached to and are a part of the integral audit report. These audit-finding forms are directed to management to satisfactorily resolve the noncompliance in a specified and timely manner.

The Project Manager has overall responsibility to ensure that all corrective actions necessary to resolve audit findings are acted upon promptly and satisfactorily. Audit reports must be submitted to the Project Manager within fifteen days of completion of the audit. Serious deficiencies will be reported to the Project Manager within 24 hours. All audit checklists, audit reports, audit findings, and acceptable resolutions are approved by the QAO prior to issue. Verification of acceptable resolutions may be determined by re-audit or documented surveillance of the item or activity. Upon verification acceptance, the QAO will close out the audit report and findings.

8.0 CORRECTIVE ACTION

8.1 Introduction

The following procedures have been established to ensure that conditions adverse to quality, such as malfunctions, deficiencies, deviations, and errors, are promptly investigated, documented, evaluated, and corrected.

8.2 Procedure Description

When a significant condition adverse to quality is noted at site, laboratory, or subcontractor location, the cause of the condition will be determined and corrective action will be taken to preclude repetition. Condition identification, cause, reference documents, and corrective action planned to be taken will be documented and reported to the QAO, Project Manager, Field Team Leader and involved contractor management, at a minimum. Implementation of corrective action is verified by documented follow-up action.

All project personnel have the responsibility, as part of the normal work duties, to promptly identify, solicit approved correction, and report conditions adverse to quality. Corrective actions will be initiated as follows:

- When predetermined acceptance standards are not attained;
- When procedure or data compiled are determined to be deficient;
- When equipment or instrumentation is found to be faulty;
- When samples and analytical test results are not clearly traceable;
- When quality assurance requirements have been violated;
- When designated approvals have been circumvented;
- As a result of system and performance audits;
- As a result of a management assessment;
- As a result of laboratory/field comparison studies; and
- As required by USEPA SW-846, and subsequent updates, or by the NYSDEC ASP.

Project management and staff, such as field investigation teams, remedial response planning personnel, and laboratory groups, monitor on-going work performance in the normal course of daily responsibilities. Work may be audited at the sites, laboratories, or contractor locations. Activities, or documents ascertained to be noncompliant with quality assurance requirements will be documented. Corrective actions will be mandated through audit finding sheets attached to the audit report. Audit findings are logged, maintained, and controlled by the Task Manager.

Personnel assigned to quality assurance functions will have the responsibility to issue and control Corrective Action Request (CAR) Forms (Figure 8.1 or similar). The CAR identifies the out-of-compliance condition, reference document(s), and recommended corrective action(s) to be administered. The CAR is issued to the personnel responsible for the affected item or activity. A copy is also submitted to the Project Manager. The individual to whom the CAR is addressed returns the requested response promptly to the QA personnel, affixing his/her signature and date to the corrective action block, after stating the cause of the conditions and corrective action to be taken. The QA personnel maintain the log for status of CARs, confirms the adequacy of the intended corrective action, and verifies its implementation. CARs will be retained in the project file for the records.

Any project personnel may identify noncompliance issues; however, the designated QA personnel are responsible for documenting, numbering, logging, and verifying the close out action. The Project Manager will be responsible for ensuring that all recommended corrective actions are implemented, documented, and approved.

FIGURE 8.1

CORRECTIVE ACTION REQUEST
Number: _____ Date: _____
TO: _____ You are hereby requested to take corrective actions indicated below and as otherwise determined by you to (a) resolve the noted condition and (b) to prevent it from recurring. Your written response is to be returned to the project quality assurance manager by _____
CONDITION:
REFERENCE DOCUMENTS:
RECOMMENDED CORRECTIVE ACTIONS:
_____ _____ _____ _____ _____ _____ Originator Date Approval Date Approval Date
RESPONSE
CAUSE OF CONDITION
CORRECTIVE ACTION (A) RESOLUTION (B) PREVENTION (C) AFFECTED DOCUMENTS
C.A. FOLLOWUP: CORRECTIVE ACTION VERIFIED BY: _____ DATE:_____

9.0 REFERENCES

NYSDEC. Division of Environmental Remediation. DER-10/Technical Guidance for Site Investigation and Remediation, dated May 3, 2010.

NYSDOH. Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York, dated October 2006.

Taylor, J. K., 1987. Quality Assurance of Chemical Measurements. Lewis Publishers, Inc., Chelsea, Michigan

USEPA, 1986. SW-846 "Test Method for Evaluating Solid Waste," dated November 1986. U.S. Environmental Protection Agency, Washington, D.C.

USEPA, 1987. Data Quality Objectives for Remedial Response Actions Activities: Development Process, EPA/540/G-87/003, OSWER Directive 9355.0-7 - U.S. Environmental Protection Agency, Washington, D.C.

USEPA, 1992a. CLP Organics Data Review and Preliminary Review. SOP No.

HW-6, Revision #8, dated January 1992. USEPA Region II.

USEPA, 1992b. Evaluation of Metals Data for the Contract Laboratory Program (CLP) based on SOW 3/90. SOP No. HW-2, Revision XI, dated January 1992. USEPA Region II.

USEPA. Hazardous Waste Support Section. Analysis of Volatile Organic Compounds in Air Contained in Canisters by Method TO-15. SOP No. HW-31, Revision #6, dated June 2014.

FIGURES

Legend

- Historical Soil Boring Location
- Historical Soil Boring/Monitoring Well Location
- Historical Test Pit Location
- Site Boundary
- Proposed Soil Boring/ Monitoring Well Location
- Proposed Soil Vapor Point

LSV-9
LSV-10
LSB-29/LMW-25
LSB-28/LMW-15
LSB-30/LMW-16
LSV-11
LSB-11/LMW-6
LSB-14
LSV-21
LSB-32/LMW-24
LSB-33
LSB-31
LTP-5
LSV-12
LSV-13
LSV-14
LSB-34/LMW-17
LSB-35/LMW-18
LSB-36/LMW-19
LSB-13/LMW-4
LSV-15
LSB-10
LSV-20
LSV-16
LSB-38/LMW-20
LSB-39
LSB-37
LTP-8
LSB-12
LSV-19
LSV-17
LSV-18
LSB-40/LMW-21
LSB-42/LMW-23
LSB-41/LMW-22

FORMERLY THE BED OF GEORGIA AVE.
PARCEL D BLOCK 4434 LOT 80 STREET BEDS
N/F LANDS OF CHRISTIAN CULTURAL CENTER, INC. CRFN #2003000210219
PARCEL E BLOCK 4434 LOTS 1&21
N/F LANDS OF CHRISTIAN CULTURAL CENTER, INC. CRFN #2003000210219
BLOCK 4434 LOT 1 N/F LANDS OF CHRISTIAN CULTURAL CENTER, INC. CRFN #2004000147827
BLOCK 4431 LOT 21
BLOCK 4330 LOTS 1&200 N/F LANDS OF CHRISTIAN CULTURAL CENTER, INC. REEL 3608 PG 9429
BLOCK 4434 LOT 60 N/F LANDS OF COUNCIL TOWER II HOUSING DEVELOPMENT FUND CORP CRFN #2008000412129
BLOCK 4431 N/F LANDS OF COUNCIL TOWERS II HOUSING DEVELOPMENT

1053.39'
300.94'
290.91'
235.32'
90°0'0"
20°0'0"
ZONE X

50 0 50
SCALE IN FEET

References:
1. Site survey basemap from Control Point Associates Inc. PC, last updated March 17, 2021.
2. Sample and test pit locations were collected using the ArcGIS Collector application on a tablet utilizing GPS location.

LANGAN
300 Kimball Drive
Parsippany, NJ 07054
T: 973.560.4900 F: 973.560.4901 www.langan.com
Langan Engineering & Environmental Services, Inc.
Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.
Langan International LLC
Collectively known as Langan
NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400

Project
12074 FLATLANDS AVENUE
BLOCK No. 4434, LOT No. 1 (Portion)
BROOKLYN
KINGS COUNTY NEW YORK

Drawing Title
PROPOSED SAMPLE LOCATION PLAN

Project No.	100688801
Date	9/12/2022
Scale	1 " = 50 '
Drawn By	IHB
Figure	1

Path: \\Langan.com\data\PAR\data8\100688801\Project Data\ArcGIS\MXD\Environmental_Figures\2022-08 RIWP\Figure 6 - Proposed Sample Location Plan.mxd

ATTACHMENT A

Resumes

JOSEPH CONBOY

STAFF CHEMIST

ENVIRONMNETAL

Mr. Conboy has seven years of environmental chemistry, quality assurance, and environmental database management experience, with a current emphasis on validation of laboratory data for submittal to NJDEP via the New Jersey Data of Known Quality Protocols and to NYSDEC. Previous work experience includes performing validation of data for projects in USEPA Regions 2 and 3 while employing appropriate validation guidelines for each region, managing large data sets, updating appropriate regulatory limits, performing statistical evaluations, and preparing electronic data deliverables and report deliverables using the Earthsoft EQuIS database program, and acted as an intermediary between project managers, field staff, and laboratories. Mr. Conboy also has experience in field sampling techniques and maintains current OSHA HAZWOPER certification.

EDUCATION

B.Sc., Chemistry with a minor in Mathematics
Rowan University

CERTIFICATIONS & TRAINING

OSHA 40-Hour HAZWOPER 29 CFR 1910.120(e)(4) Certification

NJ Analytical Guidance and Data Usability Training

USEPA Data Validation Training

Earthsoft EQuIS Environmental Database Training

SELECTED PROJECTS

- 1400 Ferris, Bronx, NY – Completed validation of soil and groundwater data and prepared the Data Usability Summary Report for submittal to NYSDEC. USEPA Region II guidelines, with aide from National Functional Guidelines, were employed to perform validation of VOCs and SVOCs including 1,4-dioxane, and tangentially used based on professional judgment to perform validation of PFAS data.
- Broome Street Parking Lot, NY - Completed validation of waste characterization data and prepared the Data Usability Summary Report for submittal to NYSDEC. USEPA Region II guidelines, with aide from National Functional Guidelines, were employed to perform validation of VOCs, SVOCs, herbicides, PCBs, pesticides, metals including mercury, ignitability temperature, pH, reactive cyanide, reactive sulfide, cyanide, and hexavalent chromium. Toxicity characteristic leachate procedure extraction data for VOCs, SVOCs, herbicides, pesticides, metals, and mercury were also validated.
- 215 North 10th Street, Brooklyn, NY - Completed validation of soil and groundwater data and prepared the Data Usability Summary Report for submittal to NYSDEC. USEPA Region II guidelines, with aide from National Functional Guidelines, were employed to perform validation of VOC, SVOC, SVOC SIM, herbicide, PCB, pesticide, metals, mercury, cyanide, hexavalent chromium, trivalent chromium data.
- 35 Commercial Street, Brooklyn, NY - Completed validation of soil data and prepared the Data Usability Summary Report for submittal to NYSDEC. USEPA Region II guidelines, with aide from National Functional Guidelines, were employed to perform validation of VOC, SVOC, SVOC SIM, herbicide, PCB, pesticide, metals, mercury, cyanide, hexavalent chromium, trivalent chromium data, and tangentially used based on professional judgment to perform validation of PFAS data.
- Suffolk Street, Lower East Side, NY- Completed validation of soil, groundwater, and soil vapor data and prepared the Data Usability Summary Report for submittal to NYSDEC. USEPA Region II

guidelines, with aide from National Functional Guidelines, were employed to perform validation of VOC, VOCs by USEPA TO-15, SVOC, SVOC SIM, herbicide, PCB, pesticide, metals, mercury, cyanide, hexavalent chromium, trivalent chromium data, and tangentially used based on professional judgment to perform validation of PFAS data.

- Managed a database for a confidential client containing 10+ years of environmental chemical data from multiple laboratories, requiring select data validation in accordance with New Jersey Data of Known Quality Protocols and identifying areas of delineation from historic field information. Once identified, NJDEP designated groundwater, surface water, soil, sediment, soil vapor, and custom screening criteria were researched and applied to each area, requiring individualized flagging for reporting.*
- Prepared the New Jersey Data of Known Quality Protocol Data Usability Evaluation and managed the database for a confidential client for a data set greater than 20 years old. A DUE or any validation effort was not prepared in the 20 years prior to current. This included data from variations of methods for volatile organic compounds, semivolatile organic compounds, total and dissolved metals, pesticides, herbicides, natural attenuation parameters, and per- and polyfluoroalkyl substances in multiple media.*
- Performed 200+ Stage 2a validations for a combined 87-acre USEPA designated Corrective Action site under the Resource Conservation and Recovery Act, including a quick-turn USEPA required PCB by soxhlet extraction investigation across multiple plants. Once a former train car painting facility, USEPA required a quick-turn PCB by soxhlet extraction soil investigation.
- Preparation of a quality assurance program for a confidential client in West Virginia. A quick turn QAPP was prepared in a service location new to the consultant, resulting in research into state requirements for data usability and auditing newly employed laboratories. The QAPP was understood to be prepared for groundwater only, but the client did not reveal the need for sediment and soil. Two QAPPs were submitted for review to governing agencies.*
- Used statistical software to determine a localized background upper confidence limit of chromium for a confidential client's sand and gravel site. Validation was used to confirm laboratory procedures, and data was used in ProUCL calculations to compare to researched background chromium levels for Pennsylvania soils. *
- Prepared daily perimeter dust and air monitoring summaries and validation of low level mirex data for a confidential client's superfund site. Low level mirex data was generated by university laboratories and subject to validation following national functional guidelines to aide in river clean-up, including sediment, surface water, and treatment system water matrices.*

**Project completed prior to employment at LANGAN.*

MARLENA JEWETT

DATA ANALYST

CAD/GIS

1 year in the industry

Education

B.A., Environmental Economics
Colgate University

Work History

Equitable Advisors
Financial Advisor
9/7/2020-4/23/2021

Langan
Data Analyst
5/10/2021 – Present

Proposed Title: Field Technician

Ms. Jewett is a data analyst with experience in database design, management and visualization using EarthSoft's EQuIS™ database in support of environmental site characterizations for sites regulated under federal and state compliance programs. Her expertise includes integration of analytical databases and coordination with GIS users.

In her current role Marlena assists project teams with planning and implementation of project databases and data visualization. This includes coordinating with field staff and laboratories to define, workflows, SOPs and ensure the receipt of the proper deliverables for field and lab data; reviewing and managing project data and information using EQuIS™, Microsoft® Access, and Excel; generating data reports including tables, graphs, charts, and GIS compatible files; and generating and reviewing electronic data deliverables following project or agency specific formats.

SELECTED PROJECTS

EQuIS Management and NYSDEC deliverables – Data Analyst. Loaded and maintained soil, groundwater, and soil vapor data in an EQuIS database for a remedial investigation and waste characterizations of New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP), NYC Office of Environmental Remediation (OER), and due diligence sites. Provided final report deliverables including sample summaries; tags; and exceedance summary exports from EQuIS. Completed this work for the following projects:

- **2-8 Main Street**
- **28-90 Review Avenue**
- **34-15 10th Street**
- **37-11 30th Street**
- **44-01 Northern Boulevard**
- **45 Commercial Avenue**
- **50 Jersey Avenue**
- **111 Willow Street**
- **118 West 13th Street**
- **122 Fifth Avenue**
- **155 Third Street**
- **160 East 125th Street**
- **210 Clarkson Avenue**
- **241 West 28th Street**
- **266 West 96th Street**
- **445 Gerard Avenue**
- **475 Bay Street and 31 Wave Street**

- **495 Peninsula Boulevard**
- **561 Greenwich Street**
- **563 Sackett Street**
- **805-825 Atlantic Avenue**
- **1525 Bedford Avenue**
- **2455 Third Avenue**
- **4650 Broadway**
- **ABC Block 27**
- **Bay Crane**
- **Broome Street**
- **Former Grant Hardware**
- **Forsyth and Delancy Street**
- **Gowanus Canal Northside**
- **Greenpoint Landing E1**
- **Greenpoint Landing Parcel H3**
- **John Evans**
- **Kissena Boulevard**
- **NYCHA Farragut**
- **Remeeder**

RONALD D. BOYER, PE

PRINCIPAL/VICE PRESIDENT

GEOTECHNICAL ENGINEERING

Mr. Boyer is an experienced geotechnical engineer whose practice involves coordination and supervision of subsurface investigations; establishment and monitoring of geotechnical instrumentation; design of shallow and deep foundation systems; evaluation of earth slope stability; design and inspection of subgrade improvement applications; preparation of geotechnical engineering reports and construction specifications; performance of pre-construction conditions documentation; coordination and supervision of construction inspection services; and monitoring of adjacent structures during demolition and construction.

SELECTED PROJECTS

- 11 Hubert Street, New York, NY
- 110 University Place, New York, NY
- 111 Murray Street Development, New York, NY
- 120 Neptune Avenue, Brooklyn, NY
- 125 Greenwich Street Development, New York, NY
- 150 Amsterdam Avenue, New York, NY
- 22 Thames Street, New York, NY
- 225 East 39th Street Development, New York, NY
- 2329 Nostrand Avenue, Brooklyn, NY
- 259 West 10th Street, New York, NY
- 315 East 46th Street, New York, NY
- 414 West 15thh Street, New York, NY
- 485 Fifth Avenue, New York, NY
- 510 West 22nd Street, New York, NY
- 57 Reade Street Development, New York, NY
- 92 Fulton Street, New York, NY
- American Dream Meadowlands, East Rutherford, NJ
- Avalon Bay, Boonton, NJ
- Bank Street Commons, White Plains, NY
- Brooklyn Law School Dormitory, Brooklyn, NY
- Cape Liberty Cruise Port, Bayonne, NJ
- CarMax - Waterbury, CT
- Christian Cultural Center, Brooklyn, NY
- Christiana Phase 2 Retail Development, Christiana, DE
- Circuit City Store, Wayne, NJ
- Clifton Commons, Clifton, NJ
- Colgate-Palmolive Waterfront Development, Various Locations
- Daily News Printing Press Facility, Jersey City, NJ
- DDC Rikers Island, New York, NY
- Essex Street Roadway Improvements, Hackensack, NJ
- Fifth Avenue Presbyterian Church, New York, NY
- General Motors - Lighthouse Landing, Sleepy Hollow, NY
- Giants Training Facility, East Rutherford, NJ
- Golden Orchards Geotechnical Support, Washington Township, NJ

EDUCATION

M.S., Civil Engineering (Geotechnical) Virginia Tech

B.S., Civil Engineering Virginia Tech

PROFESSIONAL REGISTRATION

Professional Engineer (PE) in NJ, NY

AFFILIATIONS

Deep Foundations Institute (DFI)

American Institute of Architects

Associated General Contractors of NJ

- Greenwich School, Greenwich, NJ
- Hudson County Courthouse, Jersey City, NJ
- K. Hovnanian at Bedminster Stormwater Detention System, Bedminster, NJ
- Kinko's, Norwalk, CT
- Kohl's Distribution Center, Mamakating, NY
- Lehman Brothers Data Center, Cranford, NJ
- Lehman Brothers Data Center, Piscataway, NJ
- Lowe's Norwalk, CT
- MetLife Stadium, East Rutherford, NJ
- Metropolitan Executive Towers, East Rutherford, NJ
- Morgan Stanley Data Center, Somerset, NJ
- Morristown Airport Hanger, Morristown, NJ
- MOMA West, New York, NY
- Newark International Airport, CONRac, Newark, NJ
- Newark International Airport, AirTrain Replacement, Newark, NJ
- New Britain Retail Center, New Britain, CT
- Northwest Airlines Cargo Facility, JFK International Airport, Queens, NY
- Norwalk Retail Development, Norwalk, CT
- One Bridge Plaza, Fort Lee, NJ
- PRBC - Medical Office Building, East Stroudsburg, PA
- Prospect Plaza, Brooklyn, NY
- PSEG Overhead Transmission, Throughout NJ
- River Bend at Port Imperial, West New York, NJ
- River Street Redevelopment, Hackensack, NJ
- Riverfront Stadium Redevelopment, Newark, NJ
- Riverside Square Mall Expansion, Hackensack, NJ
- Roosevelt Island DEP Seawall, New York, NY
- Roosevelt Island Park, Esplanade and Seawall, New York, NY
- Route 209 Expansion, Mamakating, NY
- Route 3 Flyover Bridge, Meadowlands, East Rutherford, NJ
- St Barnabas Hospital, Livingston, NJ
- Stevens Institute of Technology, Student Housing and University Center, Hoboken, NJ
- Stop & Shop, Various Locations
- T172 & S171N Transmission Lines, North Smithfield, RI
- Target Development, Bethel, CT
- Target Store, Horn Lake, MS
- Temporary Office Trailer Complex, East Rutherford, NJ
- The Standard, New York, NY
- The Venetian, Brooklyn, NY
- Westlakes Office Complex, Berwyn, PA
- Yonkers Avenue Bridge, Westchester County, NY

Amanda Forsburg, CHMM

Project Scientist

Environmental Oversight, Remedial Investigation, Remedial Action

9 years in the industry ~ 9 years with Langan

Ms. Forsburg has over nine years of experience that includes working on environmental projects, particularly investigation and remediation of environmental contamination. She has assisted in remedial investigations and has been involved in the collection of field data and assisted in the preparation of reports and other environmental regulatory documents for projects in New Jersey and New York.

Ms. Forsburg's field experience includes investigation and remediation of contaminated sites including the collection of soil, groundwater, and air samples for environmental analysis, supervision of injections and remedial excavations, and the completion of air monitoring to ensure OSHA compliance on HAZWOPER sites. Office experience includes management of field investigation and remediation as well as completion of proposals, Phase I Environmental Site Assessments, remedial investigation reports, and remedial closure reports in support of these activities. Ms. Forsburg has worked on projects under regulatory oversight of the New Jersey Department of Environmental Protection (NJDEP), New York State Department of Environmental Conservation (NYSDEC), and New York City Office of Environmental Remediation (NYCOER).

Selected Projects

NYSDEC Brownfield Redevelopment, Remedial Investigation and Remediation Action – 363 and 365 Bond Street, Brooklyn, NY
NYSDEC Brownfield Redevelopment, Remedial Investigation – Fashion Outlets of Niagara Falls, NY
NYSDEC Spills Redevelopment, Remedial Action – 540 West 26th Street, New York, NY
NYSDEC Spills Redevelopment, Remedial Investigation and Remedial Action – 101 Murray Street, New York, NY
NYSDEC Spills Redevelopment, Remedial Investigation and Remedial Action – 110 University Place, New York, NY
NYSDEC Spills Redevelopment, Remedial Action, Lowe's Home Centers, Kings Plaza Site Redevelopment – Brooklyn, NY
NYSDEC Spills Remediation, Con Edison Soil Remediation - Bronx, NY
NYSDEC Spills Remediation, Con Edison NAPL Monitoring and Removal, Various Sites – Manhattan, NY
NYCOER E-Designation Remediation and Volunteer Cleanup Program Redevelopment, Remedial Investigation and Remedial Action – 400 Park Avenue South, New York, NY
NYCOER E-Designation Remediation and Volunteer Cleanup Program Redevelopment, Remedial Investigation and Remedial Action – 540 West 53rd Street, New York, NY
Remedial Action – 508 West 24th Street, New York, NY

Education

B.A., Environmental Studies
Bucknell University

B.A., Environmental Geology
Bucknell University

Professional Registration

Certified Hazardous Materials Manager (CHMM)

OSHA 29 CFR 1910.120 Certification (HAZWOPER)

Professional Affiliations

New Jersey Society of Women Environmental Professionals (NJSWEP)

Association of Environmental and Engineering Geologists – *New York-Philadelphia Chapter Secretary*

Professional Women in Construction - *New York Chapter Program Committee*

Alliance of Hazardous Materials Professionals New Jersey Chapter (AHMPNJ)

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NYCOER E-Designation Remediation, Remedial Investigation and Remedial Action – 505 W 19th Street, New York, NY
NYCOER E-Designation Remediation, Remedial Investigation and Remedial Action – 53 West 53rd Street (MoMA Expansion), New York, NY
NYCOER E-Designation Remediation, Remedial Investigation and Remedial Action – 525 West 52nd Street, New York, NY
NYCOER E-Designation Remediation, Remedial Investigation and Remedial Action – 412 Greenwich Street, New York, NY
NYCOER E-Designation Remediation, Remedial Investigation and Remedial Action – 508 West 24th Street, New York, NY
NYCOER E-Designation Remediation, Remedial Investigation and Remedial Action – 68 Charlton Street, New York, NY
NYCDEP Remediation, Remedial Investigation and Remedial Action – 225 East 39th Street, New York, NY
Sky View Parc Mixed-Use Construction, Sub-Slab Vapor Ventilation System Construction – Flushing, NY
Liberty Plaza Redevelopment Site, Remedial Investigation and Remedial Action – Randallstown, MD
Former Penick Corporation Facility RCRA Site, Remedial Investigation and Remedial Action – Montville, NJ
Former Pan Graphics Facility, Soil and Groundwater Remediation – Garfield, NJ
Former Pan Graphics Facility, Sediment Investigation and Cap Construction – Lodi, NJ
Former Flintkote Facility, Soil and Groundwater Investigation – East Rutherford, NJ
Interport Site, Impacted Soils Delineation and Remediation – Newark, NJ
Lowe's Home Center Store, Sub-Slab Vapor Ventilation System O&M – Eatontown, NJ
Lowe's Home Center Store, Sub-Slab Methane Gas Ventilation System O&M – Woodbridge, NJ
Lowe's Home Center Store, Sub-Slab Vapor Barrier Construction – Rosedale, NY
Stop & Shop, Groundwater and Indoor Air Monitoring – Emerson, NJ
Stop & Shop, Methane Gas Ventilation System O&M – Raritan, NJ
Stop & Shop, Sub-Slab Vapor Ventilation System O&M – New Paltz, NY
Former First Aviation Services Facility, Groundwater Monitoring and Remediation, Teterboro, NJ
Phase I Environmental Site Assessments and Due Diligence Investigations, Various Sites – NJ and NY

Lidya Gulizia
Director, Client Services

Ms. Gulizia has over twenty five years of experience in the environmental laboratory industry. She has extensive knowledge and experience in analytical methods and laboratory operations, quality assurance/quality control protocols, federal and state regulatory requirements, data validation protocols, project management and client service.

In her most recent position prior to joining YORK, Ms. Gulizia served for over ten years as Senior Project Manager at a nationally-recognized, multi-laboratory network managing several key client accounts with large scale programs and sites across the US. In this role, she worked on behalf of her clients with environmental contractors and regulatory authorities developing site-specific quality assurance project and sampling plans, and coordinating all phases of laboratory operations from receipt, analysis to reporting and project follow-up. Her client base included large chemical manufacturers and industry, federal defense contractors, environmental/engineering firms and small to mid-size industrial dischargers.

At YORK Analytical, Ms. Gulizia is responsible for project management . In this role she works with clients to determine their analytical needs and data objectives in order to ensure that they are conducting the appropriate analytical testing to satisfy applicable environmental regulations and permits, sampling at the required monitoring schedule and submitting the appropriate reporting deliverables as necessary. She provides technical support and guidance regarding sampling, interpreting sample results and data reports, and responds to all client and data reviewer requests. Additionally, Ms. Gulizia is responsible within the laboratory for project set-up, pricing, quoting, proposal development, and log-in and final report review.

Education

- B.S./Biology (Microbiology core), Rutgers University, New Brunswick, NJ
- Continuing Education Studies, “Hazardous Waste Regulations”, Middlesex County College, Edison, NJ
- 40 Hour HAZMAT OSHA Certified (expired)

ANTHONY MOFFA, JR., ASP, CHMM, COSS, CSP

ASSOCIATE/CORPORATE HEALTH AND SAFETY MANAGER

Anthony is Langan's Corporate Health & Safety Manager and is responsible for managing health and safety compliance in all Langan office locations. He has nearly 20 years of experience in the health and safety field. He is responsible for ensuring compliance with all federal and state occupational health and safety laws and development and implementation of corporate health and safety policies. His responsibilities include reviewing and updating Langan's Corporate Health and Safety Program and assisting employees in the development of site specific Health & Safety Plans. He maintains and manages health and safety records for employees in all Langan office locations including medical evaluations, respirator fit testing, and Hazardous Waste Operations and Emergency Response training. He is also responsible for documentation and investigation of work-related injuries and incidents and sharing this information with employees to assist in the prevention of future incidents. He is also the chairman of the Corporate Health & Safety Committee and Health & Safety Leadership Team that meet periodically throughout the year. He is responsible for coordinating and providing health and safe training to Langan employees. He was formerly the Environmental, Health and Safety Coordinator at a chemical manufacturer. His experience included employee hazard communications, development of material safety data sheets for developed products, respirator fit testing and conducting required Occupational Health & Safety Association and Department of Transportation training.

EDUCATION

B.S., Physics
West Chester University

PROFESSIONAL REGISTRATION

Associate Safety Professional (ASP)

Certified Hazardous Material Manager (CHMM)

Certified Occupational Safety Specialist (COSS)

Certified Safety Professional (CSP)

AFFILIATIONS

Pennsylvania Chamber of Business & Industry

Chemical Council of New Jersey

New Jersey Business & Industry Association

Geoprofessional Business Association

American Society of Safety Professionals

ATTACHMENT B

Laboratory Reporting Limits and Method Detection Limits

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ATTACHMENT B

Laboratory Reporting Limits and Method Detection Limits

Method	Matrix	Analyte	MDL	RL	Units
VOC					
EPA 8260C	Water	1,1,1,2-Tetrachloroethane	0.2	0.5	ug/L
EPA 8260C	Water	1,1,1-Trichloroethane	0.2	0.5	ug/L
EPA 8260C	Water	1,1,2,2-Tetrachloroethane	0.2	0.5	ug/L
EPA 8260C	Water	1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	0.2	0.5	ug/L
EPA 8260C	Water	1,1,2-Trichloroethane	0.2	0.5	ug/L
EPA 8260C	Water	1,1-Dichloroethane	0.2	0.5	ug/L
EPA 8260C	Water	1,1-Dichloroethylene	0.2	0.5	ug/L
EPA 8260C	Water	Bromochloromethane	0.2	0.5	ug/L
EPA 8260C	Water	1,2,3-Trichloropropane	0.2	0.5	ug/L
EPA 8260C	Water	1,2,4-Trichlorobenzene	0.2	0.5	ug/L
EPA 8260C	Water	1,2,4-Trimethylbenzene	0.2	0.5	ug/L
EPA 8260C	Water	1,2-Dibromo-3-chloropropane	0.2	0.5	ug/L
EPA 8260C	Water	1,2-Dibromoethane	0.2	0.5	ug/L
EPA 8260C	Water	1,2-Dichlorobenzene	0.2	0.5	ug/L
EPA 8260C	Water	1,2-Dichloroethane	0.2	0.5	ug/L
EPA 8260C	Water	1,2-Dichloropropane	0.2	0.5	ug/L
EPA 8260C	Water	1,3,5-Trimethylbenzene	0.2	0.5	ug/L
EPA 8260C	Water	1,3-Dichlorobenzene	0.2	0.5	ug/L
EPA 8260C	Water	1,4-Dichlorobenzene	0.2	0.5	ug/L
EPA 8260C	Water	Cyclohexane	0.2	0.5	ug/L
EPA 8260C	Water	2-Butanone	0.2	0.5	ug/L
EPA 8260C	Water	2-Hexanone	0.2	0.5	ug/L
EPA 8260C	Water	4-Methyl-2-pentanone	0.2	0.5	ug/L
EPA 8260C	Water	Acetone	1	2	ug/L
EPA 8260C	Water	Acrolein	0.2	0.5	ug/L
EPA 8260C	Water	Acrylonitrile	0.2	0.5	ug/L
EPA 8260C	Water	Benzene	0.2	0.5	ug/L
EPA 8260C	Water	Bromodichloromethane	0.2	0.5	ug/L
EPA 8260C	Water	Bromoform	0.2	0.5	ug/L

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Laboratory Reporting Limits and Method Detection Limits

Method	Matrix	Analyte	MDL	RL	Units
VOC					
EPA 8260C	Water	Bromomethane	0.2	0.5	ug/L
EPA 8260C	Water	Carbon disulfide	0.2	0.5	ug/L
EPA 8260C	Water	Carbon tetrachloride	0.2	0.5	ug/L
EPA 8260C	Water	Chlorobenzene	0.2	0.5	ug/L
EPA 8260C	Water	Chloroethane	0.2	0.5	ug/L
EPA 8260C	Water	Chloroform	0.2	0.5	ug/L
EPA 8260C	Water	Chloromethane	0.2	0.5	ug/L
EPA 8260C	Water	cis-1,2-Dichloroethylene	0.2	0.5	ug/L
EPA 8260C	Water	cis-1,3-Dichloropropylene	0.2	0.5	ug/L
EPA 8260C	Water	Dibromochloromethane	0.2	0.5	ug/L
EPA 8260C	Water	Dibromomethane	0.2	0.5	ug/L
EPA 8260C	Water	Dichlorodifluoromethane	0.2	0.5	ug/L
EPA 8260C	Water	Naphthalene	1	2	ug/L
EPA 8260C	Water	Ethyl Benzene	0.2	0.5	ug/L
EPA 8260C	Water	Methylcyclohexane	0.2	0.5	ug/L
EPA 8260C	Water	Hexachlorobutadiene	0.2	0.5	ug/L
EPA 8260C	Water	Isopropylbenzene	0.2	0.5	ug/L
EPA 8260C	Water	Methyl acetate	0.2	0.5	ug/L
EPA 8260C	Water	Methyl tert-butyl ether (MTBE)	0.2	0.5	ug/L
EPA 8260C	Water	Methylene chloride	1	2	ug/L
EPA 8260C	Water	n-Butylbenzene	0.2	0.5	ug/L
EPA 8260C	Water	n-Propylbenzene	0.2	0.5	ug/L
EPA 8260C	Water	o-Xylene	0.2	0.5	ug/L
EPA 8260C	Water	p- & m- Xylenes	0.5	1	ug/L
EPA 8260C	Water	1,2,3-Trichlorobenzene	0.2	0.5	ug/L
EPA 8260C	Water	p-Isopropyltoluene	0.2	0.5	ug/L
EPA 8260C	Water	sec-Butylbenzene	0.2	0.5	ug/L
EPA 8260C	Water	Styrene	0.2	0.5	ug/L
EPA 8260C	Water	tert-Butyl alcohol (TBA)	0.5	1	ug/L

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Laboratory Reporting Limits and Method Detection Limits

Method	Matrix	Analyte	MDL	RL	Units
VOC					
EPA 8260C	Water	tert-Butylbenzene	0.2	0.5	ug/L
EPA 8260C	Water	Tetrachloroethylene	0.2	0.5	ug/L
EPA 8260C	Water	Toluene	0.2	0.5	ug/L
EPA 8260C	Water	trans-1,2-Dichloroethylene	0.2	0.5	ug/L
EPA 8260C	Water	trans-1,3-Dichloropropylene	0.2	0.5	ug/L
EPA 8260C	Water	Trichloroethylene	0.2	0.5	ug/L
EPA 8260C	Water	Trichlorofluoromethane	0.2	0.5	ug/L
EPA 8260C	Water	Vinyl Chloride	0.2	0.5	ug/L
EPA 8260C	Water	Xylenes, Total	0.6	1.5	ug/L

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Laboratory Reporting Limits and Method Detection Limits

Method	Matrix	Analyte	MDL	RL	Units
SVOC					
EPA 8270D	Water	Acenaphthene	0.05	0.05	ug/L
EPA 8270D	Water	Acenaphthylene	0.05	0.05	ug/L
EPA 8270D	Water	Acetophenone	2.5	5	ug/L
EPA 8270D	Water	Aniline	2.5	5	ug/L
EPA 8270D	Water	Anthracene	0.05	0.05	ug/L
EPA 8270D	Water	Atrazine	0.5	0.5	ug/L
EPA 8270D	Water	Benzaldehyde	2.5	5	ug/L
EPA 8270D	Water	Benzidine	10	20	ug/L
EPA 8270D	Water	Benzo(a)anthracene	0.05	0.05	ug/L
EPA 8270D	Water	Benzo(a)pyrene	0.05	0.05	ug/L
EPA 8270D	Water	Benzo(b)fluoranthene	0.05	0.05	ug/L
EPA 8270D	Water	Benzo(g,h,i)perylene	0.05	0.05	ug/L
EPA 8270D	Water	Benzoic acid	25	50	ug/L
EPA 8270D	Water	Benzo(k)fluoranthene	0.05	0.05	ug/L
EPA 8270D	Water	Benzyl alcohol	2.5	5	ug/L
EPA 8270D	Water	Benzyl butyl phthalate	2.5	5	ug/L
EPA 8270D	Water	1,1'-Biphenyl	2.5	5	ug/L
EPA 8270D	Water	4-Bromophenyl phenyl ether	2.5	5	ug/L
EPA 8270D	Water	Caprolactam	2.5	5	ug/L
EPA 8270D	Water	Carbazole	2.5	5	ug/L
EPA 8270D	Water	4-Chloro-3-methylphenol	2.5	5	ug/L
EPA 8270D	Water	4-Chloroaniline	2.5	5	ug/L
EPA 8270D	Water	Bis(2-chloroethoxy)methane	2.5	5	ug/L
EPA 8270D	Water	Bis(2-chloroethyl)ether	2.5	5	ug/L
EPA 8270D	Water	Bis(2-chloroisopropyl)ether	2.5	5	ug/L
EPA 8270D	Water	2-Chloronaphthalene	2.5	5	ug/L
EPA 8270D	Water	2-Chlorophenol	2.5	5	ug/L
EPA 8270D	Water	4-Chlorophenyl phenyl ether	2.5	5	ug/L
EPA 8270D	Water	Chrysene	0.05	0.05	ug/L

ATTACHMENT B

Laboratory Reporting Limits and Method Detection Limits

Method	Matrix	Analyte	MDL	RL	Units
SVOC					
EPA 8270D	Water	Dibenzo(a,h)anthracene	0.05	0.05	ug/L
EPA 8270D	Water	Dibenzofuran	2.5	5	ug/L
EPA 8270D	Water	Di-n-butyl phthalate	2.5	5	ug/L
EPA 8270D	Water	1,4-Dichlorobenzene	2.5	5	ug/L
EPA 8270D	Water	1,2-Dichlorobenzene	2.5	5	ug/L
EPA 8270D	Water	1,3-Dichlorobenzene	2.5	5	ug/L
EPA 8270D	Water	3,3'-Dichlorobenzidine	2.5	5	ug/L
EPA 8270D	Water	2,4-Dichlorophenol	2.5	5	ug/L
EPA 8270D	Water	Diethyl phthalate	2.5	5	ug/L
EPA 8270D	Water	2,4-Dimethylphenol	2.5	5	ug/L
EPA 8270D	Water	Dimethyl phthalate	2.5	5	ug/L
EPA 8270D	Water	4,6-Dinitro-2-methylphenol	2.5	5	ug/L
EPA 8270D	Water	2,4-Dinitrophenol	2.5	5	ug/L
EPA 8270D	Water	2,4-Dinitrotoluene	2.5	5	ug/L
EPA 8270D	Water	2,6-Dinitrotoluene	2.5	5	ug/L
EPA 8270D	Water	Di-n-octyl phthalate	2.5	5	ug/L
EPA 8270 SIM	Water	1,4-Dioxane	0.2	0.3	ug/L
EPA 8270D	Water	1,2-Diphenylhydrazine (as Azobenzene)	2.5	5	ug/L
EPA 8270D	Water	Bis(2-ethylhexyl)phthalate	0.5	0.5	ug/L
EPA 8270D	Water	Fluoranthene	0.05	0.05	ug/L
EPA 8270D	Water	Fluorene	0.05	0.05	ug/L
EPA 8270D	Water	Hexachlorobenzene	0.02	0.02	ug/L
EPA 8270D	Water	Hexachlorobutadiene	0.5	0.5	ug/L
EPA 8270D	Water	Hexachlorocyclopentadiene	2.5	5	ug/L
EPA 8270D	Water	Hexachloroethane	0.5	0.5	ug/L
EPA 8270D	Water	Indeno(1,2,3-cd)pyrene	0.05	0.05	ug/L
EPA 8270D	Water	Isophorone	2.5	5	ug/L
EPA 8270D	Water	2-Methylnaphthalene	2.5	5	ug/L
EPA 8270D	Water	2-Methylphenol	2.5	5	ug/L

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Laboratory Reporting Limits and Method Detection Limits

Method	Matrix	Analyte	MDL	RL	Units
SVOC					
EPA 8270D	Water	3- & 4-Methylphenols	2.5	5	ug/L
EPA 8270D	Water	Naphthalene	0.05	0.05	ug/L
EPA 8270D	Water	3-Nitroaniline	2.5	5	ug/L
EPA 8270D	Water	4-Nitroaniline	2.5	5	ug/L
EPA 8270D	Water	2-Nitroaniline	2.5	5	ug/L
EPA 8270D	Water	Nitrobenzene	0.25	0.25	ug/L
EPA 8270D	Water	4-Nitrophenol	2.5	5	ug/L
EPA 8270D	Water	2-Nitrophenol	2.5	5	ug/L
EPA 8270D	Water	N-nitroso-di-n-propylamine	2.5	5	ug/L
EPA 8270D	Water	N-Nitrosodimethylamine	0.5	0.5	ug/L
EPA 8270D	Water	N-Nitrosodiphenylamine	2.5	5	ug/L
EPA 8270D	Water	Pentachlorophenol	0.25	0.25	ug/L
EPA 8270D	Water	Phenanthrene	0.05	0.05	ug/L
EPA 8270D	Water	Phenol	2.5	5	ug/L
EPA 8270D	Water	Pyrene	0.05	0.05	ug/L
EPA 8270D	Water	Pyridine	2.5	5	ug/L
EPA 8270D	Water	1,2,4,5-Tetrachlorobenzene	2.5	5	ug/L
EPA 8270D	Water	2,3,4,6-Tetrachlorophenol	2.5	5	ug/L
EPA 8270D	Water	1,2,4-Trichlorobenzene	2.5	5	ug/L
EPA 8270D	Water	2,4,6-Trichlorophenol	2.5	5	ug/L
EPA 8270D	Water	2,4,5-Trichlorophenol	2.5	5	ug/L

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Laboratory Reporting Limits and Method Detection Limits

Method	Matrix	Analyte	MDL	RL	Units
Pesticides					
EPA 8081B	Water	Aldrin	0.004	0.004	ug/L
EPA 8081B	Water	alpha-BHC	0.004	0.004	ug/L
EPA 8081B	Water	beta-BHC	0.004	0.004	ug/L
EPA 8081B	Water	delta-BHC	0.004	0.004	ug/L
EPA 8081B	Water	gamma-BHC (Lindane)	0.004	0.004	ug/L
EPA 8081B	Water	gamma-Chlordane	0.01	0.01	ug/L
EPA 8081B	Water	alpha-Chlordane	0.004	0.004	ug/L
EPA 8081B	Water	Chlordane, total	0.04	0.04	ug/L
EPA 8081B	Water	4,4'-DDD	0.004	0.004	ug/L
EPA 8081B	Water	4,4'-DDE	0.004	0.004	ug/L
EPA 8081B	Water	4,4'-DDT	0.004	0.004	ug/L
EPA 8081B	Water	Dieldrin	0.002	0.002	ug/L
EPA 8081B	Water	Endosulfan I	0.004	0.004	ug/L
EPA 8081B	Water	Endosulfan II	0.004	0.004	ug/L
EPA 8081B	Water	Endosulfan sulfate	0.004	0.004	ug/L
EPA 8081B	Water	Endrin	0.004	0.004	ug/L
EPA 8081B	Water	Endrin aldehyde	0.01	0.01	ug/L
EPA 8081B	Water	Endrin ketone	0.01	0.01	ug/L
EPA 8081B	Water	Heptachlor	0.004	0.004	ug/L
EPA 8081B	Water	Heptachlor epoxide	0.004	0.004	ug/L
EPA 8081B	Water	Methoxychlor	0.004	0.004	ug/L
EPA 8081B	Water	Toxaphene	0.1	0.1	ug/L

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Laboratory Reporting Limits and Method Detection Limits

Method	Matrix	Analyte	MDL	RL	Units
PCBs					
EPA 8082A	Water	Aroclor 1016	0.05	0.05	ug/L
EPA 8082A	Water	Aroclor 1221	0.05	0.05	ug/L
EPA 8082A	Water	Aroclor 1232	0.05	0.05	ug/L
EPA 8082A	Water	Aroclor 1242	0.05	0.05	ug/L
EPA 8082A	Water	Aroclor 1248	0.05	0.05	ug/L
EPA 8082A	Water	Aroclor 1254	0.05	0.05	ug/L
EPA 8082A	Water	Aroclor 1260	0.05	0.05	ug/L
EPA 8082A	Water	Aroclor 1262	0.05	0.05	ug/L
EPA 8082A	Water	Aroclor 1268	0.05	0.05	ug/L
EPA 8082A	Water	Total PCBs	0.05	0.05	ug/L

ATTACHMENT B

Laboratory Reporting Limits and Method Detection Limits

Method	Matrix	Analyte	MDL	RL	Units
Metals					
EPA 6010C	Water	Aluminum	0.01	0.01	mg/L
EPA 6010C	Water	Antimony	0.005	0.005	mg/L
EPA 6010C	Water	Arsenic	0.004	0.004	mg/L
EPA 6010C	Water	Barium	0.01	0.01	mg/L
EPA 6010C	Water	Beryllium	0.001	0.001	mg/L
EPA 6010C	Water	Cadmium	0.003	0.003	mg/L
EPA 6010C	Water	Calcium	0.05	0.05	mg/L
EPA 6010C	Water	Chromium	0.005	0.005	mg/L
EPA 6010C	Water	Cobalt	0.005	0.005	mg/L
EPA 6010C	Water	Copper	0.003	0.003	mg/L
EPA 6010C	Water	Iron	0.02	0.02	mg/L
EPA 6010C	Water	Lead	0.003	0.003	mg/L
EPA 6010C	Water	Magnesium	0.05	0.05	mg/L
EPA 6010C	Water	Manganese	0.005	0.005	mg/L
EPA 7473	Water	Mercury	0.002	0.002	mg/L
EPA 6010C	Water	Nickel	0.005	0.005	mg/L
EPA 6010C	Water	Potassium	0.05	0.05	mg/L
EPA 6010C	Water	Selenium	0.01	0.01	mg/L
EPA 6010C	Water	Silver	0.005	0.005	mg/L
EPA 6010C	Water	Sodium	0.1	0.1	mg/L
EPA 6010C	Water	Thallium	0.005	0.005	mg/L
EPA 6010C	Water	Vanadium	0.01	0.01	mg/L
EPA 6010C	Water	Zinc	0.01	0.01	mg/L

ATTACHMENT B

Laboratory Reporting Limits and Method Detection Limits

Method	Matrix	Analyte	MDL	RL	Units
		PFAS			
Modified EPA 537	Water	Perfluorobutanesulfonic acid (PFBS)	0.294	2	ng/L
Modified EPA 537	Water	Perfluorohexanoic acid (PFHxA)	0.471	2	ng/L
Modified EPA 537	Water	Perfluoroheptanoic acid (PFHpA)	0.635	2	ng/L
Modified EPA 537	Water	Perfluorohexanesulfonic acid (PFHxS)	0.281	2	ng/L
Modified EPA 537	Water	Perfluorooctanoic acid (PFOA)	0.531	2	ng/L
Modified EPA 537	Water	Perfluorooctanesulfonic acid (PFOS)	0.292	2	ng/L
Modified EPA 537	Water	Perfluorononanoic acid (PFNA)	0.574	2	ng/L
Modified EPA 537	Water	Perfluorodecanoic acid (PFDA)	0.524	2	ng/L
Modified EPA 537	Water	Perfluoroundecanoic acid (PFUnA)	0.657	2	ng/L
Modified EPA 537	Water	Perfluorododecanoic acid (PFDoA)	0.777	2	ng/L
Modified EPA 537	Water	Perfluorotridecanoic acid (PFTrDA)	1.37	2	ng/L
Modified EPA 537	Water	Perfluorotetradecanoic acid (PFTA)	0.531	2	ng/L
Modified EPA 537	Water	N-MeFOSAA	0.529	2	ng/L
Modified EPA 537	Water	N-EtFOSAA	0.557	2	ng/L
Modified EPA 537	Water	Perfluoropentanoic acid (PFPeA)	0.452	2	ng/L
Modified EPA 537	Water	Perfluoro-1-octanesulfonamide (FOSA)	0.296	2	ng/L
Modified EPA 537	Water	Perfluoro-1-heptanesulfonic acid (PFHpS)	0.415	2	ng/L
Modified EPA 537	Water	Perfluoro-1-decanesulfonic acid (PFDS)	0.574	2	ng/L
Modified EPA 537	Water	1H,1H,2H,2H-Perfluorooctanesulfonic acid (6:2 FTS)	0.492	5	ng/L
Modified EPA 537	Water	1H,1H,2H,2H-Perfluorodecanesulfonic acid (8:2 FTS)	0.399	2	ng/L
Modified EPA 537	Water	Perfluoro-n-butanoic acid (PFBA)	1.63	2	ng/L

Notes

* = The contract labs has indicated that they are not able to achieve the reporting limits of 2 ng/L for 1H,1H,2H,2H-Perfluorooctanesulfonic acid (6:2 FTS). Site specific decisions will need to be made by the DEC project manager in consultation with the DEC remedial program chemist

ATTACHMENT B

Laboratory Reporting Limits and Method Detection Limits

Method	Matrix	Analyte	MDL	RL	Units
VOC					
EPA 8260C	Soil	1,1,1,2-Tetrachloroethane	2.5	5	ug/kg
EPA 8260C	Soil	1,1,1-Trichloroethane	2.5	5	ug/kg
EPA 8260C	Soil	1,1,2,2-Tetrachloroethane	2.5	5	ug/kg
EPA 8260C	Soil	1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	2.5	5	ug/kg
EPA 8260C	Soil	1,1,2-Trichloroethane	2.5	5	ug/kg
EPA 8260C	Soil	1,1-Dichloroethane	2.5	5	ug/kg
EPA 8260C	Soil	1,1-Dichloroethylene	2.5	5	ug/kg
EPA 8260C	Soil	Bromochloromethane	2.5	5	ug/kg
EPA 8260C	Soil	1,2,3-Trichloropropane	2.5	5	ug/kg
EPA 8260C	Soil	1,2,4-Trichlorobenzene	2.5	5	ug/kg
EPA 8260C	Soil	1,2,4-Trimethylbenzene	2.5	5	ug/kg
EPA 8260C	Soil	1,2-Dibromo-3-chloropropane	2.5	5	ug/kg
EPA 8260C	Soil	1,2-Dibromoethane	2.5	5	ug/kg
EPA 8260C	Soil	1,2-Dichlorobenzene	2.5	5	ug/kg
EPA 8260C	Soil	1,2-Dichloroethane	2.5	5	ug/kg
EPA 8260C	Soil	1,2-Dichloropropane	2.5	5	ug/kg
EPA 8260C	Soil	1,3,5-Trimethylbenzene	2.5	5	ug/kg
EPA 8260C	Soil	1,3-Dichlorobenzene	2.5	5	ug/kg
EPA 8260C	Soil	1,4-Dichlorobenzene	2.5	5	ug/kg
EPA 8260C	Soil	1,4-Dioxane	10	10	ug/kg
EPA 8260C	Soil	Cyclohexane	2.5	5	ug/kg
EPA 8260C	Soil	2-Butanone	2.5	5	ug/kg
EPA 8260C	Soil	2-Hexanone	2.5	5	ug/kg
EPA 8260C	Soil	4-Methyl-2-pentanone	2.5	5	ug/kg
EPA 8260C	Soil	Acetone	5	10	ug/kg
EPA 8260C	Soil	Acrolein	5	10	ug/kg
EPA 8260C	Soil	Acrylonitrile	2.5	5	ug/kg
EPA 8260C	Soil	Benzene	2.5	5	ug/kg
EPA 8260C	Soil	Bromodichloromethane	2.5	5	ug/kg

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Laboratory Reporting Limits and Method Detection Limits

Method	Matrix	Analyte	MDL	RL	Units
		VOC			
EPA 8260C	Soil	Bromoform	2.5	5	ug/kg
EPA 8260C	Soil	Bromomethane	2.5	5	ug/kg
EPA 8260C	Soil	Carbon disulfide	2.5	5	ug/kg
EPA 8260C	Soil	Carbon tetrachloride	2.5	5	ug/kg
EPA 8260C	Soil	Chlorobenzene	2.5	5	ug/kg
EPA 8260C	Soil	Chloroethane	2.5	5	ug/kg
EPA 8260C	Soil	Chloroform	2.5	5	ug/kg
EPA 8260C	Soil	Chloromethane	2.5	5	ug/kg
EPA 8260C	Soil	cis-1,2-Dichloroethylene	2.5	5	ug/kg
EPA 8260C	Soil	cis-1,3-Dichloropropylene	2.5	5	ug/kg
EPA 8260C	Soil	Dibromochloromethane	2.5	5	ug/kg
EPA 8260C	Soil	Dibromomethane	2.5	5	ug/kg
EPA 8260C	Soil	Dichlorodifluoromethane	2.5	5	ug/kg
EPA 8260C	Soil	Naphthalene	2.5	10	ug/kg
EPA 8260C	Soil	Ethyl Benzene	2.5	5	ug/kg
EPA 8260C	Soil	Methylcyclohexane	2.5	5	ug/kg
EPA 8260C	Soil	Hexachlorobutadiene	2.5	5	ug/kg
EPA 8260C	Soil	Isopropylbenzene	2.5	5	ug/kg
EPA 8260C	Soil	Methyl acetate	2.5	5	ug/kg
EPA 8260C	Soil	Methyl tert-butyl ether (MTBE)	2.5	5	ug/kg
EPA 8260C	Soil	Methylene chloride	5	10	ug/kg
EPA 8260C	Soil	n-Butylbenzene	2.5	5	ug/kg
EPA 8260C	Soil	n-Propylbenzene	2.5	5	ug/kg
EPA 8260C	Soil	1,2,3-Trichlorobenzene	2.5	5	ug/kg
EPA 8260C	Soil	o-Xylene	2.5	5	ug/kg
EPA 8260C	Soil	p- & m- Xylenes	5	10	ug/kg
EPA 8260C	Soil	p-Isopropyltoluene	2.5	5	ug/kg
EPA 8260C	Soil	sec-Butylbenzene	2.5	5	ug/kg
EPA 8260C	Soil	Styrene	2.5	5	ug/kg

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Laboratory Reporting Limits and Method Detection Limits

Method	Matrix	Analyte	MDL	RL	Units
VOC					
EPA 8260C	Soil	tert-Butyl alcohol (TBA)	2.5	5	ug/kg
EPA 8260C	Soil	tert-Butylbenzene	2.5	5	ug/kg
EPA 8260C	Soil	Tetrachloroethylene	2.5	5	ug/kg
EPA 8260C	Soil	Toluene	2.5	5	ug/kg
EPA 8260C	Soil	trans-1,2-Dichloroethylene	2.5	5	ug/kg
EPA 8260C	Soil	trans-1,3-Dichloropropylene	2.5	5	ug/kg
EPA 8260C	Soil	Trichloroethylene	2.5	5	ug/kg
EPA 8260C	Soil	Trichlorofluoromethane	2.5	5	ug/kg
EPA 8260C	Soil	Vinyl Chloride	2.5	5	ug/kg
EPA 8260C	Soil	Xylenes, Total	7.5	15	ug/kg

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Laboratory Reporting Limits and Method Detection Limits

Method	Matrix	Analyte	MDL	RL	Units
SVOC					
EPA 8270D	Soil	Acenaphthene	20.9	41.7	ug/kg
EPA 8270D	Soil	Acenaphthylene	20.9	41.7	ug/kg
EPA 8270D	Soil	Acetophenone	20.9	41.7	ug/kg
EPA 8270D	Soil	Aniline	83.5	167	ug/kg
EPA 8270D	Soil	Anthracene	20.9	41.7	ug/kg
EPA 8270D	Soil	Atrazine	20.9	41.7	ug/kg
EPA 8270D	Soil	Benzaldehyde	20.9	41.7	ug/kg
EPA 8270D	Soil	Benzidine	83.5	167	ug/kg
EPA 8270D	Soil	Benzo(a)anthracene	20.9	41.7	ug/kg
EPA 8270D	Soil	Benzo(a)pyrene	20.9	41.7	ug/kg
EPA 8270D	Soil	Benzo(b)fluoranthene	20.9	41.7	ug/kg
EPA 8270D	Soil	Benzo(g,h,i)perylene	20.9	41.7	ug/kg
EPA 8270D	Soil	Benzoic acid	20.9	41.7	ug/kg
EPA 8270D	Soil	Benzo(k)fluoranthene	20.9	41.7	ug/kg
EPA 8270D	Soil	Benzyl alcohol	20.9	41.7	ug/kg
EPA 8270D	Soil	Benzyl butyl phthalate	20.9	41.7	ug/kg
EPA 8270D	Soil	1,1'-Biphenyl	20.9	41.7	ug/kg
EPA 8270D	Soil	4-Bromophenyl phenyl ether	20.9	41.7	ug/kg
EPA 8270D	Soil	Caprolactam	41.7	83.3	ug/kg
EPA 8270D	Soil	Carbazole	20.9	41.7	ug/kg
EPA 8270D	Soil	4-Chloro-3-methylphenol	20.9	41.7	ug/kg
EPA 8270D	Soil	4-Chloroaniline	20.9	41.7	ug/kg
EPA 8270D	Soil	Bis(2-chloroethoxy)methane	20.9	41.7	ug/kg
EPA 8270D	Soil	Bis(2-chloroethyl)ether	20.9	41.7	ug/kg
EPA 8270D	Soil	Bis(2-chloroisopropyl)ether	20.9	41.7	ug/kg
EPA 8270D	Soil	2-Chloronaphthalene	20.9	41.7	ug/kg
EPA 8270D	Soil	2-Chlorophenol	20.9	41.7	ug/kg
EPA 8270D	Soil	4-Chlorophenyl phenyl ether	20.9	41.7	ug/kg
EPA 8270D	Soil	Chrysene	20.9	41.7	ug/kg

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Laboratory Reporting Limits and Method Detection Limits

Method	Matrix	Analyte	MDL	RL	Units
SVOC					
EPA 8270D	Soil	Dibenzo(a,h)anthracene	20.9	41.7	ug/kg
EPA 8270D	Soil	Dibenzofuran	20.9	41.7	ug/kg
EPA 8270D	Soil	Di-n-butyl phthalate	20.9	41.7	ug/kg
EPA 8270D	Soil	1,2-Dichlorobenzene	20.9	41.7	ug/kg
EPA 8270D	Soil	1,3-Dichlorobenzene	20.9	41.7	ug/kg
EPA 8270D	Soil	1,4-Dichlorobenzene	20.9	41.7	ug/kg
EPA 8270D	Soil	3,3'-Dichlorobenzidine	20.9	41.7	ug/kg
EPA 8270D	Soil	2,4-Dichlorophenol	20.9	41.7	ug/kg
EPA 8270D	Soil	Diethyl phthalate	20.9	41.7	ug/kg
EPA 8270D	Soil	2,4-Dimethylphenol	20.9	41.7	ug/kg
EPA 8270D	Soil	Dimethyl phthalate	20.9	41.7	ug/kg
EPA 8270D	Soil	4,6-Dinitro-2-methylphenol	41.7	83.3	ug/kg
EPA 8270D	Soil	2,4-Dinitrophenol	41.7	83.3	ug/kg
EPA 8270D	Soil	2,4-Dinitrotoluene	20.9	41.7	ug/kg
EPA 8270D	Soil	2,6-Dinitrotoluene	20.9	41.7	ug/kg
EPA 8270D	Soil	Di-n-octyl phthalate	20.9	41.7	ug/kg
EPA 8270D	Soil	1,2-Diphenylhydrazine (as Azobenzene)	20.9	41.7	ug/kg
EPA 8270D	Soil	Bis(2-ethylhexyl)phthalate	20.9	41.7	ug/kg
EPA 8270D	Soil	Fluoranthene	20.9	41.7	ug/kg
EPA 8270D	Soil	Fluorene	20.9	41.7	ug/kg
EPA 8270D	Soil	Hexachlorobenzene	20.9	41.7	ug/kg
EPA 8270D	Soil	Hexachlorobutadiene	20.9	41.7	ug/kg
EPA 8270D	Soil	Hexachlorocyclopentadiene	20.9	41.7	ug/kg
EPA 8270D	Soil	Hexachloroethane	20.9	41.7	ug/kg
EPA 8270D	Soil	Indeno(1,2,3-cd)pyrene	20.9	41.7	ug/kg
EPA 8270D	Soil	Isophorone	20.9	41.7	ug/kg
EPA 8270D	Soil	2-Methylnaphthalene	20.9	41.7	ug/kg
EPA 8270D	Soil	2-Methylphenol	20.9	41.7	ug/kg
EPA 8270D	Soil	3- & 4-Methylphenols	20.9	41.7	ug/kg

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Laboratory Reporting Limits and Method Detection Limits

Method	Matrix	Analyte	MDL	RL	Units
SVOC					
EPA 8270D	Soil	Naphthalene	20.9	41.7	ug/kg
EPA 8270D	Soil	4-Nitroaniline	41.7	83.3	ug/kg
EPA 8270D	Soil	2-Nitroaniline	41.7	83.3	ug/kg
EPA 8270D	Soil	3-Nitroaniline	41.7	83.3	ug/kg
EPA 8270D	Soil	Nitrobenzene	20.9	41.7	ug/kg
EPA 8270D	Soil	2-Nitrophenol	20.9	41.7	ug/kg
EPA 8270D	Soil	4-Nitrophenol	41.7	83.3	ug/kg
EPA 8270D	Soil	N-nitroso-di-n-propylamine	20.9	41.7	ug/kg
EPA 8270D	Soil	N-Nitrosodimethylamine	20.9	41.7	ug/kg
EPA 8270D	Soil	N-Nitrosodiphenylamine	20.9	41.7	ug/kg
EPA 8270D	Soil	Pentachlorophenol	20.9	41.7	ug/kg
EPA 8270D	Soil	Phenanthrene	20.9	41.7	ug/kg
EPA 8270D	Soil	Phenol	20.9	41.7	ug/kg
EPA 8270D	Soil	Pyrene	20.9	41.7	ug/kg
EPA 8270D	Soil	Pyridine	83.5	167	ug/kg
EPA 8270D	Soil	1,2,4,5-Tetrachlorobenzene	41.7	83.3	ug/kg
EPA 8270D	Soil	2,3,4,6-Tetrachlorophenol	41.7	83.3	ug/kg
EPA 8270D	Soil	1,2,4-Trichlorobenzene	20.9	41.7	ug/kg
EPA 8270D	Soil	2,4,6-Trichlorophenol	20.9	41.7	ug/kg
EPA 8270D	Soil	2,4,5-Trichlorophenol	20.9	41.7	ug/kg

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Laboratory Reporting Limits and Method Detection Limits

Method	Matrix	Analyte	MDL	RL	Units
Pesticides					
EPA 8081B	Soil	Aldrin	0.33	0.33	ug/kg
EPA 8081B	Soil	alpha-BHC	0.33	0.33	ug/kg
EPA 8081B	Soil	beta-BHC	0.33	0.33	ug/kg
EPA 8081B	Soil	delta-BHC	0.33	0.33	ug/kg
EPA 8081B	Soil	gamma-BHC (Lindane)	0.33	0.33	ug/kg
EPA 8081B	Soil	gamma-Chlordane	0.33	0.33	ug/kg
EPA 8081B	Soil	alpha-Chlordane	0.33	0.33	ug/kg
EPA 8081B	Soil	Chlordane, total	1.32	1.32	ug/kg
EPA 8081B	Soil	4,4'-DDD	0.33	0.33	ug/kg
EPA 8081B	Soil	4,4'-DDE	0.33	0.33	ug/kg
EPA 8081B	Soil	4,4'-DDT	0.33	0.33	ug/kg
EPA 8081B	Soil	Dieldrin	0.33	0.33	ug/kg
EPA 8081B	Soil	Endosulfan I	0.33	0.33	ug/kg
EPA 8081B	Soil	Endosulfan II	0.33	0.33	ug/kg
EPA 8081B	Soil	Endosulfan sulfate	0.33	0.33	ug/kg
EPA 8081B	Soil	Endrin	0.33	0.33	ug/kg
EPA 8081B	Soil	Endrin aldehyde	0.33	0.33	ug/kg
EPA 8081B	Soil	Endrin ketone	0.33	0.33	ug/kg
EPA 8081B	Soil	Heptachlor	0.33	0.33	ug/kg
EPA 8081B	Soil	Heptachlor epoxide	0.33	0.33	ug/kg
EPA 8081B	Soil	Methoxychlor	1.65	1.65	ug/kg
EPA 8081B	Soil	Toxaphene	16.7	16.7	ug/kg

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Laboratory Reporting Limits and Method Detection Limits

Method	Matrix	Analyte	MDL	RL	Units
PCBs					
EPA 8082A	Soil	Aroclor 1016	0.0167	0.0167	mg/kg
EPA 8082A	Soil	Aroclor 1221	0.0167	0.0167	mg/kg
EPA 8082A	Soil	Aroclor 1232	0.0167	0.0167	mg/kg
EPA 8082A	Soil	Aroclor 1242	0.0167	0.0167	mg/kg
EPA 8082A	Soil	Aroclor 1248	0.0167	0.0167	mg/kg
EPA 8082A	Soil	Aroclor 1254	0.0167	0.0167	mg/kg
EPA 8082A	Soil	Aroclor 1260	0.0167	0.0167	mg/kg
EPA 8082A	Soil	Aroclor 1262	0.0167	0.0167	mg/kg
EPA 8082A	Soil	Aroclor 1268	0.0167	0.0167	mg/kg
EPA 8082A	Soil	Total PCBs	0.0167	0.0167	mg/kg

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Laboratory Reporting Limits and Method Detection Limits

Method	Matrix	Analyte	MDL	RL	Units
Metals					
EPA 6010C	Soil	Aluminum	1	1	mg/kg
EPA 6010C	Soil	Antimony	0.5	0.5	mg/kg
EPA 6010C	Soil	Arsenic	1	1	mg/kg
EPA 6010C	Soil	Barium	1	1	mg/kg
EPA 6010C	Soil	Beryllium	0.1	0.1	mg/kg
EPA 6010C	Soil	Cadmium	0.3	0.3	mg/kg
EPA 6010C	Soil	Calcium	0.5	5	mg/kg
EPA 6010C	Soil	Chromium	0.5	0.5	mg/kg
EPA 6010C	Soil	Cobalt	0.5	0.5	mg/kg
EPA 6010C	Soil	Copper	0.5	0.5	mg/kg
EPA 6010C	Soil	Iron	2	2	mg/kg
EPA 6010C	Soil	Lead	0.3	0.3	mg/kg
EPA 6010C	Soil	Magnesium	5	5	mg/kg
EPA 6010C	Soil	Manganese	0.5	0.5	mg/kg
EPA 7473	Soil	Mercury	0.03	0.03	mg/kg
EPA 6010C	Soil	Nickel	0.5	0.5	mg/kg
EPA 6010C	Soil	Potassium	5	5	mg/kg
EPA 6010C	Soil	Selenium	1	1	mg/kg
EPA 6010C	Soil	Silver	0.5	0.5	mg/kg
EPA 6010C	Soil	Sodium	10	10	mg/kg
EPA 6010C	Soil	Thallium	1	1	mg/kg
EPA 6010C	Soil	Vanadium	1	1	mg/kg
EPA 6010C	Soil	Zinc	1	1	mg/kg

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Laboratory Reporting Limits and Method Detection Limits

Method	Matrix	Analyte	MDL	RL	Units
		PFAS			
Modified EPA 537	Soil	Perfluorobutanesulfonic acid (PFBS)	0.200	0.250	ug/kg
Modified EPA 537	Soil	Perfluorohexanoic acid (PFHxA)	0.0659	0.250	ug/kg
Modified EPA 537	Soil	Perfluoroheptanoic acid (PFHpA)	0.0455	0.250	ug/kg
Modified EPA 537	Soil	Perfluorohexanesulfonic acid (PFHxS)	0.0310	0.250	ug/kg
Modified EPA 537	Soil	Perfluorooctanoic acid (PFOA)	0.0772	0.250	ug/kg
Modified EPA 537	Soil	Perfluorooctanesulfonic acid (PFOS)	0.0438	0.250	ug/kg
Modified EPA 537	Soil	Perfluorononanoic acid (PFNA)	0.0598	0.250	ug/kg
Modified EPA 537	Soil	Perfluorodecanoic acid (PFDA)	0.0512	0.250	ug/kg
Modified EPA 537	Soil	Perfluoroundecanoic acid (PFUnA)	0.116	0.250	ug/kg
Modified EPA 537	Soil	Perfluorododecanoic acid (PFDoA)	0.0750	0.250	ug/kg
Modified EPA 537	Soil	Perfluorotridecanoic acid (PFTrDA)	0.0435	0.250	ug/kg
Modified EPA 537	Soil	Perfluorotetradecanoic acid (PFTA)	0.0747	0.250	ug/kg
Modified EPA 537	Soil	N-MeFOSAA	0.104	0.250	ug/kg
Modified EPA 537	Soil	N-EtFOSAA	0.104	0.250	ug/kg
Modified EPA 537	Soil	Perfluoropentanoic acid (PFPeA)	0.0919	0.250	ug/kg
Modified EPA 537	Soil	Perfluoro-1-octanesulfonamide (FOSA)	0.0467	0.250	ug/kg
Modified EPA 537	Soil	Perfluoro-1-heptanesulfonic acid (PFHpS)	0.0493	0.250	ug/kg
Modified EPA 537	Soil	Perfluoro-1-decanesulfonic acid (PFDS)	0.0512	0.250	ug/kg
Modified EPA 537	Soil	1H,1H,2H,2H-Perfluorooctanesulfonic acid (6:2 FTS)	0.0660	0.250	ug/kg
Modified EPA 537	Soil	1H,1H,2H,2H-Perfluorodecanesulfonic acid (8:2 FTS)	0.0256	0.250	ug/kg
Modified EPA 537	Soil	Perfluoro-n-butanoic acid (PFBA)	0.183	0.250	ug/kg

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Laboratory Reporting Limits and Method Detection Limits

Method	Matrix	Analyte	MDL	RL	Units
VOC					
EPA TO-15	Soil Vapor	1,1,1,2-Tetrachloroethane	0.1	0.1	ppb
EPA TO-15	Soil Vapor	1,1,1-Trichloroethane	0.1	0.1	ppb
EPA TO-15	Soil Vapor	1,1,2,2-Tetrachloroethane	0.1	0.1	ppb
EPA TO-15	Soil Vapor	1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	0.1	0.1	ppb
EPA TO-15	Soil Vapor	1,1,2-Trichloroethane	0.1	0.1	ppb
EPA TO-15	Soil Vapor	1,1-Dichloroethane	0.1	0.1	ppb
EPA TO-15	Soil Vapor	1,1-Dichloroethylene	0.025	0.025	ppb
EPA TO-15	Soil Vapor	1,2,4-Trichlorobenzene	0.1	0.1	ppb
EPA TO-15	Soil Vapor	1,2,4-Trimethylbenzene	0.1	0.1	ppb
EPA TO-15	Soil Vapor	1,2-Dibromoethane	0.1	0.1	ppb
EPA TO-15	Soil Vapor	1,2-Dichlorobenzene	0.1	0.1	ppb
EPA TO-15	Soil Vapor	1,2-Dichloroethane	0.1	0.1	ppb
EPA TO-15	Soil Vapor	1,2-Dichloropropane	0.1	0.1	ppb
EPA TO-15	Soil Vapor	1,2-Dichlorotetrafluoroethane	0.1	0.1	ppb
EPA TO-15	Soil Vapor	1,3,5-Trimethylbenzene	0.1	0.1	ppb
EPA TO-15	Soil Vapor	1,3-Butadiene	0.3	0.3	ppb
EPA TO-15	Soil Vapor	1,3-Dichlorobenzene	0.1	0.1	ppb
EPA TO-15	Soil Vapor	1,3-Dichloropropane	0.1	0.1	ppb
EPA TO-15	Soil Vapor	1,4-Dichlorobenzene	0.1	0.1	ppb
EPA TO-15	Soil Vapor	1,4-Dioxane	0.2	0.2	ppb
EPA TO-15	Soil Vapor	2-Butanone	0.1	0.1	ppb
EPA TO-15	Soil Vapor	2-Hexanone	0.2	0.2	ppb
EPA TO-15	Soil Vapor	3-Chloropropene	0.5	0.5	ppb
EPA TO-15	Soil Vapor	4-Methyl-2-pentanone	0.1	0.1	ppb
EPA TO-15	Soil Vapor	Acetone	0.2	0.2	ppb
EPA TO-15	Soil Vapor	Acrolein	0.1	0.1	ppb
EPA TO-15	Soil Vapor	Acrylonitrile	0.1	0.1	ppb
EPA TO-15	Soil Vapor	Benzene	0.1	0.1	ppb
EPA TO-15	Soil Vapor	Benzyl chloride	0.1	0.1	ppb

ATTACHMENT B

Laboratory Reporting Limits and Method Detection Limits

Method	Matrix	Analyte	MDL	RL	Units
VOC					
EPA TO-15	Soil Vapor	Bromodichloromethane	0.1	0.1	ppb
EPA TO-15	Soil Vapor	Bromoform	0.1	0.1	ppb
EPA TO-15	Soil Vapor	Bromomethane	0.1	0.1	ppb
EPA TO-15	Soil Vapor	Carbon disulfide	0.1	0.1	ppb
EPA TO-15	Soil Vapor	Carbon tetrachloride	0.025	0.025	ppb
EPA TO-15	Soil Vapor	Chlorobenzene	0.1	0.1	ppb
EPA TO-15	Soil Vapor	Chloroethane	0.1	0.1	ppb
EPA TO-15	Soil Vapor	Chloroform	0.1	0.1	ppb
EPA TO-15	Soil Vapor	Chloromethane	0.1	0.1	ppb
EPA TO-15	Soil Vapor	cis-1,2-Dichloroethylene	0.025	0.025	ppb
EPA TO-15	Soil Vapor	cis-1,3-Dichloropropylene	0.1	0.1	ppb
EPA TO-15	Soil Vapor	Cyclohexane	0.1	0.1	ppb
EPA TO-15	Soil Vapor	Dibromochloromethane	0.1	0.1	ppb
EPA TO-15	Soil Vapor	Dichlorodifluoromethane	0.1	0.1	ppb
EPA TO-15	Soil Vapor	Ethanol	0.1	0.1	ppb
EPA TO-15	Soil Vapor	Ethyl acetate	0.2	0.2	ppb
EPA TO-15	Soil Vapor	Ethyl Benzene	0.1	0.1	ppb
EPA TO-15	Soil Vapor	Hexachlorobutadiene	0.1	0.1	ppb
EPA TO-15	Soil Vapor	Isopropanol	0.2	0.2	ppb
EPA TO-15	Soil Vapor	Isopropylbenzene	0.1	0.1	ppb
EPA TO-15	Soil Vapor	Methyl Methacrylate	0.1	0.1	ppb
EPA TO-15	Soil Vapor	Methyl tert-butyl ether (MTBE)	0.1	0.1	ppb
EPA TO-15	Soil Vapor	Methylene chloride	0.2	0.2	ppb
EPA TO-15	Soil Vapor	Naphthalene	0.2	0.2	ppb
EPA TO-15	Soil Vapor	n-Butylbenzene	0.1	0.1	ppb
EPA TO-15	Soil Vapor	n-Heptane	0.1	0.1	ppb
EPA TO-15	Soil Vapor	n-Hexane	0.1	0.1	ppb
EPA TO-15	Soil Vapor	n-Propylbenzene	0.1	0.1	ppb
EPA TO-15	Soil Vapor	o-Xylene	0.1	0.1	ppb

ATTACHMENT B

Laboratory Reporting Limits and Method Detection Limits

Method	Matrix	Analyte	MDL	RL	Units
		VOC			
EPA TO-15	Soil Vapor	p- & m- Xylenes	0.2	0.2	ppb
EPA TO-15	Soil Vapor	p-Ethyltoluene	0.1	0.1	ppb
EPA TO-15	Soil Vapor	p-Isopropyltoluene	0.1	0.1	ppb
EPA TO-15	Soil Vapor	Propylene	0.1	0.1	ppb
EPA TO-15	Soil Vapor	sec-Butylbenzene	0.1	0.1	ppb
EPA TO-15	Soil Vapor	Styrene	0.1	0.1	ppb
EPA TO-15	Soil Vapor	tert-Butylbenzene	0.1	0.1	ppb
EPA TO-15	Soil Vapor	Tetrachloroethylene	0.025	0.025	ppb
EPA TO-15	Soil Vapor	Tetrahydrofuran	0.2	0.2	ppb
EPA TO-15	Soil Vapor	Toluene	0.1	0.1	ppb
EPA TO-15	Soil Vapor	trans-1,2-Dichloroethylene	0.1	0.1	ppb
EPA TO-15	Soil Vapor	trans-1,3-Dichloropropylene	0.1	0.1	ppb
EPA TO-15	Soil Vapor	Trichloroethylene	0.025	0.025	ppb
EPA TO-15	Soil Vapor	Trichlorofluoromethane (Freon 11)	0.1	0.1	ppb
EPA TO-15	Soil Vapor	Vinyl acetate	0.1	0.1	ppb
EPA TO-15	Soil Vapor	Vinyl bromide	0.1	0.1	ppb
EPA TO-15	Soil Vapor	Vinyl Chloride	0.025	0.025	ppb

Analytical Method Information

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PFAS, NYSDEC Target List in Soil (EPA 537m)

Preservation: Cool 4°C

Container: 10_250mL Plastic Cool to 4° C **Amount Required:** 250 mL **Hold Time:** 14 days

Analyte	MDL	Reporting Limit	Surrogate %Rec	Duplicate RPD	----Matrix Spike---- %Rec	RPD	--Blank Spike / LCS-- %Rec	RPD
Perfluorobutanesulfonic acid (PFBS)	0.200	0.250 ug/kg		30	25-150	35	50-130	30
Perfluorohexanoic acid (PFHxA)	0.0659	0.250 ug/kg		30	25-150	35	50-130	30
Perfluoroheptanoic acid (PFHpA)	0.0455	0.250 ug/kg		30	25-150	35	50-130	30
Perfluorohexanesulfonic acid (PFHxS)	0.0310	0.250 ug/kg		30	25-150	35	50-130	30
Perfluorooctanoic acid (PFOA)	0.0772	0.250 ug/kg		30	25-150	35	50-130	30
Perfluorooctanesulfonic acid (PFOS)	0.0438	0.250 ug/kg		30	25-150	35	50-130	30
Perfluorononanoic acid (PFNA)	0.0598	0.250 ug/kg		30	25-150	35	50-130	30
Perfluorodecanoic acid (PFDA)	0.0512	0.250 ug/kg		30	25-150	35	50-130	30
Perfluoroundecanoic acid (PFUnA)	0.116	0.250 ug/kg		30	25-150	35	50-130	30
Perfluorododecanoic acid (PFDoA)	0.0750	0.250 ug/kg		30	25-150	35	50-130	30
Perfluorotridecanoic acid (PFTrDA)	0.0435	0.250 ug/kg		30	25-150	35	50-130	30
Perfluorotetradecanoic acid (PFTA)	0.0747	0.250 ug/kg		30	25-150	35	50-130	30
N-MeFOSAA	0.104	0.250 ug/kg		30	25-150	35	50-130	30
N-EtFOSAA	0.104	0.250 ug/kg		30	25-150	35	50-130	30
Perfluoropentanoic acid (PFPeA)	0.0919	0.250 ug/kg		30	25-150	35	50-130	30
Perfluoro-1-octanesulfonamide (FOSA)	0.0467	0.250 ug/kg		30	25-150	35	50-130	30
Perfluoro-1-heptanesulfonic acid (PFHpS)	0.0493	0.250 ug/kg		30	25-150	35	50-130	30
Perfluoro-1-decanesulfonic acid (PFDS)	0.0512	0.250 ug/kg		30	25-150	35	50-130	30
1H,1H,2H,2H-Perfluorooctanesulfonic acid (6:2 FTS)	0.0660	0.250 ug/kg		30	25-200	35	50-200	30
1H,1H,2H,2H-Perfluorodecanesulfonic acid (8:2 FTS)	0.0256	0.250 ug/kg		30	25-200	35	50-200	30
Perfluoro-n-butanoic acid (PFBA)	0.183	0.250 ug/kg		30	25-150	35	50-130	30
Surr: M3PFBS			25-150					
Surr: M5PFHxA			25-150					
Surr: M4PFHpA			25-150					
Surr: M3PFHxS			25-150					
Surr: Perfluoro-n-[13C8]octanoic acid (M8PFOA)			25-150					
Surr: M6PFDA			25-150					
Surr: M7PFUdA			25-150					
Surr: Perfluoro-n-[1,2-13C2]dodecanoic acid (MPFDoA)			25-150					
Surr: M2PFTeDA			10-150					
Surr: Perfluoro-n-[13C4]butanoic acid (MPFBA)			25-150					
Surr: Perfluoro-1-[13C8]octanesulfonic acid (M8PFOS)			25-150					
Surr: Perfluoro-n-[13C5]pentanoic acid (M5PFPeA)			25-150					
Surr: Perfluoro-1-[13C8]octanesulfonamide (M8FOSA)			10-150					
Surr: d3-N-MeFOSAA			25-150					
Surr: d5-N-EtFOSAA			25-150					
Surr: M2-6:2 FTS			25-200					
Surr: M2-8:2 FTS			25-200					
Surr: M9PFNA			25-150					
MPFOA								

ATTACHMENT C

Analytical Methods / Quality Assurance Summary Table

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ATTACHMENT C
ANALYTICAL METHODS/QUALITY ASSURANCE SUMMARY TABLE

Matrix Type	Field Parameters	Laboratory Parameters	Analytical Methods	Sample Preservation	Sample Container Volume and Type	Sample Hold Time	Number of Samples to be Collected	Field Duplicate Samples	Equipment Blank Samples	Trip Blank Samples	Ambient Air Samples	MS/MSD Samples
Soil	Total VOCs via PID	Part 375 + TCL VOCs / CP-51 VOCs	EPA 8260C	Cool to 4°C	Two 40-ml VOC vials with 5ml H_2O, one with MeOH or 3 Encore Samplers (separate container for % solids)	14 days, freeze at lab within 48 hours	48	1 per 20 samples (minimum 1)	1 per 20 samples, if needed (minimum 1, if needed)	1 per shipment of VOC samples	NA	1 per 20 samples (minimum 1)
		Part 375 + TCL SVOCs / CP-51 SVOCs	EPA 8270D	Cool to 4°C	4 oz. jar*	14 days extract, 40 days after extraction to analysis						
		1,4-Dioxane	EPA 8270D	Cool to 4°C	8 oz. jar	14 days extract, 40 days after extraction to analysis						
		Part 375 + TAL Metals	EPA 6010C, EPA 7470, EPA 7196A, EPA 9014/9010C	Cool to 4°C	2 oz. jar*	6 months, except Mercury 28 days						
		Hexavalent Chromium	EPA 7196A	Cool to 4°C	2 oz. jar*	28 days						
		Perfluoroalkyl Substances (PFAs)	EPA 537.1	Cool to 4°C	1/2 filled 250mL HDPE container	14 days extract, 40 days after extraction to analysis						
		Part 375 + TCL Herbicides	EPA 8151A	Cool to 4°C	4 oz. jar*	14 days extract, 40 days after extraction to analysis						
		Part 375 + TCL Pesticides	EPA 8081B	Cool to 4°C	4 oz. jar*	14 days extract, 40 days after extraction to analysis						
		Part 375 + TCL PCBs	EPA 8082A	Cool to 4°C	4 oz. jar*	14 days extract, 40 days after extraction to analysis						
Groundwater	Headspace VOCs via PID, synoptic groundwater level measurement, Temperature, Turbidity, pH, ORP, Conductivity	Part 375 + TCL VOCs	EPA 8260C	Cool to 4°C; HCl to pH <2;no headspace	Three 40-mL VOC vials with Teflon®-lined cap	14 days	11	1 per 20 samples (minimum 1)	1 per 20 samples, if needed (minimum 1, if needed)	1 per shipment of VOC samples	NA	1 per 20 samples (minimum 1)
		Part 375 + TCL SVOCs / CP-51 SVOCs	EPA 8270D	Cool to 4°C	Two 1-Liter Amber Glass	7 days to extract, 40 days after extraction to analysis						
		1,4-Dioxane	EPA 8270D SIM	Cool to 4°C	1-L Amber Glass	7 days to extract, 40 days after extraction to analysis						
		Part 375 + TAL Metals	EPA 6010C, EPA 7470, EPA 7196A, EPA 9014/9010C	Cool to 4°C	Two 1-Liter Amber Glass	6 months, except Mercury 28 days						
		Hexavalent Chromium	EPA 7196A	Cool to 4°C	250 mL Plastic	24 hours						
		Perfluoroalkyl Substances (PFAs)	EPA 537.1	Cool to 4°C	Two 250mL HDPE containers	14 days extract, 40 days after extraction to analysis						
		Part 375 + TCL Herbicides	EPA 8151A	Cool to 4°C	Two 1-Liter Amber Glass	7 days to extraction, 40 days after extraction to analysis						
		Part 375 + TCL Pesticides	EPA 8081B	Cool to 4°C	Two 1-Liter Amber Glass	7 days extract, 40 days after extraction to analysis						
		Part 375 + TCL PCBs	EPA 8082A	Cool to 4°C	Two 1-Liter Amber Glass	7 days extract, 40 days after extraction to analysis						
Soil Vapor	Total VOCs via PID	Part 375 + TCL VOCs	EPA TO-15	NA	6L Summa Cannister	30 days	12	1 per 20 samples (minimum 1)	NA	NA	1 per day	NA

Notes:
*can be combined in one or more 8 oz. jars
mL = milliliter
VOC = Volatile organic compound
SVOC = Semi-volatile organic compound
PCB = Polychlorinated biphenyls
TAL = Total Analyte List
TCL = Target Criteria List
PID = Photoionization detector
Part 375 = New York State Department of Environmental Conservation (NYSDEC) Title 6 New York City Rules and Regulation (NYCRR) Part 375 List.
ORP = Oxidation reduction potential
EPA = U.S. Environmental Protection Agency
NA = Not applicable
ºC = degree Celsius

The PFAS compounds to be analyzed includes: perfluorobutanesulfonic acid, perfluorohexanesulfonic acid, perfluoroheptanesulfonic acid, perfluorooctanessulfonic acid, perfluorodecanesulfonic acid, perfluorobutanoic acid, perfluoropentanoic acid, perfluorohexanoic acid, perfluoroheptanoic acid, perfluorooctanoic acid, perfluorononanoic acid, perfluorodecanoic acid, perfluoroundecanoic acid, perfluorododecanoic acid, perfluorotridecanoic acid, perfluorotetradecanoic acid, 6:2 fluorotelomer sulfonate, 8:2 fluorotelomer sulfonate, perfluroroctanesulfonamide, n-methyl perfluorooctanesulfonamidoacetic acid, and n-ethyl perfluorooctanesulfonamidoacetic acid.

ATTACHMENT D

Sample Nomenclature

SOP #01 – Sample Nomenclature

INTRODUCTION

The Langan Environmental Group conducts an assortment of site investigations where samples (Vapor, Solids, and Aqueous) are collected and submitted to analytical laboratories for analysis. The results of which are then evaluated and entered into a data base allowing quick submittal to the state regulatory authority (New York State Division of Environmental Conservation [NYSDEC]). In addition, Langan is linking their data management system to graphic and analytical software to enable efficient evaluation of the data as well as creating client-ready presentational material.

SCOPE AND APPLICATION

This Standard Operating Procedure (SOP) is applicable to the general framework for labeling vapor, solid (soil) and aqueous (groundwater) samples that will be submitted for laboratory analysis. The nomenclature being introduced is designed to meet the NYSDEC EQuIS standard and has been incorporated into Langan software scripts to assist project personnel in processing the data. While this SOP is applicable to all site investigation; unanticipated conditions may arise which may require considerable flexibility in complying with this SOP. Therefore, guidance provided in this SOP is presented in terms of general steps and strategies that should be applied; but deviation from this SOP must be reported to the Project Manager (PM) immediately.

GENERAL SAMPLE IDENTIFICATION CONSIDERATIONS

Sample Labels

All sample ware must have a label. Recall that when you are using the Encore™ samples (see below); they are delivered in plastic lined foil bags. You are to label the bags[1]:

All other samples containers including Terra Cores™ must be labeled with laboratory provided self-adhesive labels.

Quick Breakdown of Sample Format

The general format for sample nomenclature is:

[1]Both Alpha and York laboratories permit the combining of the three Encore™ into a single bag. This may not be appropriate for all laboratories so please confirm with the labs themselves

LLNN_ID

Where

LL is a grouping of two (2) to four (4) letters signifying the sample media source. In older nomenclature SOPs this portion of the sample identification is commonly referred to as the *Sample Investigation Code*

NN represents a two digit number identifying the specific sample location or sample sequence number

_ ***(underscore)*** is required between the sample lettering and numeric identification and additional modifying data that determines the date of sampling or the depth of the sample interval

ID is a modifier specific to the sample type media (depth of soil sample or date of groundwater sample)

LL – Sample Investigation Code

Langan has devised a list of two to four letters to insure a quick ability to identify the sample investigation.

Code	Investigation
AA	Ambient Air
DS	Drum
EPB	Endpoint Location - Bottom (Excavation)
EPSW	Endpoint Location - Sidewall (Excavation)
FP	Free Product
IA	Indoor Air
IDW	Investigation Derived Waste (Soil Pile)
MW	Monitoring Well (Permanent)
SB	Soil Boring
SG	Staff Gauge (Stream Gauging)
SL	Sludge
SV	Soil Vapor Point
SVE	Soil Vapor Extraction Well
SW	Surface Water
TMW	Temporary Monitoring Well
TP	Test Pit (Excavated Material from Test Pit Not Associated With Sidewall or Bottom Samples)
WC	Waste Characterization Boring
COMP	Composite Sample
TB	Trip Blank (QA/QC Sampling – All Investigations)
FB	Field Blank (QA/QC Sampling – All Investigations)
DUP	Duplicate (QA/QC Sampling – All Investigations)

NN – Numeric Identifier

The two digit number that follows the sample investigation code (LL) identifies the specific sample based on the soil boring, monitoring well, endpoint or other location identification. For a subset of samples

where there is no specific location identifier, the two digit number is the sequence number for the sample submitted. For example, an aqueous sample from a monitoring well identified as MW-1 would have the sample investigation code of MW and the numeric identifier as 01. Note there is no hyphen. The same can be done for soil borings, a soil sample collected from soil boring 9 (SB-9) would be have the LLNN identification of SB09 (again, no hyphen).

Note however that there is a subset of samples related to laboratory analytical quality assurance, among these includes TB, FB, and DUP. On many investigations, the Scope will require multiple collections of these types of samples, therefore the numerical number represents the sequence sample count where the first sample is 01, the second sample is 02, and the third sample is 03 and so on.

_ Underscore
The underscore is required. It separates the investigation code and numeric identifier from the modifier specific to the sample itself. Note that every effort should be made to insure that the underscore is clear on the sample label and chain of custody (COC).

ID – Modifier Specific to Type Media
Each sample investigation code and numeric identifier is further modified by an ID specific to the sample type media. In general, soil samples (soil borings or endpoint samples) use an ID that indicates the depth at which the sample was taken. Aqueous samples (groundwater or surface water samples) are identified by the date the sample was collected. Other types of samples including quality control (TB, FB, and DUP), Vapor samples (AA, IA, SV or SVE), other soil type samples (IDW, sludge, free product, drum, and others) are also identified by a date. The following rules apply to the ID when using sample depth or sample date.

Sample Depth
The sample depth must be whole numbers (no fractions) separated by a hyphen. Thus for a soil sample collected from the soil boring SB-1 from a depth of 6 feet to 8 feet, the sample would be identified as:

SB01_6-8

Unfortunately, the NYSDEC EQuIS system does not accept fractions. Therefore, if your sample interval is a fraction of a foot (6.5-7.5), round up to the larger interval (6-8).

Sample Date
The sample date is always in the format of MMDDYY. Note that the year is two digits. Thus for a groundwater sample collected on July 1, 2015 from the monitoring well MW-1, the sample would be identified as:

MW01_070115

Special Cases
There are a couple of specific sample types that require further explanation.

Endpoint Sampling
End point sidewall samples are sometimes modified by magnetic direction (N, S, E, and W). For example, the first sidewall endpoint sample from the north wall of an excavation at a depth of 5 feet would be written as:

EPSW01_N_5

Again, note that the N in the identification refers to north and is separated from the prefix investigation code/numeric identifier and ID modifier suffix by underscores.

Vapor Extraction Well Sample
As with the sidewall endpoint samples, the sample name is altered by inserting a middle modifier between the prefix and suffix of the sample name. The middle modifier is used to identify the source of the sample (inlet sample port, midpoint sample port or outlet sample port). For example the midpoint port of the vapor extraction well number 1 sampled on July 1, 2015 would be written as;

SVE01_MID_070115

Matrix Spike and Matrix Spike Duplicate
On occasion, a Langan investigation will collect a sample to be used to provide the lab with a site specific medium to spike to determine the quality of the analytical method. This special case of sampling requires additional information to be used in the sample name, specifically, a suffix specifying whether the sample is the matrix spike (MS) or the matrix spike duplicate (MSD). In the following example, the sample is collected from soil boring number 1 at a depth of 2-4 feet. For the matrix spike sample:

SB01_2-4_MS

and for the matrix spike duplicate sample:

SB01_2-4_MSD

Multiple Interval Groundwater Sampling
Although not currently a common practice, low flow sampling facilitates stratigraphic sampling of a monitoring well. If the scope requires stratigraphic sampling then groundwater samples will be labeled with a lower case letter following the well number. For example, placing the pump or sampling tube at 10 feet below surface in MW01 on July 1, 2015 would require the sample to be labeled as:

MW01a_070115

While a second sample where the pump or tubing intake is placed at 20 feet would be labeled as:

MW01b_070115

Note that it is important that you record what depth the intake for each sample represents in your field notes; as this information is going to be critical to interpreting the results.

ATTACHMENT E

Laboratory Standard Operating Procedures for PFAS Analysis

LANGAN

Standard Operating Procedure

Analysis of Target Per- and Polyfluorinated Alkyl Substances (PFAS) in Potable Water by EPA Method 537.1 using HPLC/MS-MS

Approvals

Laboratory Director 12058

Jon Walsh

Corporate Technical Director

Robert Bradley

Corporate QA/QC Officer

Sarah Widomski

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Controlled Copy No. PFAS_LCMSMS112518, Rev 1.3-____

Issued to: NA

Target PFAS in Potable Water Matrices

1. SCOPE AND APPLICATION

This method is used to identify and quantitate specific PFAS compounds in extracts of Potable water samples using HPLC/MS-MS (high pressure liquid chromatography/ tandem mass spectrometry. Currently the compounds (18) that are measured by this methodology by EPA 537.1 are listed in the table below.

Analyte[a]	**Acronym ***	**CAS Number**
Hexafluoropropylene oxide dimer acid (GenX)	HFPO-DA	13252-13-6[b]
N-ethyl perfluorooctanesulfonamidoacetic acid	N-EtFOSAA	2991-50-6
N-methyl perfluorooctanesulfonamidoacetic acid	N-MeFOSAA	2355-31-9
Perfluorobutanesulfonic acid	PFBS	375-73-5
Perfluorodecanoic acid	PFDA	335-76-2
Perfluorododecanoic acid	PFDoA	307-55-1
Perfluoroheptanoic acid	PFHpA	375-85-9
Perfluorohexanesulfonic acid	PFHxS	355-46-4
Perfluorohexanoic acid	PFHxA	307-24-4
Perfluorononanoic acid	PFNA	375-95-1
Perfluorooctanesulfonic acid	PFOS	1763-23-1
Perfluorooctanoic acid	PFOA	335-67-1
Perfluorotetradecanoic acid	PFTA	376-06-7
Perfluorotridecanoic acid	PFTrDA	72629-94-8
Perfluoroundecanoic acid	PFUnA	2058-94-8
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid	11Cl-PF3OUdS	763051-92-9[c]
9-chlorohexadecafluoro-3-oxanonane-1-sulfonic acid	9Cl-PF3ONS	756426-58-1[d]
4,8-dioxa-3H-perfluorononanoic acid	ADONA	919005-14-4[e]

[a] Some PFAS are commercially available as ammonium, sodium and potassium salts. This method measures all forms of the analytes as anions while the counterion is inconsequential. Analytes may be purchased as acids or as any of the corresponding salts.
[b] HFPO-DA and the ammonium salt of HFPO-DA are components of the GenX processing aid technology and both are measured as the anion of HFPO-DA by this method.
[c] 11Cl-PF3OUdS is available in salt form (e.g. CASRN of potassium salt is 83329-89-9).
[d] 9Cl-PF3ONS analyte is available in salt form (e.g. CASRN of potassium salt is 73606-19-6)
[e] ADONA is available as the sodium salt (no CASRN) and the ammonium salt (CASRN is 958445-44-8).

* These acronyms are those listed in EPA Method 537.1. The listed acronyms are also those in our LIMS database.

The estimated reporting limit based upon the preparation/analysis parameters herein at the time of this revision are 2.0 ng/L (ppt) for aqueous samples. The linear range for these PFAS can be extended by dilution. This RL is based upopn a minimum volume of 0.125 L extracted.

2. SUMMARY

2.1 This procedure is based upon EPA method 537.1 without modification when used for potable water sample preparation or analysis.

2.2 A 125-290 mL(depending upon the volume submitted by the client sample field preserved with 1.25 g/250 mL Trizma is extracted using automated or manual Solid Phase Extraction (SPE). The compounds are eluted from the solid phase using methanol. The extract is then slowly evaporated to dryness using a nitrogen evaporation system. The resulting extract residue is reconstituted in 95%/5% Methanol/water to a final volume of 1.0 mL.

2.3 A portion of the extract is then used for analysis of PFAS using a C18 LC column using a gradient program with 5mM ammonium acetate/water and methanol to effect separation followed by analysis using AJI-ESI (Electrospray) injection into a triple Quadrupole MS operated in negative ion mode.

2.4 Quantitation is done by internal standard technique and peak response is measured as the area of the peaks from the dynamic MRM (Multiple Reaction Monitoring) run.

3. DEFINITIONS

3.1 ANALYSIS BATCH – A set of samples that is analyzed on the same instrument during a 24-hour period, including no more than 20 Field Samples, that begins and ends with the analysis of the appropriate Continuing Calibration Check (CCC) standards. Additional CCCs may be required depending on the length of the analysis batch and/or the number of Field Samples.

3.2 CALIBRATION STANDARD (CAL) – A solution prepared from the primary dilution standard solution and/or stock standard solution, internal standard(s), and the surrogate(s). The CAL solutions are used to calibrate the instrument response with respect to analyte concentration.

3.3 COLLISIONALLY ACTIVATED DISSOCIATION (CAD) – The process of converting the precursor ion's translational energy into internal energy by collisions with neutral gas molecules to bring about dissociation into product ions.

3.4 CONTINUING CALIBRATION CHECK (CCC) – A calibration standard containing the method analytes, internal standard(s) and surrogate(s). The CCC is analyzed periodically to verify the accuracy of the existing calibration for those analytes.

3.5 DETECTION LIMIT (DL) – The minimum concentration of an analyte that can be identified, measured, and reported with 99% confidence that the analyte concentration is greater than zero. This is a statistical determination of precision (Sect. 9.2.7), and accurate quantitation is not expected at this level.[2]

3.6 EXTRACTION BATCH – A set of up to 20 Field Samples (not including QC samples) extracted together by the same person(s) during a work day using the same lot of SPE devices, solvents, surrogate, internal standard and fortifying solutions. Required QC samples include Laboratory Reagent Blank, Laboratory Fortified Blank, Laboratory Fortified Sample Matrix, and either a Field Duplicate or Laboratory Fortified Sample Matrix Duplicate.

3.7 FIELD DUPLICATES (FD1 and FD2) – Two separate samples collected at the same time and place under identical circumstances, and treated exactly the same throughout field and laboratory procedures. Analyses of FD1 and FD2 give a measure of the precision associated with sample collection, preservation, and storage, as well as lab procedures.

3.8 FIELD REAGENT BLANK (FRB) – An aliquot of reagent water that is placed in a sample container in the laboratory and treated as a sample in all respects, including shipment to the sampling site, exposure to sampling site conditions, storage, preservation, and all analytical procedures. The purpose of the FRB is to determine if method analytes or other interferences are present in the field environment.

3.9 INTERNAL STANDARD (IS) – A pure chemical added to an extract or standard solution in a known amount(s) and used to measure the relative response of other method analytes and surrogates that are components of the same solution. The internal standard must be a chemical that is structurally similar to the method analytes, has no potential to be present in samples, and is not a method analyte.

3.10 LABORATORY FORTIFIED BLANK (LFB) – A volume of reagent water or other blank matrix to which known quantities of the method analytes and all the preservation compounds are added in the laboratory. The LFB is analyzed exactly like a sample, and its purpose is to determine whether the methodology is in control, and whether the laboratory is capable of making accurate and precise measurements.

3.11 LABORATORY FORTIFIED SAMPLE MATRIX (LFSM) – A preserved field sample to which known quantities of the method analytes are added in the laboratory. The LFSM is processed and analyzed exactly like a sample, and its purpose is to determine whether the sample matrix contributes bias to the analytical results. The background concentrations of the analytes in the sample matrix must be determined in a separate sample extraction and the measured values in the LFSM corrected for background concentrations.

3.12 LABORATORY FORTIFIED SAMPLE MATRIX DUPLICATE (LFSMD) – A

duplicate of the Field Sample used to prepare the LFSM. The LFSMD is fortified, extracted, and analyzed identically to the LFSM. The LFSMD is used instead of the Field Duplicate to assess method precision when the occurrence of method analytes is low.

3.13 LABORATORY REAGENT BLANK (LRB) – An aliquot of reagent water or other blank matrix that is treated exactly as a sample including exposure to all glassware, equipment, solvents and reagents, sample preservatives, internal standard, and surrogates that are used in the analysis batch. The LRB is used to determine if method analytes or other interferences are present in the laboratory environment, the reagents, or the apparatus.

3.14 LOWEST CONCENTRATION MINIMUM REPORTING LEVEL (LCMRL) – The single laboratory LCMRL is the lowest true concentration for which a future recoveryis expected, with 99% confidence, to be between 50 and 150% recovery.[1]

3.15 MINIMUM REPORTING LEVEL (MRL) – The minimum concentration that can be reported as a quantitated value for a method analyte in a sample following analysis. This defined concentration can be no lower than the concentration of the lowest calibration standard for that analyte and can only be used if acceptable QC criteria for this standard are met. A procedure for verifying a laboratory's MRL is provided in Section 9.2.5.

3.16 PRECURSOR ION – For the purpose of this method, the precursor ion is the deprotonated molecule ($[M-H]^-$) of the method analyte. In MS/MS, the precursor ion is mass selected and fragmented by collisionally activated dissociation to produce distinctive product ions of smaller *m/z*.

3.17 PRIMARY DILUTION STANDARD (PDS) SOLUTION – A solution containing the analytes prepared in the laboratory from stock standard solutions and diluted as needed to prepare calibration solutions and other needed analyte solutions.

3.18 PRODUCT ION – For the purpose of this method, a product ion is one of the fragment ions produced in MS/MS by collisionally activated dissociation of the precursor ion.

3.19 QUALITY CONTROL SAMPLE (QCS) – A solution of method analytes of known concentrations that is obtained from a source external to the laboratory and different from the source of calibration standards. The second source SSS is used to fortify the QCS at a known concentration. The QCS is used to check calibration standard integrity.

3.20 STOCK STANDARD SOLUTION (SSS) – A concentrated solution containing one or more method analytes prepared in the laboratory using assayed reference materials or purchased from a reputable commercial source.

3.21 SURROGATE ANALYTE (SUR) – A pure chemical which chemically resembles method analytes and is extremely unlikely to be found in any sample. This

chemical is added to a sample aliquot in known amount(s) before processing and is measured with the same procedures used to measure other method analytes. The purpose of the SUR is to monitor method performance with each sample.

4. INTERFERENCES

LC-MS/MS data from blanks, samples, and spikes must be evaluated for interferences. If any interferences are present, take corrective action if necessary. Do not use aluminum foil because PFAAs can be potentially transferred from the aluminum foil to the glassware. Only aluminum foil rinsed with LC/MS grade methanol can be used where necessary.

4.1 PFAS have been used in a wide variety of manufacturing processes, and laboratory supplies should be considered potentially contaminated until they have been tested and shown to be otherwise. The materials and supplies used during the method validation process have been tested and shown to be clean. These items are listed in the Reagents section.

4.2 Method interferences may be caused by contaminants in solvents, reagents (including DI water), sample bottles and caps, and other sample processing hardware that lead to discrete artifacts and/or elevated baselines in the chromatograms. All items such as these must be routinely demonstrated to be free from interferences (less than 1/2 the Reporting Limit), under the conditions of the analysis by analyzing Method Blanks. Subtracting blank values from sample results is not permitted.

4.3 PTFE products can be a source of PFAS (PFOA) contamination. The use of PTFE in the procedure should be avoided. Polypropylene (PP) or polyethylene (PE, HDPE) products may be used in place of PTFE products to minimize PFOA contamination.

4.3.1 Standards and samples are injected from polypropylene autosampler vials with polypropylene snap caps, once. Multiple injections may be performed on Primers when conditioning the instrument for analysis.

4.3.2 Random evaporation losses have been observed with the polypropylene caps causing high Internal Std. recovery after the vial was punctured and sample re-injected. For this reason, it is best to inject standards and samples once in the analytical sequence.

4.3.2 Teflon-lined screw caps have detected PFAS at low concentrations. Repeated injection from the same teflon-lined screw cap have detected PFNA at increasing concentration as each repeated injection was performed, therefore, it is best to use polypropylene

snap caps.

4.4 LC/MS grade methanol must be used for all steps where methanol is used in this method.

4.5 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.

4.6 Solid phase extraction cartridges may 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. The Biotage Isolute 101 500 mg/6mL cartidges (SDVB) brand or Phenomenex SDVB have shown no interfering peaks/ions at the retention times of interest. Each new lot of SPE cartidges must be tested to ensure that contamination does not preclude analyte identification and quantitation.

4.6 Contamination by carryover can occur whenever a high-concentration and low concentration samples are sequentially analyzed. To reduce carryover, the sample syringe in automatically rinsed with solvent between injections. These operations are programmed into the LC multi-sampler system.

4.7 Volumetric glassware and syringes are difficult to clean after being used for solutions containing high levels of PFOA. These items should be labeled for use only with similarly concentrated solutions or verified clean prior to re-use. To the extent possible, disposable labware is used.

4.8 Both branched and linear PFAS isomers can potentially be found in the environment. Linear and branched isomers are known to exist for PFOS, PFOA, PFHxS, PFBS, Et-FOSAA, and MeFOSAA based upon the scientific literature. If multiple isomers are present for one of these PFAS they might be adjacent peaks that completely resolve or not, but usually with a deflection point resolved during peak integration. The later of these peaks matches the retention time of its labeled linear analog. In general, earlier peaks are the branched isomers and are not the result of peak splitting.

Currently, all these species are available as linear isomers. Reference standards of the technical mixtures for these specific PFAS are used to ensure that all appropriate peaks are included during peak integration. <u>These branched isomers elute before the linear isomer and are integrated and reported as total for those species.</u>

4.9 In an attempt to reduce PFOS bias, it is required that *m/z* 499>80 transition be used as the quantitation transition.

5. SAMPLE HANDLING

5.1 Aqueous samples are collected by our clients in 250 mL polypropylene bottles with polypropylene caps. For potable water samples the containers are charged with preservative: TRIZMA PRESET CRYSTALS, pH 7.0 Trizma® functions as a buffer, and removes free chlorine in chlorinated finished waters. Approx. 1.25 g. are added to 250 mL samples (5g/L).

5.2 FIELD REAGENT BLANKS (FRB)
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 preserved 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 PFAAs were not introduced into the sample during sample collection/handling.

5.3 SAMPLE SHIPMENT AND STORAGE – 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.

5.4 SAMPLE AND EXTRACT HOLDING TIMES – Results of the sample storage stability study (Table 10) indicated that all compounds listed in the EPA 537.1 method have adequate stability for 14 days when collected, preserved, shipped and stored as described. Therefore, water samples should be extracted within 14 days of collection. Extracts must be stored at room temperature and analyzed within 28 days after extraction.

6. APPARATUS AND MATERIALS

6.1 250 mL polypropylene bottles with polypropylene caps. VWR Scientific or equivalent: Part no. 414004-125, 12 pk. Alternate: White PP unlined lid L238WH and 8 oz. clarified PP single wall jar 70-400 neck, item J066-Containers and Packaging.com or equivalent.

6.2 Transport Tube: Virgin Polypropylene, White, Plastic, 10 mL Capacity, 16 mm OD, 93 mm Overall Lg, Self-Standing, 250 PK, Item 710Z420, Gamut.com (Grainger), with PP cap or equivalent.

6.3 Graduated cylinders, 50, 100, 250, 500 and 1000mL, Polypropylene, VWR Scientific or equivalent

6.4 Analytical Balance, 0.0001g., checked for accuracy each day of use with Class S weights, certified annually by an outside service

6.5 Extract concentrator: Organomation Model N-EVAP 112, 24 position concentrator with water batch control and nitrogen supply controls.

6.6 Syringes, polypropylene, luer lock, 50-100 mL for filtration of turbid groundwater samples. Merck XX110500 Fisher Scientific or equivalent

6.6 3.1 Micron in-line filters, Promochrom only

6.7 1.0 mL polypropylene snap cap vials, Agilent part no. 5182-0567

6.8 Snap caps, polypropylene, 11 mm, 11/9k, Agilent Part no. 5182-0542

6.9 Solid Phase Extraction Tubes: for EPA 537.1-Potable Water: SDVB- Biotage Isolute 101 500 mg/6mL cartidges (SDVB) part no. 101-0050-C or equivalent

6.10 Syringes, Hamilton or equivalent 5.0 uL, 10 uL 25 uL, 100 uL, 250 uL, 500 uL, teflon free

6.11 Solid Phase Extraction System-automated-Promochrom 8 position autosampler system for 6 mL capacity SPE tubes. System retrofit to remove all PTFE components and replaced with PEEK tubing or PFAS free tubing. Automated bottle rinsing feature required.

6.12 Nitrogen Evaporation System- Organomation Model N-EVAP 112-24 position evaporator with water bath and individual nitrogen delivery control. Water bath capable of ambient temperature to 85 C, but used at 55-60C.

6.13 LC/MS-MS system- Agilent 1260 HPLC system interfaced to an Agilent 6470A Triple Quadrupole system. The instrument control and qualitative/quantitative software is Mass Hunter versions B.8.0 and B.9.0 or later.

6.13.1 HPLC System-Agilent 1260 Infinity II

6.13.1.1 The Agilent 1260 Infinity II HPLC system is configured with temperature controlled column oven compartment. 4 column configuration, temperature controlled (refrigerated) auto sampler

compartments, injection valve, proportioning valves, variable flow controls and variable injection capabilities.

6.13.1.2 The delay column (PFAS and other interference removal) is an Agilent Eclipse Plus C18, 4.6mm x 50 mm, 3.5 um-Part no. 959943-902

6.13.1.3 The analytical column is an Agilent ZORBAX Eclipse Plus C18, 3.0 x 50 mm, 1.8 um- part no. 959757-302

6.13.2 Agilent LC/MS-MS- Agilent 6470AAR

6.14.2.1 Agilent model 6470AAR triple Quadruploe system with Agilent Jet Stream ESI source. UHP nitrogen is used as cell gas and High purity nitrogen is delivered for the sheath gas from a Peak Scientific nitrogen generator system.

6.14 Vortex Mixer- Benchmark Industries or equivalent

6.15 SenSafe Free Chlorine test strips- VWR Scientific or equivalent

7. REAGENTS AND STANDARDS

ALL REAGENTS and STANDARDS MUST BE LOGGED INTO THE ELEMENT LIMS SYSTEM. This includes lot numbers, expiration, open and prepared dates, recipe, Certification/traceability documents from supplier(s) if provided and preparer.

7.1 Methanol, hypergrade for LC/MS. (Merck) from Sigma Aldrich Part no. 1060354000 or equivalent

7.2 Water, hypergrade for LC/MS. (Merck) from Sigma Aldrich Part no. 1153334000 or equivalent

7.3 Isopropanol-for rinsing valve seats, etc.- Sigma Aldrich Part no. 650447-1L

7.4 Ammonium Acetate, LC-MSMS grade. Sigma Aldrich Part no. 73594-100-G-F

7.5 Agilent Tuning Solution-ESI-L-Agilent Part no. G1969-85000

7.5 Stock Standards

Stock Standards are purchased in mid to high concentration form from Wellington Laboratories, Inc. Guelph, ONT, CA. Currently, Wellington is the only supplier of these materials. Second source standards to serve as an initial calibration verification are available for some of the target compounds from Absolute Standards, Hamden, CT in a

2000 ng/mL mix of linear isomers. If unavailable, use a separate preparation/lot from Wellington Labs.

7.5.1 Internal Standards used for the method described are M2PFOA, MPFOS and d3-N-MeFOSAA. These are purchased at 50,000 ng/mL levels and mixed for use. These are purchased from Wellington Labs in 1.2 mL volumes with the following part nos.: MPFOA, MPFOS, and d3-N-MeFOSAA.

7.5.2 Surrogate Materials are purchased for the method described from Wellington Labs at 50000 ng/mL levels. The part nos. are MPFHxA, MPFDA, and d5-N-EtFOSAA.

7.5.3 Stock Standard mixtures of both linear and branched plus linear isomers of the EPA 537 mix are purchase from Wellington Labs at 2000 ng/mL concentrations under part nos. EPA537PDS-L and EPA537-PDS.

The summary below details the procurement requirements for this method-All from Wellington Laboratories, Inc.:

Description	Part no.	Comes in
2000 ng/mL EPA 537.1 list targets	EPA 537 PDSL-R1	4 Days – 1.2 mL
1000-4000 ng/mL EPA 537 Surrogates	EPA 537-SS-R1	4 Days – 1.2 mL
1000, 3000, 4000 ug/mL EPA 537 Internal Stds	EPA-537IS	4 Days – 1.2 mL
Individual Standards @ 50 ug/mL for IS and SURR as alternative		4 Days – 1.2 mL
ISTD –MPFOS	MPFOS	
ISTD - M2PFOA	M2PFOA	
ISTD - d3-N-MeFOSAA	d3-N-MeFOSAA	
SURR – MPFHxA	MPFHxA	
SURR - M3HFPO-DA	M3HFPO-DA	
SURR – MPFDA	MPFDA	
SURR - d5-N-EtFOSAA	d5-N-EtFOSAA	

7.6 Preparation of Standards

7.6.1 Preparation of Working Standards and Intermediates from STOCK Materials

All stock standards are prepared by the vendor in methanol containing a bit of sodium hydroxide to prevent losses of target PFAS compounds due to potential esterification in methanolic solution. The stocks come prepared with 4 molar equivalents (a 3x excess) of sodium hydroxide for stocks at the 50 ug/mL levels. This insures their stability with respect to potential loss due to esterification. The basic solution insures that any acidic sites on the glass ampules or acidic impurities in the methanol are neutralized to prevent ester formation and forms the sodium salt of the PFAS to stabilize it.

When preparing any intermediate or working level standards, the dilution must be prepared in alkaline methanol to prevent the above from occurring.

In order to do this, prepare a 5.0 mM NaOH in Hypergrade Methanol (or LC/MSMS grade) by dissolving 0.02 g. of sodium hydroxide into 100 mL of MeOH. This has a 2 week life.

For standards that are made to 10 mL final volume, add 100 uL of 5.0 mM NaOH/MeOH as part of the preparation. This results in a final concentration of NaOH at 0.05 mM.

For Standards prepared to a final volume of 1.0 mL. add 10 uL of the 5.0 mM NaOH/MeOH.

For working calibration standards/CCVB/SVC made to 500 uL final volume, add 5 uL of the 5.0 mM NaOH/MeOH to each.

7.6.2 Storage of Standards

All working standards should be stored at room temperature provided the container are sealed properly.
Stock Standards may be stored at <10 deg. C but before using must sit to allow equilibration to room temperature followed by either vigorous vortex mixing or sonication for 3-5 mins.

7.6.3 Detailed Preparation Procedure-EPA 537.1 R1

7.6.4 Internal Standards

Option 1 -Internal Standards-purchased as a stock mixture at 1000-4000 ng/mL

These as transferred to a snap cap vial that has been pre-rinsed with 5 mM NaOH/MeOH then allowed to dry. Use as is adding 5 uL to 500 uL volumes or 3 uL to 300 uL volumes for samples or calibration.

Option 2- Internal standards-purchased at 50,000 ng/mL individual components

These as transferred to a snap cap vial that has been pre-rinsed with 5 mM NaOH/MeOH then allowed to dry. Then, dilutions are made to yield 1000, 3000 and 4000 ng/mL Levels for use. Dilutions are prepared as directed below.

For 1.0 mL final volume:

ISTD component	uL of 50,000 ng/mL Stock	uLof 5 mM NaOH/MeOH	uL MeOH
MPFOS, 2870 ng/mL	60 uL	10 uL	830 uL
M2PFOA, 1000 ng/mL	20 uL		
d3-N-MeFOSAA , 4000 ng/mL	80 uL		

7.6.5 Surrogates

7.6.5.1 Option 1 -Stock Surrogates purchased as a mixture at 1000-4000 ng/mL. These are transferred to a snap cap vial that has been pre-rinsed with 5 mM NaOH/MeOH then allowed to dry.
Prepare a 15 mL PP screw cap vial by pre-rinsing with 5 mM NaOH/MeOH then allowing to dry.

Prepare 10 mL of a 1:10 dilution to yield 100-400 ng/mL for use as follows:
Take 1.0 mL of the Surrogate Stock, plus 100 uL of 5 mM NaOH/MeOH and 8900 uL MeOH to give 10 mL final volume.

This results in the following concentrations of working surrogate mix which is used for all samples/QC (100 uL added) or used for calibration as directed under the Calibration section.

SURR – MPFHxA – 100 ng/mL
SURR - M3HFPO-DA - 100 ng/mL
SURR – MPFDA - 100 ng/mL
SURR - d5-N-EtFOSAA- 400 ng/mL

2.3.2.2 Option 2 – Stock individual Surrogates purchased at 50,000 ng/mL levels

SURR – MPFHxA – 50,000 ng/mL
SURR - M3HFPO-DA - 50,000 ng/mL
SURR – MPFDA - 50,000 ng/mL
SURR - d5-N-EtFOSAA- 50,000 ng/mL

These are received in glass ampules. The contents are transferred to snap cap vials that have been pre-rinsed with 5 mM NaOH/MeOH then allowed to dry.

The working surrogate mixture at 100-400 ng/mL is prepared in 10.0 mL quantity by diluting as directed below:

Surrogate	Amount	uL- Amount 5 mM NaOH/MeOH	uL MeOH
MFPHxA	20 uL	100	9760
M3HFPO-DA	20		
MPFDA	20		
d5-N-EtFOSAA	80		

7.6.6 Target Analytes- EPA 537.1 R1

The target analytes for this method are purchased commercially from Wellington Labs under part no. EPA 537 PDSL-R1 which contains the method target analytes as linear isomers only at a nominal concentration of 2000 ng/mL. This mixture is transferred from its glass ampule to a snap cap vial that has been pre-rinsed with 5 mM NaOH/MeOH then allowed to dry. Again these are the nominal concentrations and the actual anion concentrations for those present as salts is listed in the documentation and are reflected in both Mass Hunter and Element.

Preparation of a 10.0 mL volume for use at 100 ng/mL for both Laboratory Fortified Blanks (LFB/BS) and Laboratory Fortified Matrix (LFM/MS) and calibration is detailed below.

Rinse a 15 mL PP centrifuge tube with 5 mM NaOH/MeOH. Allow to dry. Add 100 uL of 5 mM NaOH/MeOH and 9400 uL of MeOH to the tube. Mix, then add 500 uL of the 2000 ng/mL EPA 537 PDSL-R1. Mix fully and this results in the 100 ng/mL solution used for BS/MS and Calibration for the analytes.

7.6.7 Calibration

Calibration of the LC-MSMS systems is done by a seven level calibration covering the range 0.25 ng/mL to 20 ng/mL, nominal. Various PFAS species are present as salts and at differing concentrations and these are reflected in Mass Hunter and Element as their actual concentrations. These are the nominal levels prepared: 0.25, 0.5, 1.0, 2.5, 5.0, 10.0, 20.0 ng/mL. These levels are prepared as directed below using the internal standards, surrogates and target analytes from above as directed below.

This is made to a final volume of 500 uL as shown below in 2 mL snap cap vials that have been pre-rinsed with 5 mM NaOH/MeOH then allowed to dry completely.

It is suggested that the stated volumes of methanol, 5mM NaOH/MeOH are mixed first in the snap caps, then the ISTD is added to each. Then the Surrogates added and finally the target analytes.

Based upon a final volume of 500 uL

Calibration Curve Preparation

Calibration Level	uL 100 ng/mL	uL 100 ng/mL Target Linear	uL 5 mM NaOH/	uL Methanol	uL ISTD at 1000-4000

	Surrogate mix	PFAS Analytes	MeOH		ng/mL
1 (0.25 ng/mL)*	1.25 uL	1.25 uL	5 uL	492.5 uL	5 uL
2 (0.50 ng/mL)	2.5	2.5	5	490.0	5
3 (1.0 ng/mL)	5.0	5.0	5	485.0	5
4 (2.5 ng/mL)	12.5	12.5	5	475.0	5
5 (5.0 ng/mL)*	25.0	25.0	5	445.0	5
6 (10.0 ng/mL)	50.0	50.0	5	395.0	5
7 (20.0 ng/mL)*	100.0	100.0	5	295.0	5

*These levels are also used as the LCV, CCV and HCV for each analysis sequence. Multiple vials should be prepared for these 3 levels.

7.6.8 Checking the Efficacy of the Surrogate/Spike Mixes

On a weekly basis the surrogate and spike mixes at 100 ng/mL are assayed to ensure stability. These are prepared for the analysis by taking 30 uL of the surrogate mix and 30 uL of the spike mix for a final volume of 300 uL as shown below. This yields a 1:10 dilution of the material.

Assay Preparation at 10 ng/mL nominal-prepare in PP auto sampler vial-final volume 300 uL + ISTD:

uL Methanol	uL 5 mM NaOH/MeOH	uL Surrogate at 100 ng/mL	uL Spike at 100 ng/mL	uL ISTD @ 1000-4000 ng/mL
237 uL	3 uL	30 uL	30 uL	3.0

7.6.9 Second Source - Initial Calibration Verification
EPA 537 mix at 2000 ng/mL is currently available form Absolute Standards, Hamden, CT , part no. 99206. This is prepared as an ICV as follows:

Initial Calibration Verification Preparation

Source-Absolute Standards EPA 537 Mix @ 2000 ng/mL

Preparation of Intermediate 100 ng/mL
Take 50 uL of Stock up to 1000 uL in MeOH = 100 ng/mL Intermediate

ICV Level @ 5.0 ng/mL
Take 25 uL of 100 ng/mL ICV Intermediate + 475 uL 95/5 MeOH/H2O + 5uL ISTDs-no Surrogates

8. PROCEDURE

8.1 Preventative and Routine Maintenance

HPLC/MS/MS Preventative Maintenance	
As Needed: Change pump seals. Change in-line filters in autosampler (HPLC). Check/replace in-line frit if excessive pressure or poor performance. Replace column if no change following in-line frit change. Clean needle. Replace or clean Capillary Replace fused silica tube in ESI interface. Clean lenses. Clean skimmer. Ballast rough pump 30 minutes. Check Nozzle flow pattern	**Daily (When in use)** Check solvent reservoirs for sufficient level of solvent. Verify that pump is primed, operating pulse free. (ripple < 1%) Check needle wash reservoir for sufficient solvent. Verify capillary heater temperature functioning. Verify vaporizer heater temperature. Verify rough pump oil levels. Verify turbo-pump functioning. Verify nitrogen pressure for auxiliary and sheath gasses. Possible Checktune
Semi-Annually Replace oil mist and odor elements. Replace activated alumina filter if applicable	**Annually** Vacuum system components including fans and fan covers. Clean/replace fan filters, if applicable.

8.2 Sample Preparation (Extraction and Concentration)

8.2.1 To measure sample initial volume mark a line at the meniscus present in the container. For each lab QC sample required, a clean sample bottle with Trizma® preservative should be filled to the near top and marked for initial volume measurement. Trizma is only used for potable water samples. This measurement serves as a backup since the Horizon Smart Prep II automatically measures the amount of aqueous sample processed and details the volume in the run report.

8.2.2 For every 20 field samples, a blank, a blank spike, and a blank spike duplicate must be extracted. (Field blanks are considered field samples in this consideration as they are treated as such) Ideally, if adequate sample volume is available, a duplicate and a matrix spike should be included on every batch.

8.2.3 All polypropylene equipment including graduated cylinders and sample transfer lines/reservoirs should be washed prior to using with extraction solvent (95:5 Methanol:water).

8.2.4 Add 100uL of surrogate to each sample and QC sample, recap and invert to mix well.

8.2.5 Add, 5, 50 or 100uL of spike to all BS (LFB) and 100 uL MS (LFM) samples included in the extraction batch.

8.2.6 Using the Promochrom automated system, run a cleaning run.

Be sure the reservoirs of LC/MS grade methanol and HPLC plus grade water are full. Prime all lines and align all components.

8.2.7. Load in the EPA537 method.

8.2.8 The SPE method parameters are listed in Figure 1.

Figure 1.0- Promochrom 537.1 SPE Parameters

Step	Action	Inlet	Flow (mL/Min)	Volume (mL)	Time (Mins)
1	Elute W2	CH3OH	5	5	
2	Wait (Soak)				1
3	Elute W2	CH3OH	3	5	
4	Wait (Soak)				1
5	Elute W2	CH3OH	3	5	
6	Wait (Soak)				2
7	Elute W1	H2O	5	18	
8	Wait (Soak)				1
9	Elute W1	H2O	5	5	
10	Wait				2
11	Add Sample W1	Sample	10	285*	
12	Rinse W1 (bottle rinse)	H2O	10	7.5	
13	Rinse W1 (bottle rinse)	H2O	10	7.5	
14	Add Sample W1 (line rinse)	Sample	10	4.5	
15	Elute W1 (prime)	CH3OH	10	0.2	
16	Air-Purge1 (dry tube)	Air	10	5	
17	Blow N_2 (dry tube)				5 @ (2.0 L/min)
18	Rinse 1 (Elute PFAS)	CH3OH	5	6	
19	Wait (Soak)				2
20	Rinse 1 (Elute)	CH3OH	5	6	
21	Wait (soak)				2
22	Collect 1 (final Elute step)	Sample	5	6	
23	Air-Purge1 (purge into collect)	Air	5	10	

*Maximum volume is based upon highest volume of sample in extraction batch

8.2.9 Place labeled 15 mL collection vessels in the sample collection tray and use Element labels to identify the vials at this point. Print 2 sets of labels for each since they will be used after the concentration step as well. These are graduated.

8.2.10 For Potable waters, check for free chlorine levels upon receipt using SenSafe free chlorine strips and show to be <0.1 ppm free chlorine before extraction. All samples above this limit should be rejected.

8.2.12 Add 100uL of Surrogate to each sample and QC sample and mix. Add 5 uL, 50 uL and 100 uL of the LFB (BS) depending upon the rotation of low, mid to high LFB. For LFM (MS) add 100 uL as the LFM for the batch.

8.2.13 Connect the bottles to the automated system..

8.2.14 Initiate the EPA537.1 Extraction Program as defined in Figure 1.0. Each run is approximately 1 hour 15 minutes. Draw a mark on each bottle and later measure the volume with a graduated cylinder. The actual sample volume extracted then entered into the Element Bench Sheet.

8.2.14 The resulting 10-14 mL extracts are transferred to the N-EVAP concentrator system operated at 50-55 degrees C (never more than 65C) in their original collection vials. The nitrogen flow is initiated and adjusted on each individual sample to provide a gentle stream causing a slight disturbance at the surface of the methanol extracts.

8.2.15 As this evaporation proceeds the walls of each vessel are rinsed with methanol when the volume is approximately 5 mls and then again when the volume is reduced to just below 1.0 mL. After these rinses, the evaporation is allowed to proceed until near dryness. At that point the walls of each sample vial are rinsed again with LC/MS grade Methanol and concentration allowed to proceed to dryness.

8.2.16 To each vial, add 1000 uL of 96%/4%Methanol/Water mix by swirling and using a disposable polypropylene pipet, vortex to mix, allow to settle then carefully transfer to a 2 mL PP snap cap.

8.2.17 Withdraw an aliquot of 300 uL into a 500 uL autos ampler vial (PP) and add 3.0 uL of ISTD mix. .

8.2.18 Cap with polyolefin flexible caps and vortex to mix.

8.2.19 Store Extracts at room temperature until analysis. If analysis is to proceed the next day or later, refrigerate at <10C.

8.3 Running Samples/QC - Acquisition Method

The acquisition method is detailed in Attachment 1 (HPLC) and Attachment 2 (MS/MS) of this SOP. The method is a HPLC with dynamic MRM method with precursor and

product ions with specific acquisition parameters to maximize sensitivity and specificity. This list may be modified to add other PFAS target analytes as necessary.
The Solid Phase Extraction Method (SPE) is detailed as Attachment 3.

8.3.1 The triple Quadrupole (QQQ) system must be optimized for each target analyte (including surrogates and internal standards) using the Mass Hunter Optimizer program. This program determines the most abundant precursor and product ions for each compound and their abundances. These data are then used to build an MRM (multiple reaction monitor) method for acquisition. This is done initially or after any major maintenance procedures are performed to the triple quadrupole system. A high level standard is used for this in the $[M-H]^-$ mode.

8.3.2 The QQQ is checked for tuning on a weekly basis before analysis using the Tune context by selecting the CHECKTUNE radio button. This is done only in negative ion mode since that what we are operating under. If the Checktune fails, run the Autotune program-note: this takes approx. 45 mins. in negative mode. This will require a calibration of the instrument.

8.3.3 Before any QC or samples can be run, the HPLC must be allowed to purge for at least thirty minutes. This purge must be done using the initial mobile phase conditions used in the method must be allowed to run for 15 minutes or until pressure has stabilized (ripple must be < 1%)

8.3.4 An instrument sequence (Worklist) is then made. It should begin with two primers (5 ng/mL) followed by a blank.

8.5.5 Those will be followed by the opening Low level CCC then mid level CCV. Then, the worklist can start running. Every 10 field samples (excluding QC and FRBs) a subsequent CCC must be run, alternating between medium and high CCVs (medium = 5 ng/mL, High = 20 ng/mL; Low CCV = 0.25 ng/mL). The sequence must end with a CCC in the rotation.

8.5.6 Following the run, a store column run must be entered, to ensure the column is stored in a high ratio of solvent.

8.5.7 The run can end with a script to put the instrument into standby mode.

8.4 Daily Sample Preparation/Analysis Sequence

- Prepare extracts for analysis by placing a 500 ul aliquot of sample extract containing internal standards into a PP auto-sampler vial. Apply snap cap.
- Confirm that the samples loaded on the auto-sampler were entered correctly in the injection log. Make any necessary corrections.

- Run instrument CCV checks at the RL (0.25 ng/mL), then at a mid level and high level rotating every ten samples (5, 20 ng/mL) and ending with a mid level CCV.
- Prepare samples by placing 100 ul of extract (diluted if necessary) into an auto-sampler vial. Add 2.0 ul 25 ppm Internal Standard to each.
- Enter the Worklist (injection sequence)into the instrument software and load samples onto the auto-sampler in the following order,

    - 2 Primers and a blank with ISTD
    - CCV conditioner @ 5 ng/mL
    - Low Level CCV (0.25 ng/mL)
    - Batch Method Blank
    - LFB
    - Sample Dup/LFM/LFMD
    - Samples to fill the 12-hour clock or 10 sample injections whichever is more frequent
    - CCV (ending or continuing) at 5.0 ng/mL
    - 10 injections
    - Ending CCV -High level, etc.

8.5 Data Review

The Agilent Mass Hunter Quantitation program is used to review all data. All identifications are based upon acceptable ion ratios for the abundance of both precursor and product ions along with retention time information.

8.5.1 Since certain PFAS species are manufactured by different processes the presence of branched as well as linear isomers may be found. In order to properly quantitate these species, the analyst must sum the related branched and linear isomers. This affects the following species: PFOS, PFHxS, N-EtFOSAA and N-MeFOSAA. These should be annotated as total in the quantitation report and subsequent Element outputs. This is accomplished by adding a Qualifier to these specific analytes. The specific qualifier is PFAS-T which says: "For this PFAS compound, the reported result is the Total of the linear and branched isomers".

EPA guidance on this is as follows:

1. Calibrate instrumentation using a certified quantitative standard containing only the linear isomer.

2. Identify the branched isomers by analyzing a “qualitative/semi-quantitative” PFOA mixed standard that includes both linear and branched isomers (Wellington Laboratories, cat#: T-PFOA or equivalent) and compare retention times and tandem mass spectrometry transitions.

3. Quantitate PFOA and the others by integrating the total response (i.e., accounting for peaks that are identified as linear and branched isomers) and relying on the initial calibration with the linear-isomer quantitative standard.

8.5.2 Any detection greater than the upper limit of the calibration curve requires dilution into the upper half of the curve, where possible.

9. CALIBRATION

9.1 Initial Calibration

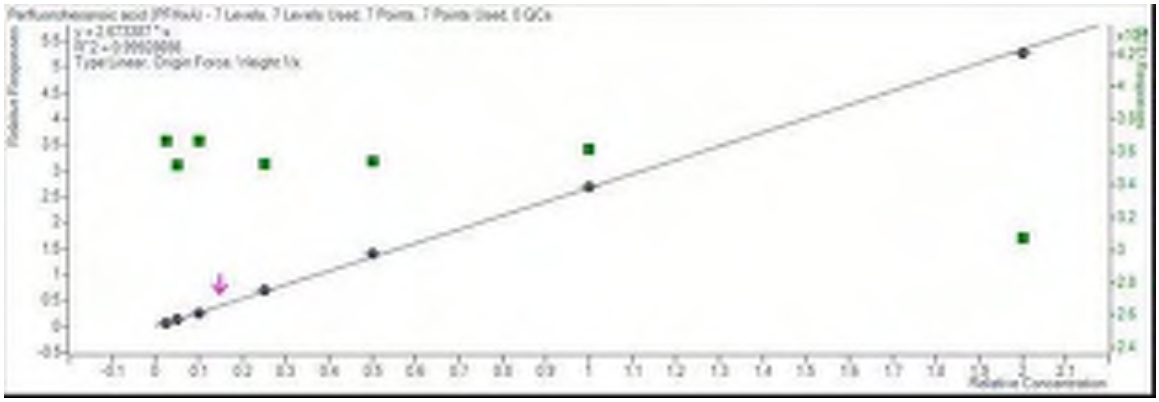
The initial calibration covers the range 0.25 ng/mL to 20 ng/mL or higher depending upon the linearity of the PFAS species. After acquisition, the data are quantitated in Mass Hunter and the default calibration model is generated using Quadratic regression , FORCED through the origin. Depending upon the response and accuracy at each level as shown in the Mass Hunter program, use Linear, Forced, weighted (1/x) or quadratic, Forced, with or without weighting to achieve the best fit which is based upon the best accuracy on a compound by compound basis. In any case, the correlation coefficient must be greater than 0.990.

9.1.1 The calibration levels as shown in Section 7.6.3 use 7 levels. All points are included in the calibration.

9.1.2 A typical calibration for a single compound showing responses and accuracy when quantitated against the curve is shown in Figure 2.0 below.

Figure 2.0 - Typical Calibration Accuracy Report and Curve

Initial Calibration	Perfluorohexanoic acid (PFHxA) Results			MPFOA (ISTD)
Name	RT, mins	Final Conc.	Accuracy	Area
SEQ-CAL1 0.25 ng/mL	10.3302	0.23	90.4	366519
SEQ-CAL2 0.50 ng/mL	10.2801	0.48	95.7	351967
SEQ-CAL3 1.00 ng/mL	10.3886	0.95	95.1	366588
SEQ-CAL4 2.50 ng/mL	10.3886	2.57	102.7	352457
SEQ-CAL5 5.00 ng/mL	10.3886	5.26	105.1	353774
SEQ-CAL6 10.0 ng/mL	10.3886	10.01	100.1	361544
SEQ-CAL7 20.0 ng/mL	10.3552	19.76	98.8	307426
BLANK	ND	ND < 0.25)	NA	365583
SEQ-SCV1 5.0 ng/mL	10.2801	5.12	102.5	360505



9.2 ICV/QCS

A second-source Initial Calibration Verification must be run immediately following initial calibration. The concentration of this standard should be in the middle of the calibration range (e.g. 5.0 ng/mL). Unless project-specific data quality objectives are required, the values from the second-source check should be within 30% of the expected concentration.

> **Corrective Action**: Quantitative sample analyses should not proceed for a failing ICV. Recalibrate and re-run the ICV if necessary.

9.3 Continuing Calibration Verification

The first CCV must be at a level of 0.25 ng/mL (the RL level), followed by rotating mid-level (2.5-5.0 ng/mL) and high-level (10-20 ng/mL) CCVs every 10 client samples including a closing CCV.

The low level (MRL) CCV must be ± 50% of the true value (0.125-0.375 ng/mL). The mid-Level CCV must be ± 30% of the true value.

> **Corrective Action**: If any of the required calibration check criteria fail, the system must be evaluated and any appropriate instrument repair or maintenance must be performed. Sample data are unacceptable and must be rerun. Reinjection the standard may be done. If the calibration check standard still fails, the system must be recalibrated.

10. Quality Control

10.1 Initial Demonstration of Capability (IDOC)

The initial demonstration requirement of EPA 537.1 must be acceptable before analysis of samples may begin. The IDOC includes the

following key elements that are detailed in Sections 9.2.1 et seq. for EPA 537.1:

10.1.1 Initial Demonstration of Branched vs. Linear Isomer profile for PFOA

10.1.2 Initial Demonstration of Low system background

10.1.3 Initial Demonstration of Precision

10.1.4 Initial Demonstration of Accuracy

10.1.5 Initial Demonstration of Asymmetry Factor

10.1.6 MRL Confirmation

10.1.7 MDL Determination (initial and on-going). This is detailed in Section 10.1.7.1 below.

10.1.7.1 MDL Determination-Spike at 4 ng/L

MDL Determination –In order to perform the MDL study, 7 total extractions are performed on 3 different days (Extraction day 1= 3 LRBs and 3 LFBs); Extraction day 2 is 2 of each, and Extraction day 3 is also 2 of each). Once extracted, the analyses are conducted on 3 separate days (we use only QQQ1 so all runs are on that system). The MDL is determined according to the EPA MDL protocol defined in Definition and Procedure of the Determination of the Method Detection Limit, Revision 2 Dec. 2016 as detailed below:

Make all computations as specified in the analytical method and express the final results in the method-specified reporting units.

Calculate the sample standard deviation (SD) of the replicate spiked sample measurements and the sample standard deviation of the replicate method blank measurements from all instruments to which the MDL will be applied.

Compute the MDLs (the MDL based on spiked samples) as follows:

MDL_s = 3.143 x SD (for seven replicates; SD = Standard Deviation)

Compute the MDLb (MDL based on method blanks-LRBs) as follows:

- If none of the blanks give numerical results then the MDLb does not apply
- If only some of the blanks (but not all) give a result, set the MDLb to the highest result found
- If ALL method blanks show a detections then use the following calculation to determine MDLb:

MDLb = Average of Blank Detections + (3.143 x Std. Dev.)

Calculate the final MDL by selecting the greater of MDLs or MDLb.

10.2 Batches are defined at the sample preparation step. Batches should be kept together through the whole analytical process as far as possible, but it is not mandatory to analyze prepared extracts on the same instrument or in the same sequence.

10.2.1 The quality control batch is a set of up to 20 samples of the same matrix processed using the same procedure and reagents within the same time period. The quality control batch must contain a matrix spike/matrix spike duplicate (MS/MSD), a laboratory control sample (LCS) and a method blank. Laboratory generated QC samples (Blank, LCS, MS/MSD) do not count toward the maximum 20 samples in a batch. Field QC samples are included in the batch count. In some cases, at client request, the MS/MSD may be replaced with a matrix spike and sample duplicate. If insufficient sample is available for an MS/MSD, an LCSD may be substituted if batch precision is required by the program or client. In the event that multiple MS/MSDs are run with a batch due to client requirements, the additional MS/MSDs do not count toward the maximum 20 samples in a batch.

10.3 METHOD BLANK- One method blank (MB, laboratory reagent blank) must be extracted with every process batch of similar matrix, not to exceed twenty (20) samples. For aqueous samples, the method blank is an aliquot of laboratory reagent water. For solid samples, the method blank is an aliquot of Ottawa sand. The method blank is processed in the same manner and at the

same time as the associated samples. Corrective actions must be documented on a Non-Conformance memo, and then implemented when target analytes are detected in the method blank above the reporting limit or when IDA recoveries are outside of the control limits. Re-extraction of the blank, other batch QC, and the affected samples are required when the method blank is deemed unacceptable.

10.3.1 If the MB produces a peak within the retention time window of any of the analytes, determine the source of the contamination and eliminate the interference before processing samples.

10.3.2 The method blank must not contain any analyte at or above 1/3 the reporting limit- for EPA 537.1 potable waters.

10.3.3 If there is no target analyte greater than the RL in the samples associated with an unacceptable method blank, the data may be reported with qualifiers. Such action should be taken in

consultation with the client.

10.3.4 Re-extraction and reanalysis of samples associated with an unacceptable method blank is required when reportable concentrations are determined in the samples.

10.3.5 Results are acceptable if the blank contamination is less than ½ of the reporting limit/LOQ for each analyte, or less than 1/10 of the regulatory limit, or less than 1/10 of the sample result for the same analyte, whichever is greater. If the method blank does not meet the acceptance criteria, the source of contamination must be investigated and measures taken to correct, minimize or eliminate the problem. Reprepare and reanalyze all field and QC samples associated with the contaminated method blank.

10.4 LABORATORY CONTROL SAMPLE (LCS) must be extracted with every process batch of similar matrix, not to exceed twenty (20) samples. The LCS is an aliquot of laboratory matrix (e.g. water for aqueous samples and Ottawa sand for solids) spiked with analytes of known identity and concentration. The LCS must be processed in the same manner and at the same time as the associated samples. Corrective actions must be documented on a Non-Conformance memo, then implemented when recoveries of any spiked analyte is outside of the control limits. Re-extraction of the blank, other batch QC, and all associated samples are required if the LCS is deemed unacceptable. The control limits for the LCS are stored in Element unless the method preempts this (537 limits).

10.5 A matrix spike/matrix spike duplicate (MS/MSD or MS/SD) pair must be extracted with every process batch of similar matrix, not to exceed twenty (20) samples. An MS/MSD pair is aliquots of a selected field sample spiked with analytes of known identity and concentration. The MS/MSD pair must be processed in the same manner and at the same time as the associated samples. Spiked analytes with recoveries or precision outside of the control limits must be within the control limits in the LCS. Corrective actions must be documented on a nonconformance memo, then implemented when recoveries of any spiked analyte are outside of the control limits provided by ELEMENT or by the client. Again if a specific method has required limits, this is preempted. Any outliers must be qualified accordingly.

10.6 A duplicate control sample (LCSD or DCS) may be added when insufficient sample volume is provided to process an MS/MSD pair, or is requested by the client. The LCSD is evaluated in the same manner as the LCS.

10.7 Initial calibration verification (ICV) –A second source standard is analyzed with the initial calibration curve. The concentration should be at the mid range of

the curve and must recover within 80-120 % of expected value.

Corrective actions for the ICV include:

- Rerun the ICV.
- Remake or acquire a new ICV.
- Evaluate the instrument conditions.
- Evaluate the initial calibration standards.
- Rerun the initial calibration.

10.8 Internal Standard- The Internal Standard (IS) is added to each field and QC sample prior to analysis. The IS response (peak area) must not deviate by more than 50% from the average response (peak area) of the initial calibration.

10.8.1 Sample IS response (peak area) must be within 70-140% of the response (peak area) in the most recent CCV.

10.9 Specific QC requirements for EPA Method 537.1 are detailed in Table 1.0 as follows.

Table 1.0 QC Criteria-EPA 537.1

Requirement	Specification and Frequency	Acceptance Criteria
Sample Holding Time	14 days with appropriate preservation and storage as described in Sections 8.1-8.5.	Sample results are valid only if samples are extracted within sample hold time.
Extract Holding Time	28 days when stored room temp. in polypropylene centrifuge tubes	Sample results are valid only if extracts are analyzed within extract hold time.
Laboratory Reagent Blank (LRB)	One MBLK with each extraction batch of up to 20 Field Samples.	Demonstrate that the method analyte concentration < 1/3 the MRL, and confirm that possible interferences do not prevent quantification. If the background concentration exceeds 1/3 the MRL, results for the extraction batch are invalid.
Laboratory Fortified Blank (LFB)	One LFB is required for each extraction batch of up to 20 Field Samples. Rotate between low, mid, high levels	Results of LFB analyses at medium and High fortification for the analyte and SUR. Results of a low-level LFB must be 50-150% of the true value.
Internal Standard (IS)	Compare IS area to the average IS area in the initial calibration and the most recent CCC.	Peak area counts for all injections must be within ± 50% of the average peak area calculated during the initial cal. and 70–140% from the most recent CCC. If the IS does not meet this criterion, target analyte results are invalid.
Surrogate(SUR) Standard	The SUR standard added to all calibration standards and samples, including QC samples. Calculate SUR recoveries.	SUR recovery must be 70-130% of the true value. If a SUR fails this criterion, report all results for sample as suspect/SUR recovery with appropriate qualifier.

Sample Matrix Spike (LFSM)	Analyze one MS per extraction batch (of up to 20 Field Samples) fortified target analytes. Calculate LFSM recoveries.	Recoveries at mid-high levels should be 70-130%. For low level LFSM 50-150% is acceptance range. Qualify any outliers using appropriate flags.
MSD (LFSMD) or Field Duplicates (FD)	Extract at least one FD or LFSMD with each extraction batch of 20 field samples or less. Calculate RPD.	RPD should be ≤30% at mid-high spike levels and at low levels ≤ 50% RPD. If not met, qualify data accordingly.
Field Reagent Blank (FRB)	Required when any target analyte is detected above the MRL. Processed as a sample.	IF any target analyte is detected at > 1/3 the MRL, all samples collected are invalid and must be recollected/reanalyzed.
Peak Asymmetry Factor	Calc. this factor each time a new ICAL is done by evaluating the 1st two chromatographic peaks in the mid point of the curve.	The Peak asymmetry factor must be 0.8-1.5-Agilent Mass Hunter calculates this as a Symmetry Factor
Quality Control Sample (QCS)-SCV	Analyzed Quarterly or when preparing new standards as well as during initial demonstration.	70-130% of true value
Initial Calibration	Use ISTD technique first order or second order FORCED through zero (origin). Use minimum of 5 points or 6 points for 2nd order	When each standard is calculated against the curve, the accuracy should be 70-130%, except for the lowest standard which should be 50-150% of the true value.
Continuing Calibration Check (CCC) (or CCV)	Verify by running low std 1st then after every 10 runs, rotating between mid and high levels	Surrogates and analyte recovery 70-130% except for low level. For low level: 50-150% recovery for analytes and 70-130% recovery for surrogates.

10.10 Initial Demonstration of Capability (IDC)

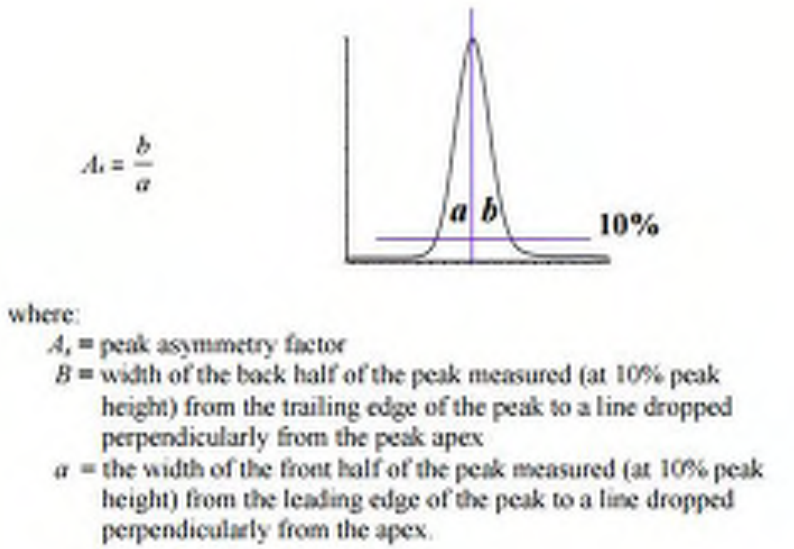
Initial Demonstration of Capability involves the following processes listed ion Table 2.0 as follows.

Table 2.0 - Initial Demonstration of Capability (IDC)

Requirement	**Specification**	**Acceptance Criteria**
Initial Demonstration of Low System Background *See EPA 537.1 Section 9.2.1*	Analyze LRB prior to any Other IDC steps	Demonstrate that all method analytes are < 1/3 MRL and possible interferences form extraction media do not prevent identification and quantification of method analytes.
Initial Demonstration of Precision (IDP) *See Section 9.2.2-*	Analyze 4-7 replicate LFBs at mid-cal level	%RSD must be < 20%
Initial Demonstration of Accuracy (IDA) *See Section 9.2.3-537.1*	Using the IDP runs above, Calc. average % Recovery	Mean Recovery ± 30% of true value

Initial Demonstration of Peak Asymmetry Factor	Calc. by evaluating the 1st two chromatographic peaks in the mid point of the curve. Equation in *Section 9.3.9 of EPA 537.1*	The Peak asymmetry factor must be 0.8-1.5 SEE FIGURE 3.0
Minimum Reporting Limit (MRL) Confirmation *See Section 9.2.5-537.1*	Fortify, extract and analyze seven replicates at the proposed MRL level. Calc. mean and the half range (HR). Confirm that the upper and lower limits for the prediction interval of result (Upper PIR and Lower PIR) meet recovery criteria.	Upper PIR $\leq$ 150% Lower PIR $\geq$ 50% SEE BELOW section 10.10.1 FOR CALCULATIONS

Figure 3.0 Peak Asymmetry Factor Determination



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.

Agilent Mass Hunter performs this calculation automatically as shown below:

			Perfluorobutanesulfonic acid (PFBS) Results				MPFOS (ISTD)...		MPFHxA Results			
Acq. Date-Time	Dil.	Pos.	RT	Final Conc.	Accuracy	Symmetry	RT	Area	RT	Final Conc.	Accuracy	Symmetry
3/31/2021 7:06 PM	1.0	Vial 2	8.715	4.7078		1.17	13.954	96552	10.318	5.3196		1.40

10.10.1 MINIMUM REPORTING LEVEL (MRL) CONFIRMATION – Establish a target concentration for the MRL (0.25-0.5 ng/mL in extract- 1.0-2.0 ng/L in sample)for PFAS based on the intended use of the method. Fortify, extract, and analyze seven replicate LFBs at the proposed MRL concentration. Calculate the mean (*Mean*) and standard deviation for these replicates. Determine the Half Range for the prediction interval of results (*HRPIR*) using the equation below

$HR_{PIR} = 3.963S$

where *S* is the standard deviation, and 3.963 is the constant value for seven replicates.

NOTE: The mass spectrum (either SIM or full scan) for the method analyte in the LFBs must meet all the analyte identification criteria the MRL verification may not be performed on LFBs where only the base peak is observed. If during MRL confirmation all identification ions are not observed, the MRL selected is too low.

Confirm that the upper and lower limits for the Prediction Interval of Result (*PIR = Mean + HRPIR*) meet the upper and lower recovery limits as shown below.

The Upper PIR Limit must be ≤ 150% recovery.

$$\textit{Upper PIR Limit} = \frac{\textit{Mean} + \textit{HRPIR}}{\textit{Fortified Concentration}} \times 100\%$$

The Lower PIR Limit must be ≥ 50% recovery.

$$\textit{Lower PIR Limit} = \frac{\textit{Mean} - \textit{HRPIR}}{\textit{Fortified Concentration}} \times 100\%$$

The MRL is validated if both the Upper and Lower PIR Limits meet the criteria described above. If these criteria are not met, the MRL for PFAS has been set too low and must be re-evaluated at a higher concentration.

11.0 DATA REVIEW, CALCULATIONS AND REPORTING

Samples concentrations are determined using either or linear regression or quadratic regression FORCED through the origin. Weighted (1/x or $1/x^2$) may assist with low level accuracy and is recommended where necessary. All calibration curves have greater than 6 points and no points can be removed. Any target analyte exceeding the calibration range will require dilution.

11.1 Data interpretation

All sample data calculations are performed by the Agilent Mass Hunter software in ng/mL and then final data are calculated taking into account final extract volumes and the initial sample volumes extracted which are entered into the Element bench sheet.

11.2 Linear and Branched Isomers are addressed in Section 8.5 and are reported for the noted species as Total which is a sum of the linear and branched isomers for affected species.

12. HEALTH AND SAFETY

12.1 General safety considerations and requirements are detailed in the York Laboratory Safety and Health Standard Operating Procedure No. Safety011600.

Specific safety rules applying to the conduct of this analysis requiring the following:

- When handling standards and samples, latex gloves are required.
- Also, when handling neat materials, a fume hood and safety glasses are required.
- When handling samples, gloves and glasses are required.
- Highly odorous samples must be handled in a fume hood.
- Refer to SDSs for specific safety/health information.

12.2 The analysts must exercise normal care and be supervised and trained to work in an analytical chemistry laboratory. The analysts will be handling fragile glassware, needles, syringes, volatile and flammable chemicals, toxic chemicals and corrosive chemicals.

- No smoking or open flames are allowed.
- No food or food products may be brought into the laboratory.

Solvents should not be left uncovered on the laboratory benches.
All solvent transfers should be done in the hoods.

Hood doors must be kept in the position which yields approx. 100 fpm face velocity.
Solvent evaporation must be done in the hood with exhaust elevated and in the rear.

Waste containers that had solvents must be vented to a hood until all solvents have evaporated.

Safety glasses are provided and must be worn at all times in the laboratory.
Gloves are provided and must be worn when working with chemicals.
Laboratory coats are provided and should be worn to protect the analysts' clothes.
Syringes and needles must be kept in their original cases when not in use.
Care must be exercised in using and handling syringes to avoid injury.
Report any sticking with a needle immediately to your supervisor.

12.3 Specific Safety Concerns

12.3.1 Preliminary toxicity studies indicate that PFAS could have significant toxic effects. In the interest of keeping exposure levels as low as reasonably achievable, PFAS must be handled in the laboratory as hazardous and toxic chemicals.

12.3.2 Exercise caution when using syringes with attached filter disc assemblies. Application of excessive force has, upon occasion, caused a filter disc to burst during the process.

12.3.3 Laboratory procedures such as repetitive use of pipets, repetitive transferring of extracts and manipulation of filled separatory funnels and other glassware represent a significant potential for repetitive motion or other ergonomic injuries. Laboratory associates performing these procedures are in the best position to realize when they are at risk for these types of injuries.

12.3.4 Eye protection, laboratory coat, and nitrile gloves must be worn while handling samples, standards, solvents, and reagents. Disposable gloves that have been contaminated will be removed and discarded; other gloves will be cleaned immediately.

12.3.5 Perfluorocarboxylic acids are acids and are not compatible with strong bases.

12.3.6 Primary Materials Used- The following is a list of the materials used in this method, which have a serious or significant hazard rating. NOTE: This list does not include all materials used in the method. The table contains a summary of the primary hazards listed in the SDS for each of the materials listed in the table. A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the SDS for each material before using it for the first time or when there are major changes to the SDS.

Methanol (2-3-0)	Flammable Poison Irritant	200 ppm (TWA)	A slight irritant to the mucous membranes. Toxic effects exerted upon nervous system, particularly the optic nerve. Symptoms of overexposure may include headache, drowsiness and dizziness. Methyl alcohol is a defatting agent and may cause skin to become dry and cracked. Skin absorption can occur; symptoms may parallel inhalation exposure. Irritant to the eyes.

13. WASTE MANAGEMENT/POLLUTION PREVENTION

Neat Materials

Waste management procedures require the prudent use of neat materials. The ordering of neat standards and materials must be done to minimize unused material which would result in storage or handling of excess material. Quantities ordered should be sufficient to provide for necessary standards with consideration to shelf life. When ordering a unique material for a standard, be sure to order the smallest practical quantity.

Solvents

The solvents used at York for this procedure include isopropanol and Methanol. These solvents are used for sample extraction or LC cleanup, All amounts are either consumed during concentration or placed in one liter amber jars in the hood areas for evaporation. Any remaining solvent/water is transferred to a drum designated for solvent waste.

Samples

Unused or remaining soil and water samples are returned to the sample control room for continued storage for proper disposal by the sample control group.

14. REFERENCES

1. US EPA, "Method 537.1 - Determination of Selected Per- and Polyfluorinated alkyl Substances in Drinking Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometery (LC/MS/MS)", Version 1.0, November 2018, J.A. Shoemaker, P.E. Grimmett, B.K. Boutin, EPA Document #: EPA/600/R-18/352, and Version 2.0, March 2020 (the only updates were editorial and did not include any technical revisions).

2. Method ISO 25101:2009, "Determination of perfluorooctanesulfonate (PFOS) and perfluorooctanoate (PFOA) – Method for unfiltered samples using solid phase extraction and liquid chromatography/mass spectrometry", April 30, 2009.

3. EPA Technical Advisory-Laboratory Analysis of Drinking Water Samples for Perfluorooctanoic Acid (PFOA) using EPA Method 537 Rev. 1.1 EPA 815-B-16-021 September 2016

15. REVISION HISTORY

Revision 1.0	11/25/2018	First issue.
Revision 1.1	01/09/2019	Modified Cover page
Revision 1.2	03/30/2021	Modified Stds prep. Section 7 to reflect updated procedures
Revision 1.3	04/22/2021	Modified Reference 1 to reflect EPA 537.1

Attachment 1 -HPLC Method Parameters

Acquisition Method Report

	Channel	Name 1	Name 2	Selected	Used	Percent
1	A	Water 5mM ammonium acetate		Ch. 1	Yes	10.0 %
2	B	95% MeOH 5mM ammonium acetate		Ch. 1	Yes	90.0 %

Timetable

	Time	A	B	Flow
1	0.50 min	90.0 %	10.0 %	--- mL/min
2	2.00 min	70.0 %	30.0 %	--- mL/min
3	14.00 min	5.0 %	95.0 %	--- mL/min
4	14.50 min	0.0 %	100.0 %	--- mL/min

Name: Column Comp. **Module:** G7116A

Left Temperature Control	
Temperature Control Mode	Temperature Set
Temperature	50.0 °C
Enable Analysis Left Temperature	
Enable Analysis Left Temperature On	Yes
Enable Analysis Left Temperature Value	0.8 °C
Left Temp. Equilibration Time	1.0 min
Right Temperature Control	
Right temperature Control Mode	Temperature Set
Right temperature	50.0 °C
Enable Analysis Right Temperature	
Enable Analysis Right Temperature On	Yes
Enable Analysis Right Temperature Value	0.8 °C
Right Temp. Equilibration Time	1.0 min
Enforce column for run	
Enforce column for run enabled	No
Stop Time	
Stoptime Mode	As pump/injector
Post Time	
Posttime Mode	Off
Timetable	
Valve Position	Position 1 (Port 1 -> 1')
Position Switch After Run	Do not switch

Attachment 2 - Triple Quadrupole Acquisition Method

Acquisition Method Report

Acquisition Method Info

Method Name	EPA537.1_041720_ACQ.m
Method Path	D:\MassHunter\Methods\EPA537.1_041720_ACQ.m
Method Description	Target PFAS Acquisiton EPA537.1 PW

Device List

Multisampler
Binary Pump
Column Comp.
QQQ

MS QQQ Mass Spectrometer

Ion Source	AJS ESI	**Tune File**	D:\MassHunter\Tune\QQQ\G6470A\Autotune_20210106_152612\atunes_20210106_154847.TUNE.XML
Stop Mode	No Limit/As Pump	**Stop Time (min)**	1
Time Filter	On	**Time Filter Width (min)**	0.07
LC->Waste Pre Row	N/A	**LC->Waste Post Row**	N/A

Time Segments

Index	Start Time (min)	Scan Type	Ion Mode	Div Valve	Delta EMV	Store	Cycle Time (ms)	Triggered?	MRM Repeats
1	0	DynamicMRM	ESI+Agilent Jet Stream	To MS	325	Yes	500	No	3

Time Segment 1

Scan Segments

Cpd Name	ISTD?	Prec Ion	MS1 Res	Prod Ion	MS2 Res	Frag (V)	CE (V)	Cell Acc (V)	Ret Time (min)	Ret Window	Polarity
11Cl-PF3OUdS	No	630.89	Unit/Enh (6490)	450.7	Unit/Enh (6490)	170	33	4	15.711	3	Negative
9Cl-PF3ONS	No	530.89	Unit/Enh (6490)	350.7	Unit/Enh (6490)	175	29	4	14.471	3	Negative
ADONA	No	376.97	Unit/Enh (6490)	250.8	Unit/Enh (6490)	103	9	4	12.108	3	Negative
ADONA	No	376.97	Unit/Enh (6490)	84.9	Unit/Enh (6490)	103	37	4	12.108	3	Negative
d3-N-MeFOSAA	Yes	572.99	Unit/Enh (6490)	418.7	Unit/Enh (6490)	148	21	4	15.092	3	Negative
d5-N-EtFOSAA	No	589.02	Unit/Enh (6490)	530.8	Unit/Enh (6490)	156	21	4	15.427	3	Negative
d5-N-EtFOSAA	No	588.99	Unit/Enh (6490)	418.8	Unit/Enh (6490)	156	21	4	15.427	3	Negative
HFPO-DA (GenX)	No	285	Unit/Enh (6490)	169	Unit/Enh (6490)	100	20	4	11.076	3	Negative
M2PFOA	Yes	414.99	Unit/Enh (6490)	369.8	Unit/Enh (6490)	84	9	4	13.067	3	Negative
M3HFPO-DA	No	287	Unit/Enh (6490)	169	Unit/Enh (6490)	100	20	4	11.075	3	Negative
MPFDA	No	514.99	Unit/Enh (6490)	469.8	Unit/Enh (6490)	78	9	4	14.774	3	Negative
MPFHxA	No	314.99	Unit/Enh (6490)	269.8	Unit/Enh (6490)	88	5	4	10.601	3	Negative
MPFOS	Yes	502.99	Unit/Enh (6490)	79.8	Unit/Enh (6490)	180	40	4	14.009	3	Negative
N-EtFOSAA	No	584	Unit/Enh (6490)	525.9	Unit/Enh (6490)	130	20	4	15.436	3	Negative
N-EtFOSAA	No	584	Unit/Enh (6490)	418.8	Unit/Enh (6490)	130	20	4	15.436	3	Negative
N-MeFOSAA	No	570	Unit/Enh (6490)	511.9	Unit/Enh (6490)	150	20	4	15.101	3	Negative
N-MeFOSAA	No	570	Unit/Enh (6490)	418.9	Unit/Enh (6490)	150	20	4	15.101	3	Negative
Perfluorobutanesulfonic acid (PFBS)	No	298.9	Unit/Enh (6490)	79.9	Unit/Enh (6490)	150	36	4	9.091	3	Negative
Perfluorodecanoic acid (PFDA)	No	513	Unit/Enh (6490)	468.8	Unit/Enh (6490)	90	8	4	14.775	3	Negative
Perfluorodecanoic acid (PFDA)	No	513	Unit/Enh (6490)	268.8	Unit/Enh (6490)	90	16	4	14.775	3	Negative

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Acquisition Method Report

YORK

Cpd Name	ISTD?	Prec Ion	MS1 Res	Prod Ion	MS2 Res	Frag (V)	CE (V)	Cell Acc (V)	Ret Time (min)	Ret Window	Polarity
Perfluorododecanoic acid (PFDoA)	No	613	Unit/Enh (6490)	568.8	Unit/Enh (6490)	90	12	4	15.964	3	Negative
Perfluorododecanoic acid (PFDoA)	No	613	Unit/Enh (6490)	168.7	Unit/Enh (6490)	90	28	4	15.964	3	Negative
Perfluoroheptanoic acid (PFHpA)	No	363	Unit/Enh (6490)	318.8	Unit/Enh (6490)	90	8	4	11.968	3	Negative
Perfluoroheptanoic acid (PFHpA)	No	363	Unit/Enh (6490)	168.9	Unit/Enh (6490)	90	16	4	11.968	3	Negative
Perfluorohexanesulfonic acid (PFHxS)	No	398.9	Unit/Enh (6490)	98.9	Unit/Enh (6490)	150	40	4	12.015	3	Negative
Perfluorohexanesulfonic acid (PFHxS)	No	398.9	Unit/Enh (6490)	79.9	Unit/Enh (6490)	150	44	4	12.015	3	Negative
Perfluorohexanoic acid (PFHxA)	No	313	Unit/Enh (6490)	268.9	Unit/Enh (6490)	70	4	4	10.595	3	Negative
Perfluorohexanoic acid (PFHxA)	No	313	Unit/Enh (6490)	119	Unit/Enh (6490)	70	20	4	10.595	3	Negative
Perfluorononanoic acid (PFNA)	No	463	Unit/Enh (6490)	418.8	Unit/Enh (6490)	90	8	4	14.002	3	Negative
Perfluorononanoic acid (PFNA)	No	463	Unit/Enh (6490)	218.8	Unit/Enh (6490)	90	16	4	14.002	3	Negative
Perfluorooctanesulfonic acid (PFOS)	No	498.9	Unit/Enh (6490)	98.9	Unit/Enh (6490)	150	44	4	14.01	3	Negative
Perfluorooctanesulfonic acid (PFOS)	No	498.9	Unit/Enh (6490)	79.9	Unit/Enh (6490)	150	84	4	14.01	3	Negative
Perfluorooctanoic acid (PFOA)	No	413	Unit/Enh (6490)	368.8	Unit/Enh (6490)	90	8	4	13.067	3	Negative
Perfluorooctanoic acid (PFOA)	No	413	Unit/Enh (6490)	168.9	Unit/Enh (6490)	90	16	4	13.067	3	Negative
Perfluorotetradecanoic acid (PFTA)	No	713	Unit/Enh (6490)	669	Unit/Enh (6490)	110	12	4	16.843	3	Negative
Perfluorotetradecanoic acid (PFTA)	No	713	Unit/Enh (6490)	168.8	Unit/Enh (6490)	110	28	4	16.843	3	Negative
Perfluorotridecanoic acid (PFTrDA)	No	663	Unit/Enh (6490)	618.8	Unit/Enh (6490)	90	12	4	16.433	3	Negative
Perfluoroundecanoic acid (PFUnA)	No	563	Unit/Enh (6490)	519	Unit/Enh (6490)	90	8	4	15.421	3	Negative
Perfluoroundecanoic acid (PFUnA)	No	563	Unit/Enh (6490)	169	Unit/Enh (6490)	90	24	4	15.421	3	Negative

Scan Parameters

Data Stg	Threshold
Centroid	0

Report generation date: 05-Apr-2021 07:54:20 AM

Acquisition Method Report

Source Parameters

Parameter	Value (+)	Value (-)
Gas Temp (°C)	230	230
Gas Flow (l/min)	5	5
Nebulizer (psi)	15	15
SheathGasHeater	350	350
SheathGasFlow	12	12
Capillary (V)	3500	2500
VCharging	500	0

Chromatograms

Chrom Type	Label	Offset	Y-Range
TIC	TIC	0	10000000

Instrument Curves

Actual

Name: Multisampler — **Module: G7167A**

Sampling Speed	
Draw Speed	100.0 µL/min
Eject Speed	400.0 µL/min
Wait Time After Drawing	1.2 s
Injection	
Needle Wash Mode	Standard Wash
Injection Volume	5.00 µL
Standard Needle Wash	
Needle Wash Mode	Flush Port
Duration	10 s
High Throughput	
Injection Valve to Bypass for Delay Volume Reduction	No
Sample Flush-Out Factor	5.0
Overlapped Injection	
Overlap Injection Enabled	No
Needle Height Position	
Draw Position Offset	1.5 mm
Use Vial/Well Bottom Sensing	Yes
Stop Time	
Stoptime Mode	No Limit
Post Time	
Posttime Mode	Off

Name: Binary Pump — **Module: G7112B**

Flow	0.400 mL/min
Use Solvent Types	No
Low Pressure Limit	0.00 bar
High Pressure Limit	600.00 bar
Maximum Flow Gradient	100.000 mL/min²
Stroke A	
Automatic Stroke Calculation A	Yes
Stroke B	
Automatic Stroke Calculation B	Yes
Compress A	
Compressibility Mode A	Compressibility Value Set
Compressibility A	70 10e-6/bar
Compress B	
Compressibility Mode B	Compressibility Value Set
Compressibility B	90 10e-6/bar
Stop Time	
Stoptime Mode	Time set

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ATTACHMENT F

Laboratory ELAP Certification

LANGAN

ATTACHMENT F

ELAP Certification
(York Analytical Laboratories, Inc.)

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2022
Issued April 01, 2021

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MR. ROBERT Q. BRADLEY
YORK ANALYTICAL LABORATORIES INC
120 RESEARCH DRIVE
STRATFORD, CT 06615

NY Lab Id No: 10854

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2016) for the category ENVIRONMENTAL ANALYSES NON POTABLE WATER
All approved analytes are listed below:

Acrylates	
Acrolein (Propenal)	EPA 8260D
	EPA 8260C
	EPA 624.1
Acrylonitrile	EPA 8260D
	EPA 8260C
	EPA 624.1
Methyl methacrylate	EPA 8260D
	EPA 8260C
Amines	
1,2-Diphenylhydrazine	EPA 8270D
	EPA 8270E
2-Nitroaniline	EPA 8270D
	EPA 8270E
3-Nitroaniline	EPA 8270D
	EPA 8270E
4-Chloroaniline	EPA 8270D
	EPA 8270E
4-Nitroaniline	EPA 8270D
	EPA 8270E
Aniline	EPA 625.1
	EPA 8270D
	EPA 8270E
Carbazole	EPA 625.1
	EPA 8270D
	EPA 8270E
Amines	
Diphenylamine	EPA 8270D
	EPA 8270E
Pyridine	EPA 625.1
	EPA 8270D
	EPA 8270E
Benzidines	
3,3'-Dichlorobenzidine	EPA 625.1
	EPA 8270D
	EPA 8270E
Benzidine	EPA 625.1
	EPA 8270D
	EPA 8270E
Chlorinated Hydrocarbon Pesticides	
4,4'-DDD	EPA 8081B
	EPA 608.3
4,4'-DDE	EPA 8081B
	EPA 608.3
4,4'-DDT	EPA 8081B
	EPA 608.3
Aldrin	EPA 8081B
	EPA 608.3
alpha-BHC	EPA 8081B
	EPA 608.3
alpha-Chlordane	EPA 8081B
beta-BHC	EPA 8081B

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Chlorinated Hydrocarbon Pesticides	
beta-BHC	EPA 608.3
Chlordane Total	EPA 8081B
	EPA 608.3
delta-BHC	EPA 8081B
	EPA 608.3
Dieldrin	EPA 8081B
	EPA 608.3
Endosulfan I	EPA 8081B
	EPA 608.3
Endosulfan II	EPA 8081B
	EPA 608.3
Endosulfan sulfate	EPA 8081B
	EPA 608.3
Endrin	EPA 8081B
	EPA 608.3
Endrin aldehyde	EPA 8081B
	EPA 608.3
Endrin Ketone	EPA 8081B
gamma-Chlordane	EPA 8081B
Heptachlor	EPA 8081B
	EPA 608.3
Heptachlor epoxide	EPA 8081B
	EPA 608.3
Lindane	EPA 8081B
	EPA 608.3
Methoxychlor	EPA 8081B

Chlorinated Hydrocarbon Pesticides	
Methoxychlor	EPA 608.3
Mirex	EPA 8081B
Toxaphene	EPA 8081B
	EPA 608.3

Chlorinated Hydrocarbons	
1,2,3-Trichlorobenzene	EPA 8260D
	EPA 8260C
1,2,4,5-Tetrachlorobenzene	EPA 8270D
	EPA 8270E
1,2,4-Trichlorobenzene	EPA 625.1
	EPA 8270D
	EPA 8270E
2-Chloronaphthalene	EPA 625.1
	EPA 8270D
	EPA 8270E
Hexachlorobenzene	EPA 625.1
	EPA 8270D
	EPA 8270E
Hexachlorobutadiene	EPA 625.1
	EPA 8270D
	EPA 8270E
Hexachlorocyclopentadiene	EPA 625.1
	EPA 8270D
	EPA 8270E
Hexachloroethane	EPA 625.1

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Chlorinated Hydrocarbons	
Hexachloroethane	EPA 8270D
	EPA 8270E
Pentachlorobenzene	EPA 8270D
	EPA 8270E
Chlorophenoxy Acid Pesticides	
2,4,5-T	EPA 8151A
2,4,5-TP (Silvex)	EPA 8151A
	SM 6640B-2006
2,4-D	EPA 8151A
Dicamba	EPA 8151A
Demand	
Biochemical Oxygen Demand	SM 5210B-2011
Carbonaceous BOD	SM 5210B-2011
Chemical Oxygen Demand	SM 5220D-2011
Fuel Oxygenates	
Di-isopropyl ether	EPA 8260D
	EPA 8260C
Ethanol	EPA 8260D
	EPA 8260C
Methyl tert-butyl ether	EPA 8260D
	EPA 8260C
tert-amyl alcohol	EPA 8260D
	EPA 8260C
tert-amyl methyl ether (TAME)	EPA 8260D

Fuel Oxygenates	
tert-amyl methyl ether (TAME)	EPA 8260C
tert-butyl alcohol	EPA 8260D
	EPA 8260C
tert-butyl ethyl ether (ETBE)	EPA 8260D
	EPA 8260C
Haloethers	
2,2'-Oxybis(1-chloropropane)	EPA 625.1
	EPA 8270D
	EPA 8270E
4-Bromophenylphenyl ether	EPA 625.1
	EPA 8270D
	EPA 8270E
4-Chlorophenylphenyl ether	EPA 625.1
	EPA 8270D
	EPA 8270E
Bis(2-chloroethoxy)methane	EPA 625.1
	EPA 8270D
	EPA 8270E
Bis(2-chloroethyl)ether	EPA 625.1
	EPA 8270D
	EPA 8270E
Low Level Halocarbons	
1,2,3-Trichloropropane, Low Level	EPA 8011
1,2-Dibromo-3-chloropropane, Low Level	EPA 8011
1,2-Dibromoethane, Low Level	EPA 8011

Serial No.: 62804

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Low Level Polynuclear Aromatics	
Acenaphthene Low Level	EPA 8270D
	EPA 8270E
	EPA 8270E SIM
Acenaphthylene Low Level	EPA 8270D
	EPA 8270E
	EPA 8270E SIM
Anthracene Low Level	EPA 8270D
	EPA 8270E
	EPA 8270E SIM
Benzo(a)anthracene Low Level	EPA 8270D
	EPA 8270E
	EPA 8270E SIM
Benzo(a)pyrene Low Level	EPA 8270D
	EPA 8270E
	EPA 8270E SIM
Benzo(b)fluoranthene Low Level	EPA 8270D
	EPA 8270E
	EPA 8270E SIM
Benzo(g,h,i)perylene Low Level	EPA 8270D
	EPA 8270E
	EPA 8270E SIM
Benzo(k)fluoranthene Low Level	EPA 8270D
	EPA 8270E
	EPA 8270E SIM
Chrysene Low Level	EPA 8270D
	EPA 8270E

Low Level Polynuclear Aromatics	
Chrysene Low Level	EPA 8270E SIM
Dibenzo(a,h)anthracene Low Level	EPA 8270D
	EPA 8270E
	EPA 8270E SIM
Fluoranthene Low Level	EPA 8270D
	EPA 8270E
	EPA 8270E SIM
Fluorene Low Level	EPA 8270D
	EPA 8270E
	EPA 8270E SIM
Indeno(1,2,3-cd)pyrene Low Level	EPA 8270D
	EPA 8270E
	EPA 8270E SIM
Naphthalene Low Level	EPA 8270D
	EPA 8270E
	EPA 8270E SIM
Phenanthrene Low Level	EPA 8270D
	EPA 8270E
	EPA 8270E SIM
Pyrene Low Level	EPA 8270D
	EPA 8270E
	EPA 8270E SIM
Metals I	
Barium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C

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Metals I	
Barium, Total	EPA 6010D
	EPA 6020A
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Cadmium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Calcium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
Chromium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Copper, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Iron, Total	EPA 200.7, Rev. 4.4 (1994)

Metals I	
Iron, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Lead, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Magnesium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
Manganese, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Nickel, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)

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All approved analytes are listed below:

Metals I

Potassium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
Silver, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Sodium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D

Metals II

Aluminum, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Antimony, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)

Metals II

Arsenic, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Beryllium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Chromium VI	EPA 7196A
	SM 3500-Cr B-2011
Mercury, Total	EPA 245.1, Rev. 3.0 (1994)
	EPA 245.2 (Issued 1974, Rev. 1
	EPA 7470A
	EPA 7473
Selenium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Vanadium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C

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Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MR. ROBERT Q. BRADLEY
YORK ANALYTICAL LABORATORIES INC
120 RESEARCH DRIVE
STRATFORD, CT 06615

NY Lab Id No: 10854

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2016) for the category ENVIRONMENTAL ANALYSES NON POTABLE WATER
All approved analytes are listed below:

Metals II	
Vanadium, Total	EPA 6010D
	EPA 6020A
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Zinc, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Metals III	
Cobalt, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Molybdenum, Total	EPA 6020A
	EPA 200.8, Rev. 5.4 (1994)
Thallium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Metals III	
Tin, Total	EPA 6020A
	EPA 200.8, Rev. 5.4 (1994)
Titanium, Total	EPA 6020A
	EPA 200.8, Rev. 5.4 (1994)
Mineral	
Alkalinity	SM 2320B-2011
Calcium Hardness	EPA 200.7, Rev. 4.4 (1994)
Chloride	EPA 300.0, Rev. 2.1 (1993)
Fluoride, Total	EPA 300.0, Rev. 2.1 (1993)
Hardness, Total	EPA 200.7, Rev. 4.4 (1994)
Sulfate (as SO4)	EPA 300.0, Rev. 2.1 (1993)
Miscellaneous	
Boron, Total	EPA 6020A
	EPA 200.8, Rev. 5.4 (1994)
Bromide	EPA 300.0, Rev. 2.1 (1993)
Color	SM 2120B-2011
Cyanide, Total	SM 4500-CN E-2011
Oil and Grease Total Recoverable (HEM)	EPA 1664A
Organic Carbon, Total	SM 5310C-2011
Phenols	EPA 420.1 (Rev. 1978)
Specific Conductance	EPA 120.1 (Rev. 1982)
Sulfide (as S)	SM 4500-S2- F-2011
Surfactant (MBAS)	SM 5540C-2011
Turbidity	EPA 180.1, Rev. 2.0 (1993)

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Nitroaromatics and Isophorone	
2,4-Dinitrotoluene	EPA 625.1
	EPA 8270D
	EPA 8270E
2,6-Dinitrotoluene	EPA 625.1
	EPA 8270D
	EPA 8270E
Isophorone	EPA 625.1
	EPA 8270D
	EPA 8270E
Nitrobenzene	EPA 625.1
	EPA 8270D
	EPA 8270E
Nitrosoamines	
N-Nitrosodimethylamine	EPA 625.1
	EPA 8270D
	EPA 8270E
N-Nitrosodi-n-propylamine	EPA 625.1
	EPA 8270D
	EPA 8270E
N-Nitrosodiphenylamine	EPA 625.1
	EPA 8270D
	EPA 8270E
Nutrient	
Ammonia (as N)	SM 4500-NH3 D-2011 or E-2011
Kjeldahl Nitrogen, Total	SM 4500-N Org D-2011
Nutrient	
Kjeldahl Nitrogen, Total	SM 4500-NH3 D-2011 or E-2011
Nitrate (as N)	EPA 300.0, Rev. 2.1 (1993)
Nitrate-Nitrite (as N)	EPA 300.0, Rev. 2.1 (1993)
Nitrite (as N)	EPA 300.0, Rev. 2.1 (1993)
Orthophosphate (as P)	EPA 300.0, Rev. 2.1 (1993)
	SM 4500-P E-2011
Phosphorus, Total	SM 4500-P E-2011
Organophosphate Pesticides	
Atrazine	EPA 8270D
	EPA 8270E
Parathion ethyl	EPA 8270D
	EPA 8270E
Petroleum Hydrocarbons	
Diesel Range Organics	EPA 8015D
Gasoline Range Organics	EPA 8015D
Phthalate Esters	
Benzyl butyl phthalate	EPA 625.1
	EPA 8270D
	EPA 8270E
Bis(2-ethylhexyl) phthalate	EPA 625.1
	EPA 8270D
	EPA 8270E
Diethyl phthalate	EPA 625.1
	EPA 8270D

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Phthalate Esters	
Diethyl phthalate	EPA 8270E
Dimethyl phthalate	EPA 625.1
	EPA 8270D
	EPA 8270E
Di-n-butyl phthalate	EPA 625.1
	EPA 8270D
	EPA 8270E
Di-n-octyl phthalate	EPA 625.1
	EPA 8270D
	EPA 8270E
Polychlorinated Biphenyls	
Aroclor 1016 (PCB-1016)	EPA 8082A
	EPA 608.3
Aroclor 1221 (PCB-1221)	EPA 8082A
	EPA 608.3
Aroclor 1232 (PCB-1232)	EPA 8082A
	EPA 608.3
Aroclor 1242 (PCB-1242)	EPA 8082A
	EPA 608.3
Aroclor 1248 (PCB-1248)	EPA 8082A
	EPA 608.3
Aroclor 1254 (PCB-1254)	EPA 8082A
	EPA 608.3
Aroclor 1260 (PCB-1260)	EPA 8082A
	EPA 608.3

Polychlorinated Biphenyls	
Aroclor 1262 (PCB-1262)	EPA 8082A
Aroclor 1268 (PCB-1268)	EPA 8082A
Polynuclear Aromatics	
Acenaphthene	EPA 625.1
	EPA 8270D
	EPA 8270E
Acenaphthylene	EPA 625.1
	EPA 8270D
	EPA 8270E
Anthracene	EPA 625.1
	EPA 8270D
	EPA 8270E
Benzo(a)anthracene	EPA 625.1
	EPA 8270D
	EPA 8270E
Benzo(a)pyrene	EPA 625.1
	EPA 8270D
	EPA 8270E
Benzo(b)fluoranthene	EPA 625.1
	EPA 8270D
	EPA 8270E
Benzo(g,h,i)perylene	EPA 625.1
	EPA 8270D
	EPA 8270E
Benzo(k)fluoranthene	EPA 625.1

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Polynuclear Aromatics		Priority Pollutant Phenols	
Benzo(k)fluoranthene	EPA 8270D	2,3,4,6 Tetrachlorophenol	EPA 8270D
	EPA 8270E		EPA 8270E
Chrysene	EPA 625.1	2,4,5-Trichlorophenol	EPA 625.1
	EPA 8270D		EPA 8270D
	EPA 8270E		EPA 8270E
Dibenzo(a,h)anthracene	EPA 625.1	2,4,6-Trichlorophenol	EPA 625.1
	EPA 8270D		EPA 8270D
	EPA 8270E		EPA 8270E
Fluoranthene	EPA 625.1	2,4-Dichlorophenol	EPA 625.1
	EPA 8270D		EPA 8270D
	EPA 8270E		EPA 8270E
Fluorene	EPA 625.1	2,4-Dimethylphenol	EPA 625.1
	EPA 8270D		EPA 8270D
	EPA 8270E		EPA 8270E
Indeno(1,2,3-cd)pyrene	EPA 625.1	2,4-Dinitrophenol	EPA 625.1
	EPA 8270D		EPA 8270D
	EPA 8270E		EPA 8270E
Naphthalene	EPA 625.1	2-Chlorophenol	EPA 625.1
	EPA 8270D		EPA 8270D
	EPA 8270E		EPA 8270E
Phenanthrene	EPA 625.1	2-Methyl-4,6-dinitrophenol	EPA 625.1
	EPA 8270D		EPA 8270D
	EPA 8270E		EPA 8270E
Pyrene	EPA 625.1	2-Methylphenol	EPA 625.1
	EPA 8270D		EPA 8270D
	EPA 8270E		EPA 8270E

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Priority Pollutant Phenols	
2-Nitrophenol	EPA 625.1
	EPA 8270D
	EPA 8270E
4-Chloro-3-methylphenol	EPA 625.1
	EPA 8270D
	EPA 8270E
4-Methylphenol	EPA 625.1
	EPA 8270D
	EPA 8270E
4-Nitrophenol	EPA 625.1
	EPA 8270D
	EPA 8270E
Cresols, Total	EPA 8270D
	EPA 8270E
Pentachlorophenol	EPA 625.1
	EPA 8270D
	EPA 8270E
Phenol	EPA 625.1
	EPA 8270D
	EPA 8270E

Residue	
Settleable Solids	SM 2540 F-2011
Solids, Total	SM 2540 B-2011
Solids, Total Dissolved	SM 2540 C-2011
Solids, Total Suspended	SM 2540 D-2011

Semi-Volatile Organics	
1,1'-Biphenyl	EPA 8270D
	EPA 8270E
1,2-Dichlorobenzene, Semi-volatile	EPA 8270D
	EPA 8270E
1,3-Dichlorobenzene, Semi-volatile	EPA 8270D
	EPA 8270E
1,4-Dichlorobenzene, Semi-volatile	EPA 8270D
	EPA 8270E
2-Methylnaphthalene	EPA 8270D
	EPA 8270E
Acetophenone	EPA 8270D
	EPA 8270E
alpha-Terpineol	EPA 625.1
	EPA 8270E
Benzaldehyde	EPA 8270D
	EPA 8270E
Benzoic Acid	EPA 8270D
	EPA 8270E
Benzyl alcohol	EPA 8270D
	EPA 8270E
Caprolactam	EPA 8270D
	EPA 8270E
Dibenzofuran	EPA 8270D
	EPA 8270E

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Volatile Aromatics	
1,2,4-Trichlorobenzene, Volatile	EPA 8260D
	EPA 8260C
1,2,4-Trimethylbenzene	EPA 8260D
	EPA 8260C
1,2-Dichlorobenzene	EPA 8260D
	EPA 8260C
	EPA 624.1
1,3,5-Trimethylbenzene	EPA 8260D
	EPA 8260C
1,3-Dichlorobenzene	EPA 8260D
	EPA 8260C
	EPA 624.1
1,4-Dichlorobenzene	EPA 8260D
	EPA 8260C
	EPA 624.1
2-Chlorotoluene	EPA 8260D
	EPA 8260C
4-Chlorotoluene	EPA 8260D
	EPA 8260C
Benzene	EPA 8260D
	EPA 8260C
	EPA 624.1
Bromobenzene	EPA 8260D
	EPA 8260C
Chlorobenzene	EPA 8260D
	EPA 8260C

Volatile Aromatics	
Chlorobenzene	EPA 624.1
Ethyl benzene	EPA 8260D
	EPA 8260C
	EPA 624.1
Isopropylbenzene	EPA 8260D
	EPA 8260C
m/p-Xylenes	EPA 8260D
	EPA 8260C
	EPA 624.1
Naphthalene, Volatile	EPA 8260D
	EPA 8260C
n-Butylbenzene	EPA 8260D
	EPA 8260C
n-Propylbenzene	EPA 8260D
	EPA 8260C
o-Xylene	EPA 8260D
	EPA 8260C
	EPA 624.1
p-Isopropyltoluene (P-Cymene)	EPA 8260D
	EPA 8260C
sec-Butylbenzene	EPA 8260D
	EPA 8260C
Styrene	EPA 8260D
	EPA 8260C
	EPA 624.1
tert-Butylbenzene	EPA 8260D

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Volatile Aromatics	
tert-Butylbenzene	EPA 8260C
Toluene	EPA 8260D
	EPA 8260C
	EPA 624.1
Total Xylenes	EPA 8260D
	EPA 8260C
	EPA 624.1
Volatile Halocarbons	
1,1,1,2-Tetrachloroethane	EPA 8260D
	EPA 8260C
1,1,1-Trichloroethane	EPA 8260D
	EPA 8260C
	EPA 624.1
1,1,2,2-Tetrachloroethane	EPA 8260D
	EPA 8260C
	EPA 624.1
1,1,2-Trichloro-1,2,2-Trifluoroethane	EPA 8260D
	EPA 8260C
1,1,2-Trichloroethane	EPA 8260D
	EPA 8260C
	EPA 624.1
1,1-Dichloroethane	EPA 8260D
	EPA 8260C
	EPA 624.1
1,1-Dichloroethene	EPA 8260D

Volatile Halocarbons	
1,1-Dichloroethene	EPA 8260C
	EPA 624.1
1,1-Dichloropropene	EPA 8260D
	EPA 8260C
1,2,3-Trichloropropane	EPA 8260D
	EPA 8260C
1,2-Dibromo-3-chloropropane	EPA 8260D
	EPA 8260C
1,2-Dibromoethane	EPA 8260D
	EPA 8260C
1,2-Dichloroethane	EPA 8260D
	EPA 8260C
	EPA 624.1
1,2-Dichloropropane	EPA 8260D
	EPA 8260C
	EPA 624.1
1,3-Dichloropropane	EPA 8260D
	EPA 8260C
2,2-Dichloropropane	EPA 8260D
	EPA 8260C
2-Chloroethylvinyl ether	EPA 8260D
	EPA 8260C
	EPA 624.1
Bromochloromethane	EPA 8260D
	EPA 8260C
Bromodichloromethane	EPA 8260D

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Volatile Halocarbons	
Bromodichloromethane	EPA 8260C
	EPA 624.1
Bromoform	EPA 8260D
	EPA 8260C
	EPA 624.1
Bromomethane	EPA 8260D
	EPA 8260C
	EPA 624.1
Carbon tetrachloride	EPA 8260D
	EPA 8260C
	EPA 624.1
Chloroethane	EPA 8260D
	EPA 8260C
	EPA 624.1
Chloroform	EPA 8260D
	EPA 8260C
	EPA 624.1
Chloromethane	EPA 8260D
	EPA 8260C
	EPA 624.1
cis-1,2-Dichloroethene	EPA 8260D
	EPA 8260C
	EPA 624.1
cis-1,3-Dichloropropene	EPA 8260D
	EPA 8260C
	EPA 624.1

Volatile Halocarbons	
Dibromochloromethane	EPA 8260D
	EPA 8260C
	EPA 624.1
Dibromomethane	EPA 8260D
	EPA 8260C
Dichlorodifluoromethane	EPA 8260D
	EPA 8260C
	EPA 624.1
Hexachlorobutadiene, Volatile	EPA 8260D
	EPA 8260C
Methylene chloride	EPA 8260D
	EPA 8260C
	EPA 624.1
Tetrachloroethene	EPA 8260D
	EPA 8260C
	EPA 624.1
trans-1,2-Dichloroethene	EPA 8260D
	EPA 8260C
	EPA 624.1
trans-1,3-Dichloropropene	EPA 8260D
	EPA 8260C
	EPA 624.1
trans-1,4-Dichloro-2-butene	EPA 8260D
	EPA 8260C
Trichloroethene	EPA 8260D
	EPA 8260C

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Volatile Halocarbons	
Trichloroethene	EPA 624.1
Trichlorofluoromethane	EPA 8260D
	EPA 8260C
	EPA 624.1
Vinyl chloride	EPA 8260D
	EPA 8260C
	EPA 624.1
Volatiles Organics	
1,4-Dioxane	EPA 8260D
	EPA 8260C
	EPA 8270D SIM
	EPA 8270E
	EPA 8270E SIM
2-Butanone (Methylethyl ketone)	EPA 8260D
	EPA 8260C
2-Hexanone	EPA 8260D
	EPA 8260C
4-Methyl-2-Pentanone	EPA 8260D
	EPA 8260C
Acetone	EPA 8260D
	EPA 8260C
Carbon Disulfide	EPA 8260D
	EPA 8260C
Cyclohexane	EPA 8260D
	EPA 8260C

Volatiles Organics	
Methyl acetate	EPA 8260D
	EPA 8260C
Methyl cyclohexane	EPA 8260D
	EPA 8260C
Vinyl acetate	EPA 8260D
	EPA 8260C
Sample Preparation Methods	
	SM 4500-P B(5)-2011
	EPA 5030C
	SM 4500-CN B-2011 and C-201
	EPA 3015A
	EPA 3010A
	EPA 3005A
	EPA 3510C
	SM 4500-N Org B-2011 or C-20

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All approved analytes are listed below:

Acrylates	
Acrolein (Propenal)	EPA 8260D
	EPA 8260C
Acrylonitrile	EPA 8260D
	EPA 8260C
Methyl methacrylate	EPA 8260D
	EPA 8260C
Amines	
1,2-Diphenylhydrazine	EPA 8270D
	EPA 8270E
2-Nitroaniline	EPA 8270D
	EPA 8270E
3-Nitroaniline	EPA 8270D
	EPA 8270E
4-Chloroaniline	EPA 8270D
	EPA 8270E
4-Nitroaniline	EPA 8270D
	EPA 8270E
Aniline	EPA 8270D
	EPA 8270E
Carbazole	EPA 8270D
	EPA 8270E
Diphenylamine	EPA 8270D
	EPA 8270E
Benzidines	
3,3'-Dichlorobenzidine	EPA 8270D

Benzidines	
3,3'-Dichlorobenzidine	EPA 8270E
Benzidine	EPA 8270D
	EPA 8270E
Characteristic Testing	
Corrosivity (pH)	EPA 9045D
Free Liquids	EPA 9095B
Ignitability	EPA 1010A
Synthetic Precipitation Leaching Proc.	EPA 1312
TCLP	EPA 1311
Chlorinated Hydrocarbon Pesticides	
4,4'-DDD	EPA 8081B
4,4'-DDE	EPA 8081B
4,4'-DDT	EPA 8081B
Aldrin	EPA 8081B
alpha-BHC	EPA 8081B
alpha-Chlordane	EPA 8081B
Atrazine	EPA 8270D
	EPA 8270E
beta-BHC	EPA 8081B
Chlordane Total	EPA 8081B
delta-BHC	EPA 8081B
Dieldrin	EPA 8081B
Endosulfan I	EPA 8081B
Endosulfan II	EPA 8081B
Endosulfan sulfate	EPA 8081B

Serial No.: 62805

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2022
Issued April 01, 2021

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MR. ROBERT Q. BRADLEY
YORK ANALYTICAL LABORATORIES INC
120 RESEARCH DRIVE
STRATFORD, CT 06615

NY Lab Id No: 10854

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2016) for the category ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved analytes are listed below:

Chlorinated Hydrocarbon Pesticides	
Endrin	EPA 8081B
Endrin aldehyde	EPA 8081B
Endrin Ketone	EPA 8081B
gamma-Chlordane	EPA 8081B
Heptachlor	EPA 8081B
Heptachlor epoxide	EPA 8081B
Lindane	EPA 8081B
Methoxychlor	EPA 8081B
Mirex	EPA 8081B
Toxaphene	EPA 8081B
Chlorinated Hydrocarbons	
1,2,3-Trichlorobenzene	EPA 8260D
	EPA 8260C
1,2,4,5-Tetrachlorobenzene	EPA 8270D
	EPA 8270E
1,2,4-Trichlorobenzene	EPA 8270D
	EPA 8270E
2-Chloronaphthalene	EPA 8270D
	EPA 8270E
Hexachlorobenzene	EPA 8270D
	EPA 8270E
Hexachlorobutadiene	EPA 8270D
	EPA 8270E
Hexachlorocyclopentadiene	EPA 8270D
	EPA 8270E
Chlorinated Hydrocarbons	
Hexachloroethane	EPA 8270D
	EPA 8270E
Chlorophenoxy Acid Pesticides	
2,4,5-T	EPA 8151A
2,4,5-TP (Silvex)	EPA 8151A
2,4-D	EPA 8151A
Dicamba	EPA 8151A
Haloethers	
2,2'-Oxybis(1-chloropropane)	EPA 8270D
	EPA 8270E
4-Bromophenylphenyl ether	EPA 8270D
	EPA 8270E
4-Chlorophenylphenyl ether	EPA 8270D
	EPA 8270E
Bis(2-chloroethoxy)methane	EPA 8270D
	EPA 8270E
Bis(2-chloroethyl)ether	EPA 8270D
	EPA 8270E
Metals I	
Barium, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
Cadmium, Total	EPA 6010C

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Metals I	
Cadmium, Total	EPA 6010D
	EPA 6020A
	EPA 6020B
Calcium, Total	EPA 6010C
	EPA 6010D
Chromium, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
Copper, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
Iron, Total	EPA 6010C
	EPA 6010D
Lead, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
Magnesium, Total	EPA 6010C
	EPA 6010D
Manganese, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
Nickel, Total	EPA 6010C

Metals I	
Nickel, Total	EPA 6010D
	EPA 6020A
	EPA 6020B
Potassium, Total	EPA 6010C
	EPA 6010D
Silver, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
Sodium, Total	EPA 6010C
	EPA 6010D
Metals II	
Aluminum, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
Antimony, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
Arsenic, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
Beryllium, Total	EPA 6010C

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Metals II	
Beryllium, Total	EPA 6010D
Chromium VI	EPA 7196A
Mercury, Total	EPA 7471B
	EPA 7473
Selenium, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
Vanadium, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
Zinc, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
Metals III	
Cobalt, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
Molybdenum, Total	EPA 6020A
Thallium, Total	EPA 6010C
	EPA 6010D
	EPA 6020A

Metals III	
Thallium, Total	EPA 6020B
Tin, Total	EPA 6020A
	EPA 6020B
Titanium, Total	EPA 6020A
Miscellaneous	
Boron, Total	EPA 6020A
	EPA 6020B
Cyanide, Total	EPA 9014
Extractable Organic Halides	EPA 9023
Nitroaromatics and Isophorone	
2,4-Dinitrotoluene	EPA 8270D
	EPA 8270E
2,6-Dinitrotoluene	EPA 8270D
	EPA 8270E
Isophorone	EPA 8270D
	EPA 8270E
Nitrobenzene	EPA 8270D
	EPA 8270E
Pyridine	EPA 8270D
	EPA 8270E
Nitrosoamines	
N-Nitrosodimethylamine	EPA 8270D
	EPA 8270E
N-Nitrosodi-n-propylamine	EPA 8270D

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Nitrosoamines	
N-Nitrosodi-n-propylamine	EPA 8270E
N-Nitrosodiphenylamine	EPA 8270D
	EPA 8270E
Organophosphate Pesticides	
Parathion ethyl	EPA 8270D
	EPA 8270E
Petroleum Hydrocarbons	
Diesel Range Organics	EPA 8015D
Gasoline Range Organics	EPA 8015D
Phthalate Esters	
Benzyl butyl phthalate	EPA 8270D
	EPA 8270E
Bis(2-ethylhexyl) phthalate	EPA 8270D
	EPA 8270E
Diethyl phthalate	EPA 8270D
	EPA 8270E
Dimethyl phthalate	EPA 8270D
	EPA 8270E
Di-n-butyl phthalate	EPA 8270D
	EPA 8270E
Di-n-octyl phthalate	EPA 8270D
	EPA 8270E
Polychlorinated Biphenyls	
Aroclor 1016 (PCB-1016)	EPA 8082A

Polychlorinated Biphenyls	
Aroclor 1016 (PCB-1016) in Oil	EPA 8082A
Aroclor 1221 (PCB-1221)	EPA 8082A
Aroclor 1221 (PCB-1221) in Oil	EPA 8082A
Aroclor 1232 (PCB-1232)	EPA 8082A
Aroclor 1232 (PCB-1232) in Oil	EPA 8082A
Aroclor 1242 (PCB-1242)	EPA 8082A
Aroclor 1242 (PCB-1242) in Oil	EPA 8082A
Aroclor 1248 (PCB-1248)	EPA 8082A
Aroclor 1248 (PCB-1248) in Oil	EPA 8082A
Aroclor 1254 (PCB-1254)	EPA 8082A
Aroclor 1254 (PCB-1254) in Oil	EPA 8082A
Aroclor 1260 (PCB-1260)	EPA 8082A
Aroclor 1260 (PCB-1260) in Oil	EPA 8082A
Aroclor 1262 (PCB-1262)	EPA 8082A
Aroclor 1262 (PCB-1262) in Oil	EPA 8082A
Aroclor 1268 (PCB-1268)	EPA 8082A
Aroclor 1268 (PCB-1268) in Oil	EPA 8082A
Polynuclear Aromatic Hydrocarbons	
Acenaphthene	EPA 8270D
	EPA 8270E
Acenaphthylene	EPA 8270D
	EPA 8270E
Anthracene	EPA 8270D
	EPA 8270E
Benzo(a)anthracene	EPA 8270D

Serial No.: 62805

Property of the New York State Department of Health. Certificates are valid only at the address shown, must be conspicuously posted, and are printed on secure paper. Continued accreditation depends on successful ongoing participation in the Program. Consumers are urged to call (518) 485-5570 to verify the laboratory's accreditation status.

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WADSWORTH CENTER

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120 RESEARCH DRIVE
STRATFORD, CT 06615

NY Lab Id No: 10854

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Polynuclear Aromatic Hydrocarbons	
Benzo(a)anthracene	EPA 8270E
Benzo(a)pyrene	EPA 8270D
	EPA 8270E
Benzo(b)fluoranthene	EPA 8270D
	EPA 8270E
Benzo(g,h,i)perylene	EPA 8270D
	EPA 8270E
Benzo(k)fluoranthene	EPA 8270D
	EPA 8270E
Chrysene	EPA 8270D
	EPA 8270E
Dibenzo(a,h)anthracene	EPA 8270D
	EPA 8270E
Fluoranthene	EPA 8270D
	EPA 8270E
Fluorene	EPA 8270D
	EPA 8270E
Indeno(1,2,3-cd)pyrene	EPA 8270D
	EPA 8270E
Naphthalene	EPA 8270D
	EPA 8270E
Phenanthrene	EPA 8270D
	EPA 8270E
Pyrene	EPA 8270D
	EPA 8270E

Priority Pollutant Phenols	
2,3,4,6 Tetrachlorophenol	EPA 8270D
	EPA 8270E
2,4,5-Trichlorophenol	EPA 8270D
	EPA 8270E
2,4,6-Trichlorophenol	EPA 8270D
	EPA 8270E
2,4-Dichlorophenol	EPA 8270D
	EPA 8270E
2,4-Dimethylphenol	EPA 8270D
	EPA 8270E
2,4-Dinitrophenol	EPA 8270D
	EPA 8270E
2-Chlorophenol	EPA 8270D
	EPA 8270E
2-Methyl-4,6-dinitrophenol	EPA 8270D
	EPA 8270E
2-Methylphenol	EPA 8270D
	EPA 8270E
2-Nitrophenol	EPA 8270D
	EPA 8270E
4-Chloro-3-methylphenol	EPA 8270D
	EPA 8270E
4-Methylphenol	EPA 8270D
	EPA 8270E
4-Nitrophenol	EPA 8270D
	EPA 8270E

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Priority Pollutant Phenols	
Pentachlorophenol	EPA 8270D
	EPA 8270E
Phenol	EPA 8270D
	EPA 8270E
Semi-Volatile Organics	
1,1'-Biphenyl	EPA 8270D
	EPA 8270E
1,2-Dichlorobenzene, Semi-volatile	EPA 8270D
	EPA 8270E
1,3-Dichlorobenzene, Semi-volatile	EPA 8270D
	EPA 8270E
1,4-Dichlorobenzene, Semi-volatile	EPA 8270D
	EPA 8270E
2-Methylnaphthalene	EPA 8270D
	EPA 8270E
Acetophenone	EPA 8270D
	EPA 8270E
Benzaldehyde	EPA 8270D
	EPA 8270E
Benzoic Acid	EPA 8270D
	EPA 8270E
Benzyl alcohol	EPA 8270D
	EPA 8270E
Caprolactam	EPA 8270D
	EPA 8270E
Semi-Volatile Organics	
Dibenzofuran	EPA 8270D
	EPA 8270E
Volatile Aromatics	
1,2,4-Trichlorobenzene, Volatile	EPA 8260D
	EPA 8260C
1,2,4-Trimethylbenzene	EPA 8260D
	EPA 8260C
1,2-Dichlorobenzene	EPA 8260D
	EPA 8260C
1,3,5-Trimethylbenzene	EPA 8260D
	EPA 8260C
1,3-Dichlorobenzene	EPA 8260D
	EPA 8260C
1,4-Dichlorobenzene	EPA 8260D
	EPA 8260C
2-Chlorotoluene	EPA 8260D
	EPA 8260C
4-Chlorotoluene	EPA 8260D
	EPA 8260C
Benzene	EPA 8260D
	EPA 8260C
Bromobenzene	EPA 8260D
	EPA 8260C
Chlorobenzene	EPA 8260D
	EPA 8260C

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Volatile Aromatics	
Ethyl benzene	EPA 8260D
	EPA 8260C
Isopropylbenzene	EPA 8260D
	EPA 8260C
m/p-Xylenes	EPA 8260D
	EPA 8260C
Naphthalene, Volatile	EPA 8260D
	EPA 8260C
n-Butylbenzene	EPA 8260D
	EPA 8260C
n-Propylbenzene	EPA 8260D
	EPA 8260C
o-Xylene	EPA 8260D
	EPA 8260C
p-Isopropyltoluene (P-Cymene)	EPA 8260D
	EPA 8260C
sec-Butylbenzene	EPA 8260D
	EPA 8260C
Styrene	EPA 8260D
	EPA 8260C
tert-Butylbenzene	EPA 8260D
	EPA 8260C
Toluene	EPA 8260D
	EPA 8260C
Total Xylenes	EPA 8260D
	EPA 8260C

Volatile Halocarbons	
1,1,1,2-Tetrachloroethane	EPA 8260D
	EPA 8260C
1,1,1-Trichloroethane	EPA 8260D
	EPA 8260C
1,1,2,2-Tetrachloroethane	EPA 8260D
	EPA 8260C
1,1,2-Trichloro-1,2,2-Trifluoroethane	EPA 8260D
	EPA 8260C
1,1,2-Trichloroethane	EPA 8260D
	EPA 8260C
1,1-Dichloroethane	EPA 8260D
	EPA 8260C
1,1-Dichloroethene	EPA 8260D
	EPA 8260C
1,1-Dichloropropene	EPA 8260D
	EPA 8260C
1,2,3-Trichloropropane	EPA 8260D
	EPA 8260C
1,2-Dibromo-3-chloropropane	EPA 8260D
	EPA 8260C
1,2-Dibromoethane	EPA 8260D
	EPA 8260C
1,2-Dichloroethane	EPA 8260D
	EPA 8260C
1,2-Dichloropropane	EPA 8260D
	EPA 8260C

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All approved analytes are listed below:

Volatile Halocarbons		**Volatile Halocarbons**	
1,3-Dichloropropane	EPA 8260D	Dibromochloromethane	EPA 8260D
	EPA 8260C		EPA 8260C
2,2-Dichloropropane	EPA 8260D	Dibromomethane	EPA 8260D
	EPA 8260C		EPA 8260C
2-Chloroethylvinyl ether	EPA 8260D	Dichlorodifluoromethane	EPA 8260D
	EPA 8260C		EPA 8260C
Bromochloromethane	EPA 8260D	Hexachlorobutadiene, Volatile	EPA 8260D
	EPA 8260C		EPA 8260C
Bromodichloromethane	EPA 8260D	Methylene chloride	EPA 8260D
	EPA 8260C		EPA 8260C
Bromoform	EPA 8260D	Tetrachloroethene	EPA 8260D
	EPA 8260C		EPA 8260C
Bromomethane	EPA 8260D	trans-1,2-Dichloroethene	EPA 8260D
	EPA 8260C		EPA 8260C
Carbon tetrachloride	EPA 8260D	trans-1,3-Dichloropropene	EPA 8260D
	EPA 8260C		EPA 8260C
Chloroethane	EPA 8260D	Trichloroethene	EPA 8260D
	EPA 8260C		EPA 8260C
Chloroform	EPA 8260D	Trichlorofluoromethane	EPA 8260D
	EPA 8260C		EPA 8260C
Chloromethane	EPA 8260D	Vinyl chloride	EPA 8260D
	EPA 8260C		EPA 8260C
cis-1,2-Dichloroethene	EPA 8260D	**Volatile Organics**	
	EPA 8260C	1,4-Dioxane	EPA 8260D
cis-1,3-Dichloropropene	EPA 8260D		EPA 8260C
	EPA 8260C		

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All approved analytes are listed below:

Volatile Organics		Sample Preparation Methods
1,4-Dioxane	EPA 8270D SIM	EPA 5035A-L
	EPA 8270E	EPA 5035A-H
	EPA 8270E SIM	EPA 3580A
2-Butanone (Methylethyl ketone)	EPA 8260D	EPA 3010A
	EPA 8260C	EPA 3050B
2-Hexanone	EPA 8260D	EPA 3550C
	EPA 8260C	EPA 3546
4-Methyl-2-Pentanone	EPA 8260D	EPA 3545A
	EPA 8260C	EPA 3060A
Acetone	EPA 8260D	EPA 9010C
	EPA 8260C	
Carbon Disulfide	EPA 8260D	
	EPA 8260C	
Cyclohexane	EPA 8260D	
	EPA 8260C	
Methyl acetate	EPA 8260D	
	EPA 8260C	
Methyl cyclohexane	EPA 8260D	
	EPA 8260C	
Methyl tert-butyl ether	EPA 8260D	
	EPA 8260C	
tert-butyl alcohol	EPA 8260D	
	EPA 8260C	
Vinyl acetate	EPA 8260D	
	EPA 8260C	

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ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved subcategories and/or analytes are listed below:

Miscellaneous

Lead in Dust Wipes	EPA 6010C
Lead in Paint	EPA 6010C

Sample Preparation Methods

EPA 3050B

NEW YORK STATE OF OPPORTUNITY. Department of Health

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MR. JON WALSH
YORK ANALYTICAL LABORATORIES, INC. (II)
132-02 89TH AVENUE SUITE 217
RICHMOND HILL, NY 11418

NY Lab Id No: 12058

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2016) for the category ENVIRONMENTAL ANALYSES AIR AND EMISSIONS
All approved analytes are listed below:

Acrylates	
Acrylonitrile	EPA TO-15
Methyl methacrylate	EPA TO-15
Chlorinated Hydrocarbons	
1,2,4-Trichlorobenzene	EPA TO-15
Hexachlorobutadiene	EPA TO-15
Hexachloroethane	EPA TO-15
Purgeable Aromatics	
1,2,4-Trimethylbenzene	EPA TO-15
1,2-Dichlorobenzene	EPA TO-15
1,3,5-Trimethylbenzene	EPA TO-15
1,3-Dichlorobenzene	EPA TO-15
1,4-Dichlorobenzene	EPA TO-15
Benzene	EPA TO-15
Chlorobenzene	EPA TO-15
Ethyl benzene	EPA TO-15
Isopropylbenzene	EPA TO-15
m/p-Xylenes	EPA TO-15
o-Xylene	EPA TO-15
Styrene	EPA TO-15
Toluene	EPA TO-15
Total Xylenes	EPA TO-15
Purgeable Halocarbons	
1,1,1-Trichloroethane	EPA TO-15
1,1,2,2-Tetrachloroethane	EPA TO-15
Purgeable Halocarbons	
1,1,2-Trichloro-1,2,2-Trifluoroethane	EPA TO-15
1,1,2-Trichloroethane	EPA TO-15
1,1-Dichloroethane	EPA TO-15
1,1-Dichloroethene	EPA TO-15
1,2-Dibromoethane	EPA TO-15
1,2-Dichloroethane	EPA TO-15
1,2-Dichloropropane	EPA TO-15
3-Chloropropene (Allyl chloride)	EPA TO-15
Bromodichloromethane	EPA TO-15
Bromoform	EPA TO-15
Bromomethane	EPA TO-15
Carbon tetrachloride	EPA TO-15
Chloroethane	EPA TO-15
Chloroform	EPA TO-15
Chloromethane	EPA TO-15
cis-1,2-Dichloroethene	EPA TO-15
cis-1,3-Dichloropropene	EPA TO-15
Dibromochloromethane	EPA TO-15
Dichlorodifluoromethane	EPA TO-15
Methylene chloride	EPA TO-15
Tetrachloroethene	EPA TO-15
trans-1,2-Dichloroethene	EPA TO-15
trans-1,3-Dichloropropene	EPA TO-15
Trichloroethene	EPA TO-15
Trichlorofluoromethane	EPA TO-15
Vinyl bromide	EPA TO-15

Serial No.: 63316

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

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Issued April 01, 2021

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MR. JON WALSH
YORK ANALYTICAL LABORATORIES, INC. (II)
132-02 89TH AVENUE SUITE 217
RICHMOND HILL, NY 11418

NY Lab Id No: 12058

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2016) for the category ENVIRONMENTAL ANALYSES AIR AND EMISSIONS
All approved analytes are listed below:

Purgeable Halocarbons	
Vinyl chloride	EPA TO-15
Volatile Chlorinated Organics	
Benzyl chloride	EPA TO-15
Volatile Organics	
1,2-Dichlorotetrafluoroethane	EPA TO-15
1,3-Butadiene	EPA TO-15
1,4-Dioxane	EPA TO-15
2-Butanone (Methylethyl ketone)	EPA TO-15
4-Methyl-2-Pentanone	EPA TO-15
Acetone	EPA TO-15
Carbon Disulfide	EPA TO-15
Cyclohexane	EPA TO-15
Hexane	EPA TO-15
Isopropanol	EPA TO-15
Methyl tert-butyl ether	EPA TO-15
n-Heptane	EPA TO-15
Vinyl acetate	EPA TO-15

NEW YORK STATE OF OPPORTUNITY | Department of Health

Serial No.: 63316

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NELAP RECOGNIZED TNI ACCREDITATION BODY

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All approved analytes are listed below:

Acrylates	
Acrolein (Propenal)	EPA 8260D
	EPA 8260C
Acrylonitrile	EPA 8260D
	EPA 8260C
Methyl methacrylate	EPA 8260D
	EPA 8260C
Chlorinated Hydrocarbons	
1,2,3-Trichlorobenzene	EPA 8260D
	EPA 8260C
Fuel Oxygenates	
Di-isopropyl ether	EPA 8260D
	EPA 8260C
Ethanol	EPA 8260D
	EPA 8260C
Methyl tert-butyl ether	EPA 8260D
	EPA 8260C
tert-amyl alcohol	EPA 8260D
	EPA 8260C
tert-amyl methyl ether (TAME)	EPA 8260D
	EPA 8260C
tert-butyl alcohol	EPA 8260D
	EPA 8260C
tert-butyl ethyl ether (ETBE)	EPA 8260D
	EPA 8260C
Volatile Aromatics	
1,2,4-Trichlorobenzene, Volatile	EPA 8260D
	EPA 8260C
1,2,4-Trimethylbenzene	EPA 8260D
	EPA 8260C
1,2-Dichlorobenzene	EPA 8260D
	EPA 8260C
1,3,5-Trimethylbenzene	EPA 8260D
	EPA 8260C
1,3-Dichlorobenzene	EPA 8260D
	EPA 8260C
1,4-Dichlorobenzene	EPA 8260D
	EPA 8260C
2-Chlorotoluene	EPA 8260D
	EPA 8260C
4-Chlorotoluene	EPA 8260D
	EPA 8260C
Benzene	EPA 8260D
	EPA 8260C
Bromobenzene	EPA 8260D
	EPA 8260C
Chlorobenzene	EPA 8260D
	EPA 8260C
Ethyl benzene	EPA 8260D
	EPA 8260C
Isopropylbenzene	EPA 8260D
	EPA 8260C

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All approved analytes are listed below:

Volatile Aromatics

m/p-Xylenes	EPA 8260D
	EPA 8260C
Naphthalene, Volatile	EPA 8260D
	EPA 8260C
n-Butylbenzene	EPA 8260D
	EPA 8260C
n-Propylbenzene	EPA 8260D
	EPA 8260C
o-Xylene	EPA 8260D
	EPA 8260C
p-Isopropyltoluene (P-Cymene)	EPA 8260D
	EPA 8260C
sec-Butylbenzene	EPA 8260D
	EPA 8260C
Styrene	EPA 8260D
	EPA 8260C
tert-Butylbenzene	EPA 8260D
	EPA 8260C
Toluene	EPA 8260D
	EPA 8260C
Total Xylenes	EPA 8260D
	EPA 8260C

Volatile Halocarbons

1,1,1,2-Tetrachloroethane	EPA 8260D
	EPA 8260C

Volatile Halocarbons

1,1,1-Trichloroethane	EPA 8260D
	EPA 8260C
1,1,2,2-Tetrachloroethane	EPA 8260D
	EPA 8260C
1,1,2-Trichloro-1,2,2-Trifluoroethane	EPA 8260D
	EPA 8260C
1,1,2-Trichloroethane	EPA 8260D
	EPA 8260C
1,1-Dichloroethane	EPA 8260D
	EPA 8260C
1,1-Dichloroethene	EPA 8260D
	EPA 8260C
1,1-Dichloropropene	EPA 8260D
	EPA 8260C
1,2,3-Trichloropropane	EPA 8260D
	EPA 8260C
1,2-Dibromo-3-chloropropane	EPA 8260D
	EPA 8260C
1,2-Dibromoethane	EPA 8260D
	EPA 8260C
1,2-Dichloroethane	EPA 8260D
	EPA 8260C
1,2-Dichloropropane	EPA 8260D
	EPA 8260C
1,3-Dichloropropane	EPA 8260D
	EPA 8260C

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All approved analytes are listed below:

Volatile Halocarbons		
2,2-Dichloropropane	EPA 8260D	
	EPA 8260C	
2-Chloroethylvinyl ether	EPA 8260D	
	EPA 8260C	
Bromochloromethane	EPA 8260D	
	EPA 8260C	
Bromodichloromethane	EPA 8260D	
	EPA 8260C	
Bromoform	EPA 8260D	
	EPA 8260C	
Bromomethane	EPA 8260D	
	EPA 8260C	
Carbon tetrachloride	EPA 8260D	
	EPA 8260C	
Chloroethane	EPA 8260D	
	EPA 8260C	
Chloroform	EPA 8260D	
	EPA 8260C	
Chloromethane	EPA 8260D	
	EPA 8260C	
cis-1,2-Dichloroethene	EPA 8260D	
	EPA 8260C	
cis-1,3-Dichloropropene	EPA 8260D	
	EPA 8260C	
Dibromochloromethane	EPA 8260D	
	EPA 8260C	
Volatile Halocarbons		
Dibromomethane	EPA 8260D	
	EPA 8260C	
Dichlorodifluoromethane	EPA 8260D	
	EPA 8260C	
Hexachlorobutadiene, Volatile	EPA 8260D	
	EPA 8260C	
Methylene chloride	EPA 8260D	
	EPA 8260C	
Tetrachloroethene	EPA 8260D	
	EPA 8260C	
trans-1,2-Dichloroethene	EPA 8260D	
	EPA 8260C	
trans-1,3-Dichloropropene	EPA 8260D	
	EPA 8260C	
trans-1,4-Dichloro-2-butene	EPA 8260D	
	EPA 8260C	
Trichloroethene	EPA 8260D	
	EPA 8260C	
Trichlorofluoromethane	EPA 8260D	
	EPA 8260C	
Vinyl chloride	EPA 8260D	
	EPA 8260C	
Volatiles Organics		
1,4-Dioxane	EPA 8260D	
	EPA 8260C	

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All approved analytes are listed below:

Volatiles Organics

2-Butanone (Methylethyl ketone)	EPA 8260D
	EPA 8260C
2-Hexanone	EPA 8260D
	EPA 8260C
4-Methyl-2-Pentanone	EPA 8260D
	EPA 8260C
Acetone	EPA 8260D
	EPA 8260C
Carbon Disulfide	EPA 8260D
	EPA 8260C
Cyclohexane	EPA 8260D
	EPA 8260C
Methyl acetate	EPA 8260D
	EPA 8260C
Methyl cyclohexane	EPA 8260D
	EPA 8260C
Vinyl acetate	EPA 8260D
	EPA 8260C

Sample Preparation Methods

	EPA 5030C

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All approved analytes are listed below:

Acrylates	
Acrolein (Propenal)	EPA 8260D
	EPA 8260C
Acrylonitrile	EPA 8260D
	EPA 8260C
Methyl methacrylate	EPA 8260D
	EPA 8260C
Chlorinated Hydrocarbons	
1,2,3-Trichlorobenzene	EPA 8260D
	EPA 8260C
Volatile Aromatics	
1,2,4-Trichlorobenzene, Volatile	EPA 8260D
	EPA 8260C
1,2,4-Trimethylbenzene	EPA 8260D
	EPA 8260C
1,2-Dichlorobenzene	EPA 8260D
	EPA 8260C
1,3,5-Trimethylbenzene	EPA 8260D
	EPA 8260C
1,3-Dichlorobenzene	EPA 8260D
	EPA 8260C
1,4-Dichlorobenzene	EPA 8260D
	EPA 8260C
2-Chlorotoluene	EPA 8260D
	EPA 8260C
4-Chlorotoluene	EPA 8260D

Volatile Aromatics	
4-Chlorotoluene	EPA 8260C
Benzene	EPA 8260D
	EPA 8260C
Bromobenzene	EPA 8260D
	EPA 8260C
Chlorobenzene	EPA 8260D
	EPA 8260C
Ethyl benzene	EPA 8260D
	EPA 8260C
Isopropylbenzene	EPA 8260D
	EPA 8260C
m/p-Xylenes	EPA 8260D
	EPA 8260C
Naphthalene, Volatile	EPA 8260D
	EPA 8260C
n-Butylbenzene	EPA 8260D
	EPA 8260C
n-Propylbenzene	EPA 8260D
	EPA 8260C
o-Xylene	EPA 8260D
	EPA 8260C
p-Isopropyltoluene (P-Cymene)	EPA 8260D
	EPA 8260C
sec-Butylbenzene	EPA 8260D
	EPA 8260C
Styrene	EPA 8260D

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All approved analytes are listed below:

Volatile Aromatics	
Styrene	EPA 8260C
tert-Butylbenzene	EPA 8260D
	EPA 8260C
Toluene	EPA 8260D
	EPA 8260C
Total Xylenes	EPA 8260D
	EPA 8260C
Volatile Halocarbons	
1,1,1,2-Tetrachloroethane	EPA 8260D
	EPA 8260C
1,1,1-Trichloroethane	EPA 8260D
	EPA 8260C
1,1,2,2-Tetrachloroethane	EPA 8260D
	EPA 8260C
1,1,2-Trichloro-1,2,2-Trifluoroethane	EPA 8260D
	EPA 8260C
1,1,2-Trichloroethane	EPA 8260D
	EPA 8260C
1,1-Dichloroethane	EPA 8260D
	EPA 8260C
1,1-Dichloroethene	EPA 8260D
	EPA 8260C
1,1-Dichloropropene	EPA 8260D
	EPA 8260C
1,2,3-Trichloropropane	EPA 8260D

Volatile Halocarbons	
1,2,3-Trichloropropane	EPA 8260C
1,2-Dibromo-3-chloropropane	EPA 8260D
	EPA 8260C
1,2-Dibromoethane	EPA 8260D
	EPA 8260C
1,2-Dichloroethane	EPA 8260D
	EPA 8260C
1,2-Dichloropropane	EPA 8260D
	EPA 8260C
1,3-Dichloropropane	EPA 8260D
	EPA 8260C
2,2-Dichloropropane	EPA 8260D
	EPA 8260C
2-Chloroethylvinyl ether	EPA 8260D
	EPA 8260C
Bromochloromethane	EPA 8260D
	EPA 8260C
Bromodichloromethane	EPA 8260D
	EPA 8260C
Bromoform	EPA 8260D
	EPA 8260C
Bromomethane	EPA 8260D
	EPA 8260C
Carbon tetrachloride	EPA 8260D
	EPA 8260C
Chloroethane	EPA 8260D

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All approved analytes are listed below:

Volatile Halocarbons	
Chloroethane	EPA 8260C
Chloroform	EPA 8260D
	EPA 8260C
Chloromethane	EPA 8260D
	EPA 8260C
cis-1,2-Dichloroethene	EPA 8260D
	EPA 8260C
cis-1,3-Dichloropropene	EPA 8260D
	EPA 8260C
Dibromochloromethane	EPA 8260D
	EPA 8260C
Dibromomethane	EPA 8260D
	EPA 8260C
Dichlorodifluoromethane	EPA 8260D
	EPA 8260C
Hexachlorobutadiene, Volatile	EPA 8260D
	EPA 8260C
Methylene chloride	EPA 8260D
	EPA 8260C
Tetrachloroethene	EPA 8260D
	EPA 8260C
trans-1,2-Dichloroethene	EPA 8260D
	EPA 8260C
trans-1,3-Dichloropropene	EPA 8260D
	EPA 8260C
Trichloroethene	EPA 8260D

Volatile Halocarbons	
Trichloroethene	EPA 8260C
Trichlorofluoromethane	EPA 8260D
	EPA 8260C
Vinyl chloride	EPA 8260D
	EPA 8260C
Volatile Organics	
1,4-Dioxane	EPA 8260D
	EPA 8260C
2-Butanone (Methylethyl ketone)	EPA 8260D
	EPA 8260C
2-Hexanone	EPA 8260D
	EPA 8260C
4-Methyl-2-Pentanone	EPA 8260D
	EPA 8260C
Acetone	EPA 8260D
	EPA 8260C
Carbon Disulfide	EPA 8260D
	EPA 8260C
Cyclohexane	EPA 8260D
	EPA 8260C
Methyl acetate	EPA 8260D
	EPA 8260C
Methyl cyclohexane	EPA 8260D
	EPA 8260C
Methyl tert-butyl ether	EPA 8260D

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All approved analytes are listed below:

Volatile Organics

Methyl tert-butyl ether	EPA 8260C
tert-butyl alcohol	EPA 8260D
	EPA 8260C
Vinyl acetate	EPA 8260D
	EPA 8260C

Sample Preparation Methods

EPA 5035A-L
EPA 5035A-H

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NELAP RECOGNIZED TNI ACCREDITATION BODY

APPENDIX C

PREVIOUS REPORTS

(Submitted under separate cover)

APPENDIX D

HISTORICAL SAMPLE ANALYTICAL RESULTS TABLES AND SUMMARY FIGURES

Legend

- Site Boundary
- Soil Boring Location
- Soil Boring/Monitoring Well Location
- Test Pit Location

Sample ID:	030/LSB-11A		032/LSB-11C	
Material	Hist. Fill		Fill Above Ash	
Laboratory Sample Number:	18E0514-01		18E0514-03	
Sample Date:	5/9/2018		5/9/2018	
Sample Depth/VOC Sample Depth (ft bgs):	0-2 (1-1.5)		11.5-13.5 (13-13.5)	
Units:	mg/kg	Q	mg/kg	Q
VOCs				
Acetone	0.0061	J	**0.14**	
SVOCs				
2-Methylnaphthalene	0.0445	U	**1.35**	D
Pesticides				
4,4'-DDT	**0.00673**	D	0.00193	U
PCBs				
Aroclor 1260	0.0393		**0.918**	E
Total PCBs	0.0393		**0.918**	
Metals				
Barium	191		**419**	
Copper	**80**		25.5	
Iron	**12500**		**13500**	
Lead	**241**		**489**	
Mercury	0.176		**0.287**	
Zinc	**257**		**377**	

Sample ID:	017/LSB-14A		018/LSB-14B	
Material	Hist. Fill		Fill Above Ash	
Laboratory Sample Number:	18E0411-17		18E0411-18	
Sample Date:	5/8/2018		5/8/2018	
Sample Depth/VOC Sample Depth (ft bgs):	0-2 (1.5-2)		8-10 (9-9.5)	
Units:	mg/kg	Q	mg/kg	Q
VOCs				
Acetone	0.026		**0.05**	
SVOCs				
2-Methylnaphthalene	**1.67**	D	**0.904**	D
Benzo(a)anthracene	**2.25**	D	**1.51**	D
Benzo(a)pyrene	**2.31**	D	**1.4**	D
Benzo(b)fluoranthene	**1.39**	D	**1.06**	D
Benzo(k)fluoranthene	**1.57**	D	**1.04**	D
Chrysene	**2.24**	D	**1.44**	D
Dibenzo(a,h)anthracene	**0.447**	D	0.327	D
Indeno(1,2,3-cd)pyrene	**1.05**	D	**0.7**	D
Pesticides				
4,4'-DDT	**0.0181**	D	0.00183	U
PCBs				
Aroclor 1260	**0.127**		0.044	P
Total PCBs	**0.127**		0.044	P
Metals				
Barium	171		**385**	
Cadmium	2.45		**6.82**	
Chromium, Trivalent	21.7		**44.8**	
Copper	**97.8**		**191**	
Iron	**15,900**		**27,000**	
Lead	**462**		**1,640**	
Mercury	**0.266**		**0.263**	
Nickel	**42.6**		**63.4**	
Zinc	**2,500**		**5,070**	D

Sample ID:	023/LSB-10A		024/LSB-10B	
Material	Hist. Fill		Fill Above Ash	
Laboratory Sample Number:	18E0487-03		18E0487-04	
Sample Date:	5/9/2018		5/9/2018	
Sample Depth/VOC Sample Depth (ft bgs):	0-2 (1.5-2)		15-17 (16-16.5)	
Units:	mg/kg	Q	mg/kg	Q
VOCs	No Exceedance		No Exceedance	
SVOCs	No Exceedance		No Exceedance	
Pesticides				
4,4'-DDT	**0.0223**	D	0.00177	U
PCBs				
Aroclor 1254	**0.225**		0.0179	U
Aroclor 1260	**0.113**		0.0179	U
Total PCBs	**0.338**		0.0179	U
Metals				
Chromium, Trivalent	**65.1**		18.8	
Copper	**112**		34.5	
Iron	**22000**		**11000**	
Lead	**469**		**91.3**	
Mercury	**0.587**		0.134	
Nickel	**31.5**		14.3	
Selenium	1.09	U	**8.44**	
Zinc	**439**		86	

Sample ID:	021/LSB-12A		022/LSB-12B	
Material	Hist. Fill		Fill Between Ash Layers	
Laboratory Sample Number:	18E0487-01		18E0487-02	
Sample Date:	5/9/2018		5/9/2018	
Sample Depth/VOC Sample Depth (ft bgs):	0-2 (1-1.5)		16-18 (16.5-17)	
Units:	mg/kg	Q	mg/kg	Q
VOCS				
Acetone	0.048		**0.16**	
SVOCs				
2-Methylnaphthalene	0.0458	U	**1.72**	D
Benzo(a)anthracene	0.838	D	**12.2**	D
Benzo(a)pyrene	0.935	D	**10**	D
Benzo(b)fluoranthene	0.835	D	**7.3**	D
Benzo(k)fluoranthene	0.781	D	**7.82**	D
Chrysene	0.875	D	**10.7**	D
Dibenzo(a,h)anthracene	0.221	D	**2.27**	D
Indeno(1,2,3-cd)pyrene	**0.559**	D	**5.51**	D
Pesticides				
4,4'-DDD	0.0018	U	**0.022**	D
4,4'-DDT	0.0018	U	**0.00762**	DP
Dieldrin	0.0018	U	**0.00522**	D
PCBs				
Aroclor 1260	**0.113**		0.0198	U
Total PCBs	**0.113**		**0.252**	
Metals				
Barium	156		**572**	
Copper	**112**		**225**	
Iron	**19,400**		**19,400**	
Lead	**286**		**734**	
Mercury	**0.496**		**0.689**	
Zinc	**330**		**451**	

Sample ID:	025/LSB-13A		026/LSB-13B	
Material	Hist. Fill		Hist. Fill	
Laboratory Sample Number:	18E0487-05		18E0487-06	
Sample Date:	5/9/2018		5/9/2018	
Sample Depth/VOC Sample Depth (ft bgs):	0-2 (1-1.5)		8-10 (9.5-10)	
Units:	mg/kg	Q	mg/kg	Q
VOCs	No Exceedance		No Exceedance	
SVOCs				
Benzo(a)anthracene	0.844	D	**1.77**	D
Benzo(a)pyrene	0.937	D	**1.89**	D
Benzo(b)fluoranthene	0.794	D	**1.23**	D
Benzo(k)fluoranthene	0.736	D	**1.28**	D
Chrysene	0.802	D	**1.82**	D
Dibenzo(a,h)anthracene	0.248	D	**0.371**	D
Indeno(1,2,3-cd)pyrene	**0.521**	D	**0.934**	D
Pesticides				
4,4'-DDT	**0.0247**	D	0.00202	U
Dieldrin	**0.0111**	D	0.00202	U
PCBs				
Aroclor 1254	**0.19**		0.0204	U
Aroclor 1260	**0.104**		0.0204	U
Total PCBs	**0.294**		0.0204	U
Metals				
Copper	**102**		**69.7**	
Iron	**19,700**		**68,300**	
Lead	**270**		**542**	
Mercury	**0.667**		**0.664**	
Zinc	**333**		**437**	

NYSDEC Subpart 375-6 Remedial Program SCOs	Unrestricted Use	Protection of Public Health - Restricted Use SCOs			
		Residential	Restricted - Residential	Commercial	Industrial
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
VOCs					
Acetone	0.05	100	100	500	1,000
SVOCs					
2-Methylnaphthalene	---	0.41	---	---	---
Benzo(a)anthracene	1	1	1	5.6	11
Benzo(a)pyrene	1	1	1	1	1.1
Benzo(b)fluoranthene	1	1	1	5.6	11
Benzo(k)fluoranthene	0.8	1	3.9	56	110
Chrysene	1	1	3.9	56	110
Dibenzo(a,h)anthracene	0.33	0.33	0.33	0.56	1.1
Indeno(1,2,3-cd)pyrene	0.5	0.5	0.5	5.6	11
Pesticides					
4,4'-DDD	0.0033	2.6	13	92	180
4,4'-DDT	0.0033	1.7	7.9	47	94
Dieldrin	0.005	0.039	0.2	1.4	2.8
PCBs					
Aroclor 1254	0.1	1	1	1	25
Aroclor 1260	0.1	1	1	1	25
Total PCBs	0.1	1	1	1	25
Metals					
Barium	350	350	400	400	10,000
Cadmium	2.5	2.5	4.3	9.3	60
Chromium, Trivalent	30	36	180	1500	6,800
Copper	50	270	270	270	10,000
Iron	---	2,000	---	---	---
Lead	63	400	400	1,000	3,900
Mercury	0.18	0.81	0.81	3	6
Nickel	30	140	310	310	10,000
Selenium	3.9	36	180	1500	6,800
Zinc	109	2,200	10,000	10,000	10,000

NOTES:
Soil Cleanup Objectives are taken from the NYSDEC Subpart 375-6 Remedial Program SCOs (Revised Brownfields) criteria are from the NYSDEC Soil Cleanup Objective Tables 375-6.8(a) and 375-6.8(b), last revised 14 December 2006 and the NYSDEC CP-51 Soil Cleanup Guidance dated 21 October 2010.

ft bgs: feet below ground surface

mg/kg: milligrams per kilogram

--- : Indicates that no regulatory limit has been established for this analyte

Regulatory Exceedances are in **bold** and are color coded by regulation.

Q is the Qualifier Column with definitions as follows:
U: The analyte was analyzed for, but was not detected at a level greater than or equal to the level of the Limit of Detection (LOD)/Method Detection Limit (MDL) or the sample concentration for results impacted by blank contamination.

J: The analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample.

D: Compound analyzed at a secondary dilution factor.

P: this flag is used for pesticide and PCB (Aroclor) target compounds when there is a % difference for detected concentrations that exceed method dictated limits between the two GC columns used for analysis

E: The concentration indicated for this analyte is an estimated value above the calibration range of the instrument. This value is considered an estimate.

60 0 60

SCALE IN FEET

References:
1. Site survey basemap from "Map of Survey" plan by Leonard J. Strandberg and Associates, from survey last updated February 19, 2018.
2. Sample and test pit locations were collected using the ArcGIS Collector application on a tablet utilizing GPS location.

LANGAN
300 Kimball Drive
Parsippany, NJ 07054
T: 973.560.4900 F: 973.560.4901 www.langan.com

Langan Engineering & Environmental Services, Inc.
Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.
Langan International LLC
Collectively known as Langan

NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400

Project
12074 FLATLANDS AVENUE
BLOCK No. 4434, LOT No. 1
BROOKLYN
KINGS COUNTY NEW YORK

Drawing Title
SOIL SAMPLE LOCATIONS AND RESULTS

Project No. 100688801
Date 5/30/2018
Scale 1 " = 60 '
Drawn By IHB
Figure 3

Path: \\Langan.com\data\PAR\data8\100688801\Project Data\ArcGIS\MXD\Environmental_Figures\2018-05 Phase II (Block 4434 Lot 1)\10.5\Figure 3 - Soil Sample Locations and Results 11x17.mxd

Legend

- Site Boundary
- Soil Boring Location
- Soil Boring/Monitoring Well Location
- Test Pit Location

Groundwater Part 703 and TOGS 1.1.1 Combined	Ground Water Quality Standards ug/L
VOCs	
Methyl tert-butyl ether	10
SVOCs	
3- & 4-Methylphenols	1
PCBs	
Pcb-1254 (Aroclor 1254)	0.09
Total PCBs	0.09
Total Metals	
Iron	300
Lead	25
Manganese	300
Selenium	10
Sodium	20,000
Dissolved Metals	
Iron	300
Manganese	300
Selenium	10
Sodium	20,000

Sample ID:	055/LMW-6	
Langan Sample Number:	055	
Laboratory Sample Number:	18E0702-03	
Sampling Date:	5/14/2018	
Units:	ug/L	Q
VOCs	No Exceedances	
SVOCs	No Exceedances	
PCBs		
Pcb-1254 (Aroclor 1254)	**0.3410**	
Total PCBs	**0.3410**	
Metals		
Iron	**34400.00**	
Lead	**117**	
Manganese	**877**	
Sodium	**181000.00**	B
Dissolved Metals		
Iron	**9800**	
Manganese	**513**	
Sodium	**87800.00**	

Sample ID:	059/LMW-4	
Langan Sample Number:	059	
Laboratory Sample Number:	18E0702-07	
Sampling Date:	5/14/2018	
Units:	ug/L	Q
VOCs		
Methyl tert-butyl ether	**19.900**	
SVOCs		
3- & 4-Methylphenols	**6.430**	
PCBs	No Exceedances	
Metals		
Iron	**532.00**	
Manganese	**439**	
Selenium	**20.90**	
Sodium	**76100.00**	B
Dissolved Metals		
Iron	**2940**	
Manganese	**309**	
Selenium	**14.60**	
Sodium	**123000.00**	

NOTES:
Exceedances of regulatory criteria are highlighted and **bold**.
ug/L: micrograms per liter
B: Analyte present in the analysis batch blank

NYSDEC Technical & Operational Guidance Series (TOGS) 1.1.1 Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations, last revised June 2004.
http://www.dec.ny.gov/regulations/2652.html

50 0 50
SCALE IN FEET

References:
1. Site survey basemap from "Map of Survey" plan by Leonard J. Strandberg and Associates, from survey last updated February 19, 2018.
2. Sample and test pit locations were collected using the ArcGIS Collector application on a tablet utilizing GPS location.

LANGAN
300 Kimball Drive
Parsippany, NJ 07054
T: 973.560.4900 F: 973.560.4901 www.langan.com
Langan Engineering & Environmental Services, Inc.
Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.
Langan International LLC
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Project
12074 FLATLANDS AVENUE
BLOCK No. 4434, LOT No. 1
BROOKLYN
KINGS COUNTY NEW YORK

Drawing Title
GROUNDWATER SAMPLE LOCATIONS AND RESULTS

Project No.	Figure
100688801	4
Date: 5/30/2018	
Scale: 1 " = 50 '	
Drawn By: IHB	

Path: \\Langan.com\data\PAR\data8\100688801\Project Data\ArcGIS\MXD\Environmental_Figures\2018-05 Phase II (Block 4434 Lot 1)\10.5\Figure 4 - Groundwater Sample Locations and Results.mxd

TABLE 1
SUMMARY OF SOIL ANALYTICAL RESULTS
Block 4434 Lot 1
Brooklyn, New York

Sample ID: / Material / Laboratory Sample Number: / Sample Date: / Sample Depth/VOC Sample Depth (ft bgs): / Units:	CAS Number	NYSDEC Subpart 375-6 Remedial Program Soil Cleanup Objectives					023/LSB-10A Hist. Fill 18E0487-03 5/9/2018 0-2 (1.5-2) mg/kg	Q	024/LSB-10B Fill Above Ash 18E0487-04 5/9/2018 15-17 (16-16.5) mg/kg	Q	030/LSB-11A Hist. Fill 18E0514-01 5/9/2018 0-2 (1-1.5) mg/kg	Q	032/LSB-11C Fill Above Ash 18E0514-03 5/9/2018 11.5-13.5 (13-13.5) mg/kg	Q	021/LSB-12A Hist. Fill 18E0487-01 5/9/2018 0-2 (1-1.5) mg/kg	Q	022/LSB-12B Fill Between Ash Layers 18E0487-02 5/9/2018 16-18 (16.5-17) mg/kg	Q	025/LSB-13A Hist. Fill 18E0487-05 5/9/2018 0-2 (1-1.5) mg/kg	Q	026/LSB-13B Hist. Fill 18E0487-06 5/9/2018 8-10 (9.5-10) mg/kg	Q	017/LSB-14A Hist. Fill 18E0411-17 5/8/2018 0-2 (1.5-2) mg/kg	Q	018/LSB-14B Fill Above Ash 18E0411-18 5/8/2018 8-10 (9-9.5) mg/kg	Q
		Unrestricted Use	Protection of Public Health - Restricted Use SCOs: Residential	Restricted-Residential	Commercial	Industrial																				
			mg/kg	mg/kg	mg/kg	mg/kg																				
Volatile Organics, NJDEP/TCL/Part 375 List																										
1,1,1,2-Tetrachloroethane	630-20-6	---	---	---	---	---	0.0024	U	0.0023	U	0.0024	U	0.0038	U	0.0023	U	0.0038	U	0.0024	U	0.0027	U	0.0023	U	0.0026	U
1,1,1-Trichloroethane	71-55-6	0.68	100	100	500	1,000	0.0024	U	0.0023	U	0.0024	U	0.0038	U	0.0023	U	0.0038	U	0.0024	U	0.0027	U	0.0023	U	0.0026	U
1,1,2,2-Tetrachloroethane	79-34-5	---	35	---	---	---	0.0024	U	0.0023	U	0.0024	U	0.0038	U	0.0023	U	0.0038	U	0.0024	U	0.0027	U	0.0023	U	0.0026	U
1,1,2,2-Tetrachloroethylene	127-18-4	---	---	---	---	---	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	76-13-1	---	100	---	---	---	0.0024	U	0.0023	U	0.0024	U	0.0038	U	0.0023	U	0.0038	U	0.0024	U	0.0027	U	0.0023	U	0.0026	U
1,1,2-Trichloroethane	79-00-5	---	---	---	---	---	0.0024	U	0.0023	U	0.0024	U	0.0038	U	0.0023	U	0.0038	U	0.0024	U	0.0027	U	0.0023	U	0.0026	U
1,1-Dichloroethane	75-34-3	0.27	19	26	240	480	0.0024	U	0.0023	U	0.0024	U	0.0038	U	0.0023	U	0.0038	U	0.0024	U	0.0027	U	0.0023	U	0.0026	U
1,1-Dichloroethylene	75-35-4	0.33	100	100	500	1,000	0.0024	U	0.0023	U	0.0024	U	0.0038	U	0.0023	U	0.0038	U	0.0024	U	0.0027	U	0.0023	U	0.0026	U
1,1-Dichloropropylene	563-58-6	---	---	---	---	---	0.0024	U	0.0023	U	0.0024	U	0.0038	U	0.0023	U	0.0038	U	0.0024	U	0.0027	U	0.0023	U	0.0026	U
1,2,3-Trichlorobenzene	87-61-6	---	---	---	---	---	0.0024	U	0.0023	U	0.0024	U	0.0038	U	0.0023	U	0.0038	U	0.0024	U	0.0027	U	0.0023	U	0.0026	U
1,2,3-Trichloropropane	96-18-4	---	80	---	---	---	0.0024	U	0.0023	U	0.0024	U	0.0038	U	0.0023	U	0.0038	U	0.0024	U	0.0027	U	0.0023	U	0.0026	U
1,2,3,4-Tetrachlorobenzene	634-66-2	---	---	---	---	---	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
1,2,4-Trichlorobenzene	120-82-1	---	---	---	---	---	0.0024	U	0.0023	U	0.0024	U	0.0038	U	0.0023	U	0.0038	U	0.0024	U	0.0027	U	0.0023	U	0.0026	U
1,2,4-Trimethylbenzene	95-63-6	3.6	47	52	190	380	0.0024	U	0.0023	U	0.0024	U	0.0061	J	0.0023	U	0.0038	U	0.0024	U	0.0027	U	0.12		0.082	
1,2-Dibromo-3-chloropropane	96-12-8	---	---	---	---	---	0.0024	U	0.0023	U	0.0024	U	0.0038	U	0.0023	U	0.0038	U	0.0024	U	0.0027	U	0.0023	U	0.0026	U
1,2-Dibromoethane	106-93-4	---	---	---	---	---	0.0024	U	0.0023	U	0.0024	U	0.0038	U	0.0023	U	0.0038	U	0.0024	U	0.0027	U	0.0023	U	0.0026	U
1,2-Dichlorobenzene	95-50-1	1.1	100	100	500	1,000	0.0024	U	0.0023	U	0.0024	U	0.0038	U	0.0023	U	0.0038	U	0.0024	U	0.0027	U	0.0023	U	0.0026	U
1,2-Dichloroethane	107-06-2	0.02	2.3	3.1	30	60	0.0024	U	0.0023	U	0.0024	U	0.0038	U	0.0023	U	0.0038	U	0.0024	U	0.0027	U	0.0023	U	0.0026	U
1,2-Dichloropropane	78-87-5	---	---	---	---	---	0.0024	U	0.0023	U	0.0024	U	0.0038	U	0.0023	U	0.0038	U	0.0024	U	0.0027	U	0.0023	U	0.0026	U
1,3,5-Trimethylbenzene	108-67-8	8.4	47	52	190	380	0.0024	U	0.0023	U	0.0024	U	0.0038	U	0.0023	U	0.0038	U	0.0024	U	0.0027	U	0.044		0.027	
1,3-Dichlorobenzene	541-73-1	2.4	17	49	280	560	0.0024	U	0.0023	U	0.0024	U	0.0038	U	0.0023	U	0.0038	U	0.0024	U	0.0027	U	0.0023	U	0.0026	U
1,3-Dichloropropane	142-28-9	---	---	---	---	---	0.0024	U	0.0023	U	0.0024	U	0.0038	U	0.0023	U	0.0038	U	0.0024	U	0.0027	U	0.0023	U	0.0026	U
1,4-Dichlorobenzene	106-46-7	1.8	9.8	13	130	250	0.0024	U	0.0023	U	0.0024	U	0.059		0.0023	U	0.0038	U	0.0024	U	0.0027	U	0.0023	U	0.0026	U
1,4-Dioxane	123-91-1	0.1	9.8	13	130	250	0.048	U	0.047	U	0.047	U	0.076	U	0.045	U	0.077	U	0.047	U	0.054	U	0.046	U	0.052	U
2,2-Dichloropropane	594-20-7	---	---	---	---	---	0.0024	U	0.0023	U	0.0024	U	0.0038	U	0.0023	U	0.0038	U	0.0024	U	0.0027	U	0.0023	U	0.0026	U
2-Butanone	78-93-3	0.12	100	100	500	1,000	0.0072		0.0056		0.0024	U	0.047		0.013		0.033		0.0024	U	0.01		0.006		0.011	
2-Chlorotoluene	95-49-8	---	---	---	---	---	0.0024	U	0.0023	U	0.0024	U	0.015		0.0023	U	0.0038	U	0.0024	U	0.0027	U	0.0023	U	0.0083	
2-Hexanone	591-78-6	---	---	---	---	---	0.0024	U	0.0023	U	0.0024	U	0.0038	U	0.0023	U	0.0038	U	0.0024	U	0.0027	U	0.0023	U	0.0026	U
2,4-Dichloroaniline	554-00-7	---	---	---	---	---	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
3,4-Dichloroaniline	95-76-1	---	---	---	---	---	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
4-Chlorotoluene	106-43-4	---	---	---	---	---	0.0024	U	0.0023	U	0.0024	U	0.0038	U	0.0023	U	0.0038	U	0.0024	U	0.0027	U	0.0023	U	0.0026	U
4-Methyl-2-pentanone	108-10-1	---	---	---	---	---	0.0024	U	0.0023	U	0.0024	U	0.0038	U	0.0023	U	0.0038	U	0.0024	U	0.0027	U	0.0023	U	0.0026	U
Acetone	67-64-1	0.05	100	100	500	1,000	0.026		0.044		0.0061	J	**0.14**		0.048		**0.16**		0.0047	U	0.042		0.026		**0.05**	
Acrolein	107-02-8	---	---	---	---	---	0.0048	U	0.0047	U	0.0047	U	0.0076	U	0.0045	U	0.0077	U	0.0047	U	0.0054	U	0.0046	U	0.0052	U
Acrylonitrile	107-13-1	---	---	---	---	---	0.0024	U	0.0023	U	0.0024	U	0.0038	U	0.0023	U	0.0038	U	0.0024	U	0.0027	U	0.0023	U	0.0026	U
Benzene	71-43-2	0.06	2.9	4.8	44	89	0.0024	U	0.0023	U	0.0024	U	0.0038	U	0.0023	U	0.0038	U	0.0024	U	0.0027	U	0.0031	J	0.0026	U
Bromobenzene	108-86-1	---	---	---	---	---	0.0024	U	0.0023	U	0.0024	U	0.0038	U	0.0023	U	0.0038	U	0.0024	U	0.0027	U	0.0023	U	0.0026	U
Bromochloromethane	74-97-5	---	---	---	---	---	0.0024	U	0.0023	U	0.0024	U	0.0038	U	0.0023	U	0.0038	U	0.0024	U	0.0027	U	0.0023	U	0.0026	U
Bromodichloromethane	75-27-4	---	---	---	---	---	0.0024	U	0.0023	U	0.0024	U	0.0038	U	0.0023	U	0.0038	U	0.0024	U	0.0027	U	0.0023	U	0.0026	U
Bromoform	75-25-2	---	---	---	---	---	0.0024	U	0.0023	U	0.0024	U	0.0038	U	0.0023	U	0.0038	U	0.0024	U	0.0027	U	0.0023	U	0.0026	U
Bromomethane	74-83-9	---	---	---	---	---	0.0024	U	0.0023	U	0.0024	U	0.0038	U	0.0023	U	0.0038	U	0.0024	U	0.0027	U	0.0023	U	0.0026	U
Carbon disulfide	75-15-0	---	100	---	---	---	0.0024	U	0.0029	J	0.0024	U	0.014		0.0023	U	0.0038	U	0.0024	U	0.0027	U	0.0023	U	0.0026	U
Carbon tetrachloride	56-23-5	0.76	1.4	2.4	22	44	0.0024	U	0.0023	U	0.0024	U	0.0038	U	0.0023	U	0.0038	U	0.0024	U	0.0027	U	0.0023	U	0.0026	U
Chloroacetamide	79-07-2	---	---	---	---	---	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Chlorobenzene	108-90-7	1.1	100	100	500	1,000	0.0024	U	0.0023	U	0.0024	U	0.0062	J	0.0023	U	0.0038	U	0.0024	U	0.0027	U	0.0023	U	0.0026	U
Chloroethane	75-00-3	---	---	---	---	---	0.0024	U	0.0023	U	0.0024	U	0.0038	U	0.0023	U	0.0038	U	0.0024	U	0.0027	U	0.0023	U	0.0026	U
Chloroform	67-66-3	0.37	10	49	350	700	0.0024	U	0.0023	U	0.0024	U	0.0038	U	0.0023	U	0.0038	U	0.0024	U	0.0027	U	0.0023	U	0.0026	U
Chloromethane	74-87-3	---	---	---	---	---	0.0024	U	0.0023	U	0.0024	U	0.0038	U	0.0023	U	0.0038	U	0.0024	U	0.0027	U	0.0023	U	0.0026	U
cis-1,2-Dichloroethylene	156-59-2	0.25	59	100	500	1,000	0.0024	U	0.0023	U	0.0024	U	0.0038	U	0.0023	U	0.0038	U	0.0024	U	0.0027	U	0.0023	U	0.0026	U
cis-1,3-Dichloropropylene	10061-01-5	---	---	---	---	---	0.0024	U	0.0023	U	0.0024	U	0.0038	U	0.0023	U	0.0038	U	0.0024	U	0.0027	U	0.0023	U	0.0026	U
Cyclohexane	110-82-7	---	---	---	---	---	0.0024	U	0.0023	U	0.0024	U	0.029		0.0023	U	0.0038	U	0.0024	U	0.0027	U	0.0086		0.011	
Dibromochloromethane	124-48-1	---	---	---	---	---	0.0024	U	0.0023	U	0.0024	U	0.0038	U	0.0023	U	0.0038	U	0.0024	U	0.0027	U	0.0023	U	0.0026	U
Dibromomethane	74-95-3	---	---	---	---	---	0.0024	U	0.0023	U	0.0024	U	0.0038	U	0.0023	U	0.0038	U	0.0024	U	0.0027	U	0.0023	U	0.0026	U
Dichlorodifluoromethane	75-71-8	---	---	---	---	---	0.0024	U	0.0023	U	0.0024	U	0.0038	U	0.0023	U	0.0038	U	0.0024	U	0.0027	U	0.0023	U	0.0026	U
Ethylacetate	141-78-6	---	---	---	---	---	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Ethyl Benzene	100-41-4	1	30	41	390	780	0.0024	U	0.0023	U	0.0024	U	0.0038	U	0.0023	U	0.0038	U	0.0024	U	0.0027	U	0.016		0.0092	
Hexachlorobutadiene	87-68-3	---	---	---	---	---	0.0024	U	0.0023	U	0.0024	U	0.0038	U	0.0023	U	0.0038	U	0.0024	U	0.0027	U	0.0023	U	0.0026	U
Isopropylbenzene	98-82-8	---	100	---	---	---	0.0024	U	0.0023	U	0.0024	U	0.01		0.0023	U	0.0038	U	0.0024	U	0.0027	U	0.0045	J	0.0036	J
Methanol	67-56-1	---	---	---	---	---	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Methyl acetate	79-20-9	---	---	---	---	---	0.0024	U	0.0023	U	0.0024	U	0.0038	U	0.0023	U	0.0038	U	0.0024	U	0.0027	U	0.0023	U	0.0026	U
Methyl tert-butyl ether (MTBE)	1634-04-4	0.93	62	100	500	1,000	0.0024	U	0.0023	U	0.0024	U	0.0038	U	0.0023	U	0.0038	U	0.0024	U	0.0027	U	0.0023	U	0.0026	U
Methylcyclohexane	108-87-2	---	---	---	---	---	0.0024	U	0.0023	U	0.0024	U	0.094		0.0023	U	0.0038	U	0.0024	U	0.0027	U	0.02		0.016	
Methylene chloride	75-09-2	0.05	51	100	500	1,000	0.0048	U	0.0047	U	0.0047	U	0.011	J	0.0045	U	0.0084	J	0.0047	U	0.0054	U	0.0046	U	0.0052	U
n-Butylbenzene	104-51-8	12	100	100	500	1,000	0.0024	U	0.0023	U	0.0024	U	0.026		0.0023	U	0.0038	U	0.0024	U	0.0027	U	0.011		0.0071	
n-Propylbenzene	103-65-1	3.9	100	100	500	1,000	0.0024	U	0.0023	U	0.0024	U	0.0099		0.0023	U	0.0038	U	0.0024	U	0.0027	U	0.0097		0.0067	
Naphthalene	91-20-3	12	100	100	500	1,000	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
o-Xylene	95-47-6	0.26	100	100	500	1,000	0.0024	U	0.0023	U	0.0024	U	0.0058	J	0.0023	U	0.0038	U	0.0024	U	0.0027	U	0.054		0.035	
p- & m- Xylenes	179601-23-1	0.26	100	100	500	1,000	0.0048	U	0.0047	U	0.0047	U	0.0076	U	0.0045	U	0.0077	U	0.0047	U	0.0054	U	0.046		0.034	
p- & m- Xylenes	79601-23-1	0.26	100	100	500	1,000	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
p-Isopropyltoluene	99-87-6	---	---	---	---	---	0.0024	U	0.0023	U	0.0024	U	0.023		0.0023	U	0.0038	U	0.0024	U	0.0027	U	0.0025	J	0.0026	U
P-CYMENE (P-ISOPROPYLTOLUENE)	CYMP	---	---	---	---	---	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
sec-Butylbenzene	135-98-8	11	100	100	500	1,000	0.0024	U	0.0023	U	0.0024	U	0.026		0.0023	U	0.0038	U	0.0024	U	0.0027	U	0.0024	J	0.0026	U
Styrene	100-42-5	---	---	---	---	---	0.0024	U	0.0023	U	0.0024	U	0.0038	U	0.0023	U	0.0038	U	0.0024	U	0.0027	U	0.0023	U	0.0026	U
tert-Butyl alcohol (TBA)	75-65-0	---	---	---	---	---	0.0024	U	0.0023	U	0.0024	U	0.0038	U	0.0023	U	0.0038	U	0.0024	U	0.0027	U	0.0023	U	0.0026	U
tert-Butylbenzene	98-06-6	5.9	100	100	500	1,000	0.0024	U	0.0023	U	0.0024	U	0.0038	U	0.0023	U	0.0038	U	0.0024	U	0.0027	U	0.0023	U	0.0026	U
Tetrachloroethylene	127-18-4	1.3	5.5	19	150	300	0.0024	U	0.0023	U	0.0024	U	0.0038	U	0.0023	U	0.0038	U	0.0024	U	0.0027	U	0.0023	U	0.0026	U
Toluene	108-88-3	0.7	100	100	500	1,000	0.0024	U	0.0023	U	0.0024	U	0.0038	U	0.0023	U	0.0038	U	0.0024	U	0.0027	U	0.017		0.011	
trans-1,2-Dichloroethylene	156-60-5	0.19	100	100	500	1,000	0.0024	U	0.0023	U	0.0024	U	0.0038	U	0.0023	U	0.0038	U	0.0024	U	0.0027	U	0.0023	U	0.0026	U
trans-1,3-Dichloropropylene	10061-02-6	---	---	---	---	---	0.0024	U	0.0023	U	0.0024	U	0.0038	U	0.0023	U	0.0038	U	0.0024	U	0.0027	U	0.0023	U	0.0026	U
Trichloroethylene	79-01-6	0.47	10	21	200	400	0.0024	U	0.0023	U	0.0024	U	0.0038	U	0.0023	U	0.0038	U	0.0024	U	0.0027	U	0.0023	U	0.0026	U
Trichlorofluoromethane	75-69-4	---	---	---	---	---	0.0024	U	0.0023	U	0.0024	U	0.0038	U	0.0023	U	0.0038	U	0.009		0.0027	U	0.0023	U	0.0026	U
Vinyl Acetate	108-05-4	---	---	---	---	---	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Vinyl Chloride	75-01-4	0.02	0.21	0.9	13	27	0.0024	U	0.0023	U	0.0024	U	0.0038	U	0.0023	U	0.0038	U	0.0024	U	0.0027	U	0.0023	U	0.0026	U
Xylenes, Total	1330-20-7	0.26	100	100	500	1,000	0.0072	U	0.007	U	0.0071	U	0.011	U	0.0068	U	0.012	U	0.0071	U	0.0081	U	0.1		0.068	

TABLE 1
SUMMARY OF SOIL ANALYTICAL RESULTS
Block 4434 Lot 1
Brooklyn, New York

Sample ID:		NYSDEC Subpart 375-6 Remedial Program Soil Cleanup Objectives					023/LSB-10A		024/LSB-10B		030/LSB-11A		032/LSB-11C		021/LSB-12A		022/LSB-12B		025/LSB-13A		026/LSB-13B		017/LSB-14A		018/LSB-14B	
Material							Hist. Fill		Fill Above Ash		Hist. Fill		Fill Above Ash		Hist. Fill		Fill Between Ash Layers		Hist. Fill		Hist. Fill		Hist. Fill		Fill Above Ash	
Laboratory Sample Number:			Protection of Public Health - Restricted Use SCOs				18E0487-03		18E0487-04		18E0514-01		18E0514-03		18E0487-01		18E0487-02		18E0487-05		18E0487-06		18E0411-17		18E0411-18	
Sample Date:							5/9/2018		5/9/2018		5/9/2018		5/9/2018		5/9/2018		5/9/2018		5/9/2018		5/9/2018		5/8/2018		5/8/2018	
Sample Depth/VOC Sample Depth (ft bgs):							0-2 (1.5-2)		15-17 (16-16.5)		0-2 (1-1.5)		11.5-13.5 (13-13.5)		0-2 (1-1.5)		16-18 (16.5-17)		0-2 (1-1.5)		8-10 (9.5-10)		0-2 (1.5-2)		8-10 (9-9.5)	
Units:		Unrestricted Use	Residential	Restricted-Residential	Commercial	Industrial	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q
Semi-Volatiles, NJDEP/TCL/Part 375 List																										
1,1'-Biphenyl	92-52-4	---	---	---	---	---	0.0456	U	0.0446	U	0.0445	U	0.0488	U	0.0458	U	0.397	D	0.0463	U	0.0511	U	0.0448	U	0.0464	U
1,2,3,6,7,8-HCDF	57117-44-9	---	---	---	---	---	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
1,2,4,5-Tetrachlorobenzene	95-94-3	---	---	---	---	---	0.0911	U	0.0891	U	0.0887	U	0.0974	U	0.0914	U	0.0997	U	0.0925	U	0.102	U	0.0895	U	0.0925	U
1,2-Diphenylhydrazine (as Azobenzene)	122-66-7	---	---	---	---	---	0.0456	U	0.0446	U	0.0445	U	0.0488	U	0.0458	U	0.05	U	0.0463	U	0.0511	U	0.0448	U	0.0464	U
2,3,5,6-Tetrachloroaniline	3481-20-7	---	---	---	---	---	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
2,3,4,5-Tetrachlorophenol	4901-51-3	---	---	---	---	---	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
2,3,4,6-Tetrachlorophenol	58-90-2	---	---	---	---	---	0.0911	U	0.0891	U	0.0887	U	0.0974	U	0.0914	U	0.0997	U	0.0925	U	0.102	U	0.0895	U	0.0925	U
2,4,5-Trichloroaniline	636-30-6	---	---	---	---	---	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
2,4,5-Trichlorophenol	95-95-4	---	100	---	---	---	0.0456	U	0.0446	U	0.0445	U	0.0488	U	0.0458	U	0.05	U	0.0463	U	0.0511	U	0.0448	U	0.0464	U
2,4,6-Trichlorophenol	88-06-2	---	---	---	---	---	0.0456	U	0.0446	U	0.0445	U	0.0488	U	0.0458	U	0.05	U	0.0463	U	0.0511	U	0.0448	U	0.0464	U
2,4-Dichlorophenol	120-83-2	---	100	---	---	---	0.0456	U	0.0446	U	0.0445	U	0.0488	U	0.0458	U	0.05	U	0.0463	U	0.0511	U	0.0448	U	0.0464	U
2,4-Dimethylphenol	105-67-9	---	---	---	---	---	0.0456	U	0.0446	U	0.0445	U	0.0488	U	0.0458	U	0.146	D	0.0463	U	0.0511	U	0.0448	U	0.0464	U
2,4-Dinitrophenol	51-28-5	---	100	---	---	---	0.0911	U	0.0891	U	0.0887	U	0.0974	U	0.0914	U	0.0997	U	0.0925	U	0.102	U	0.0895	U	0.0925	U
2,4-Dinitrotoluene	121-14-2	---	---	---	---	---	0.0456	U	0.0446	U	0.0445	U	0.0488	U	0.0458	U	0.05	U	0.0463	U	0.0511	U	0.0448	U	0.0464	U
2,6-Dinitrotoluene	606-20-2	---	1.03	---	---	---	0.0456	U	0.0446	U	0.0445	U	0.0488	U	0.0458	U	0.05	U	0.0463	U	0.0511	U	0.0448	U	0.0464	U
2-Chloronaphthalene	91-58-7	---	---	---	---	---	0.0456	U	0.0446	U	0.0445	U	0.0488	U	0.0458	U	0.05	U	0.0463	U	0.0511	U	0.0448	U	0.0464	U
2-Chlorophenol	95-57-8	---	100	---	---	---	0.0456	U	0.0446	U	0.0445	U	0.0488	U	0.0458	U	0.05	U	0.0463	U	0.0511	U	0.0448	U	0.0464	U
2-Methylnaphthalene	91-57-6	---	0.41	---	---	---	0.0456	U	0.0634	JD	0.0445	U	**1.35**	**D**	0.0458	U	**1.72**	**D**	0.0463	U	0.294	D	**1.67**	**D**	**0.904**	**D**
2-Methylphenol	95-48-7	0.33	100	100	500	1,000	0.0456	U	0.0446	U	0.0445	U	0.0488	U	0.0458	U	0.107	D	0.0463	U	0.0511	U	0.0448	U	0.0464	U
2-Nitroaniline	88-74-4	---	---	---	---	---	0.0911	U	0.0891	U	0.0887	U	0.0974	U	0.0914	U	0.0997	U	0.0925	U	0.102	U	0.0895	U	0.0925	U
2-Nitrophenol	88-75-5	---	---	---	---	---	0.0456	U	0.0446	U	0.0445	U	0.0488	U	0.0458	U	0.05	U	0.0463	U	0.0511	U	0.0448	U	0.0464	U
3-Chloroaniline	108-42-9	---	---	---	---	---	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
3-Chlorophenol	108-43-0	---	---	---	---	---	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
3- & 4-Methylphenols	65794-96-9	330	34,000	100,000	500,000	1,000,000	0.0456	U	0.0446	U	0.0445	U	0.0488	U	0.0458	U	0.213	D	0.0463	U	0.0511	U	0.0448	U	0.0464	U
3- AND 4- METHYLPHENOL (TOTAL)	MEPH3MEPH4	330	34,000	100,000	500,000	1,000,000	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
3,3'-Dichlorobenzidine	91-94-1	---	---	---	---	---	0.0456	U	0.0446	U	0.0445	U	0.0488	U	0.0458	U	0.05	U	0.0463	U	0.0511	U	0.0448	U	0.0464	U
3,4-Dichlorophenol	95-77-2	---	---	---	---	---	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
3-Nitroaniline	99-09-2	---	---	---	---	---	0.0911	U	0.0891	U	0.0887	U	0.0974	U	0.0914	U	0.0997	U	0.0925	U	0.102	U	0.0895	U	0.0925	U
4-Chloroaniline	106-47-8	---	100	---	---	---	0.0456	U	0.0446	U	0.0445	U	0.0488	U	0.0458	U	0.05	U	0.0463	U	0.0511	U	0.0448	U	0.0464	U
4,6-Dinitro-2-methylphenol	534-52-1	---	---	---	---	---	0.0911	U	0.0891	U	0.0887	U	0.0974	U	0.0914	U	0.0997	U	0.0925	U	0.102	U	0.0895	U	0.0925	U
4-Bromophenyl phenyl ether	101-55-3	---	---	---	---	---	0.0456	U	0.0446	U	0.0445	U	0.0488	U	0.0458	U	0.05	U	0.0463	U	0.0511	U	0.0448	U	0.0464	U
4-Chlorophenyl phenyl ether	7005-72-3	---	---	---	---	---	0.0456	U	0.0446	U	0.0445	U	0.0488	U	0.0458	U	0.05	U	0.0463	U	0.0511	U	0.0448	U	0.0464	U
4-Chloro-3-methylphenol	59-50-7	---	---	---	---	---	0.0456	U	0.0446	U	0.0445	U	0.0488	U	0.0458	U	0.05	U	0.0463	U	0.0511	U	0.0448	U	0.0464	U
4-Nitroaniline	100-01-6	---	---	---	---	---	0.0911	U	0.0891	U	0.0887	U	0.0974	U	0.0914	U	0.0997	U	0.0925	U	0.102	U	0.0895	U	0.0925	U
4-Nitrophenol	100-02-7	---	---	---	---	---	0.0911	U	0.0891	U	0.0887	U	0.0974	U	0.0914	U	0.0997	U	0.0925	U	0.102	U	0.0895	U	0.0925	U
Acenaphthene	83-32-9	20	100	100	500	1,000	0.0456	U	0.134	D	0.0445	U	0.0488	U	0.0504	JD	3.08	D	0.0628	JD	0.508	D	0.569	D	0.319	D
Acenaphthylene	208-96-8	100	100	100	500	1,000	0.0925	D	0.0897	D	0.0532	JD	0.0488	U	0.0686	JD	1.19	D	0.107	D	0.256	D	0.215	D	0.108	D
Acetophenone	98-86-2	---	---	---	---	---	0.0456	U	0.0446	U	0.0445	U	0.0488	U	0.0458	U	0.05	U	0.0463	U	0.0511	U	0.0448	U	0.0464	U
Analine	62-53-3	---	48	100	500	1,000	0.182	U	0.178	U	0.178	U	0.195	U	0.183	U	0.2	U	0.185	U	0.204	U	0.179	U	0.185	U
Anthracene	120-12-7	100	100	100	500	1,000	0.186	D	0.358	D	0.117	D	0.0802	JD	0.169	D	8.71	D	0.256	D	1.17	D	1.45	D	0.892	D
Atrazine	1912-24-9	---	---	---	---	---	0.0456	U	0.0446	U	0.0445	U	0.0488	U	0.0458	U	0.05	U	0.0463	U	0.0511	U	0.0448	U	0.0464	U
Benzaldehyde	100-52-7	---	---	---	---	---	0.0456	U	0.0446	U	0.0445	U	0.0488	U	0.0458	U	0.05	U	0.0463	U	0.0511	U	0.0448	U	0.0464	U
Benzidine	92-87-5	---	---	---	---	---	0.182	U	0.178	U	0.178	U	0.195	U	0.183	U	0.2	U	0.185	U	0.204	U	0.179	U	0.185	U
Benzo(a)anthracene	56-55-3	1	1	1	5.6	11	0.748	D	0.787	D	0.386	D	0.0958	JD	0.838	D	**12.2**	**D**	0.844	D	**1.77**	**D**	**2.25**	**D**	**1.51**	**D**
Benzo(a)pyrene	50-32-8	1	1	1	1	1.1	0.876	D	0.902	D	0.454	D	0.0818	JD	0.935	D	**10**	**D**	0.937	D	**1.89**	**D**	**2.31**	**D**	**1.4**	**D**
Benzo(b)fluoranthene	205-99-2	1	1	1	5.6	11	0.741	D	0.646	D	0.342	D	0.0787	JD	0.835	D	**7.3**	**D**	0.794	D	**1.23**	**D**	**1.39**	**D**	**1.06**	**D**
Benzo(g,h,i)perylene	191-24-2	100	100	100	500	1,000	0.637	D	0.631	D	0.355	D	0.0701	JD	0.673	D	6.29	D	0.698	D	1.13	D	1.32	D	0.849	D
Benzo(k)fluoranthene	207-08-9	0.8	1	3.9	56	110	0.673	D	0.65	D	0.33	D	0.053	JD	0.781	D	**7.82**	**D**	0.736	D	**1.28**	**D**	**1.57**	**D**	**1.04**	**D**
Benzoic acid	65-85-0	---	100	---	---	---	0.0456	U	0.0446	U	0.0445	U	0.0488	U	0.0458	U	0.112	D	0.0463	U	0.0511	U	0.0448	U	0.0464	U
Benzyl alcohol	100-51-6	---	---	---	---	---	0.0456	U	0.0446	U	0.0445	U	0.0488	U	0.0458	U	0.261	D	0.0463	U	0.0511	U	0.0448	U	0.0464	U
Benzyl butyl phthalate	85-68-7	---	100	---	---	---	0.411	D	2.09	D	0.0445	U	0.0488	U	0.407	D	0.152	D	0.452	D	0.0511	U	0.0448	U	0.0464	U
Bis(2-chloroethoxy)methane	111-91-1	---	---	---	---	---	0.0456	U	0.0446	U	0.0445	U	0.0488	U	0.0458	U	0.05	U	0.0463	U	0.0511	U	0.0448	U	0.0464	U
Bis(2-chloroethyl)ether	111-44-4	---	---	---	---	---	0.0456	U	0.0446	U	0.0445	U	0.0488	U	0.0458	U	0.05	U	0.0463	U	0.0511	U	0.0448	U	0.0464	U
Bis(2-chloroisopropyl)ether	108-60-1	---	---	---	---	---	0.0456	U	0.0446	U	0.0445	U	0.0488	U	0.0458	U	0.05	U	0.0463	U	0.0511	U	0.0448	U	0.0464	U
Bis(2-ethylhexyl)phthalate	117-81-7	---	50	---	---	---	21.6	D	0.312	D	0.0582	JD	0.42	D	0.443	D	4.1	D	0.466	D	0.057	JD	4.23	D	0.0464	U
Caprolactam	105-60-2	---	---	---	---	---	0.0911	U	0.0891	U	0.0887	U	0.0974	U	0.0914	U	0.0997	U	0.0925	U	0.102	U	0.0895	U	0.0925	U
Carbazole	86-74-8	---	---	---	---	---	0.0524	JD	0.0446	U	0.0445	U	0.0488	U	0.0825	JD	3.8	D	0.0983	D	0.107	D	0.167	D	0.187	D
Chrysene	218-01-9	1	1	3.9	56	110	0.713	D	0.856	D	0.364	D	0.187	D	0.875	D	**10.7**	**D**	0.802	D	**1.82**	**D**	**2.24**	**D**	**1.44**	**D**
Dibenzo(a,h)anthracene	53-70-3	0.33	0.33	0.33	0.56	1.1	0.157	D	0.169	D	0.0922	D	0.0488	U	0.221	D	**2.27**	**D**	0.248	D	**0.371**	**D**	**0.447**	**D**	0.327	D
Dibenzofuran	132-64-9	7	14	59	350	1,000	0.0456	U	0.0446	U	0.0445	U	0.0488	U	0.0458	U	2.99	D	0.0463	U	0.134	D	0.0448	U	0.163	D
Diethyl phthalate	84-66-2	---	100	---	---	---	0.0456	U	0.0446	U	0.0445	U	0.0488	U	0.0458	U	0.05	U	0.0463	U	0.0511	U	0.0448	U	0.0464	U
Dimethyl phthalate	131-11-3	---	100	---	---	---	0.0456	U	0.0446	U	0.0445	U	0.0488	U	0.0458	U	0.051	JD	0.0463	U	0.0511	U	0.0448	U	0.0464	U
Di-n-butyl phthalate	84-74-2	---	100	---	---	---	0.0456	U	0.0446	U	0.0445	U	0.0488	U	0.0458	U	0.05	U	0.0643	JD	0.0511	U	0.0448	U	0.0717	JD
Di-n-hexyl phthalate	84-75-3	---	---	---	---	---	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Di-n-octyl phthalate	117-84-0	---	100	---	---	---	0.218	D	0.0446	U	0.0445	U	0.0488	U	0.0497	JD	13.8	D	0.0463	U	0.0511	U	0.0448	U	0.0464	U
Fluoranthene	206-44-0	100	100	100	500	1,000	1.33	D	1.52	D	0.561	D	0.294	D	1.73	D	31.4	D	1.52	D	3.87	D	3.35	D	3.01	D
Fluorene	86-73-7	30	100	100	500	1,000	0.0456	U	0.187	D	0.0445	U	0.224	D	0.0475	JD	3.99	D	0.0791	JD	0.836	D	1.17	D	0.556	D
Hexachlorobenzene	118-74-1	0.33	0.33	1.2	6	12	0.0456	U	0.0446	U	0.0445	U	0.0488	U	0.0458	U	0.05	U	0.0463	U	0.0511	U	0.0448	U	0.0464	U
Hexachlorocyclopentadiene	77-47-4	---	---	---	---	---	0.0456	U	0.0446	U	0.0445	U	0.0488	U	0.0458	U	0.05	U	0.0463	U	0.0511	U	0.0448	U	0.0464	U
Hexachloroethane	67-72-1	---	---	---	---	---	0.0456	U	0.0446	U	0.0445	U	0.0488	U	0.0458	U	0.05	U	0.0463	U	0.0511	U	0.0448	U	0.0464	U
Indeno(1,2,3-cd)pyrene	193-39-5	0.5	0.5	0.5	5.6	11	0.487	D	0.496	D	0.258	D	0.0488	U	**0.559**	**D**	**5.51**	**D**	**0.521**	**D**	**0.934**	**D**	**1.05**	**D**	**0.7**	**D**
Isophorone	78-59-1	---	100	---	---	---	0.0456	U	0.0446	U	0.0445	U	0.0488	U	0.0458	U	0.05	U	0.0463	U	0.0511	U	0.0448	U	0.0464	U
Naphthalene	91-20-3	12	100	100	500	1,000	0.0456	U	0.0527	JD	0.0445	U	0.0488	U	0.0458	U	3.95	D	0.0463	U	0.202	D	0.929	D	0.551	D
Nitrobenzene	98-95-3	---	3.7	15	69	140	0.0456	U	0.0446	U	0.0445	U	0.0488	U	0.0458	U	0.05	U	0.0463	U	0.0511	U	0.0448	U	0.0464	U
N-Nitrosodimethylamine	62-75-9	---	---	---	---	---	0.0456	U	0.0446	U	0.0445	U	0.0488	U	0.0458	U	0.05	U	0.0463	U	0.0511	U	0.0448	U	0.0464	U
N-nitroso-di-n-propylamine	621-64-7	---	---	---	---	---	0.0456	U	0.0446	U	0.0445	U	0.0488	U	0.0458	U	0.05	U	0.0463	U	0.0511	U	0.0448	U	0.0464	U
N-Nitrosodiphenylamine	86-30-6	---	---	---	---	---	0.0456	U	0.0446	U	0.0445	U	0.0488	U	0.0458	U	0.05	U	0.0463	U	0.0511	U	0.0448	U	0.0464	U
Pentachloroaniline	527-20-8	---	---	---	---	---	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Pentachlorobenzene	608-93-5	---	---	---	---	---	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Pentachloronitrobenzene	82-68-8	---	---	---	---	---	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Pentachlorophenol	87-86-5	0.8	2.4	6.7	6.7	55	0.0456	U	0.0446	U	0.0445	U	0.0488	U	0.0458	U	0.05	U	0.0463	U	0.0511	U	0.0448	U	0.0464	U
Phenanthrene	85-01-8	100	100	100	500	1,000	0.583	D	1.18	D	0.299	D	0.657	D	0.62	D	38.6	D	0.928	D	4.8	D	5.09	D	3.17	D
Phenol	108-95-2	0.33	100	100	500	1,000	0.0456	U	0.0446	U	0.0445	U	0.0488	U	0.0458	U	0.127	D	0.0463	U	0.0511	U	0.0448	U	0.0464	U
Pyrene	129-00-0	100	100	100	500	1,000	1.23	D	1.72	D	0.698	D	0.306	D	1.41	D	26.9	D	1.47	D	4.53	D	5.42	D	2.85	D
Pyridine	110-86-1	---	---	---	---	---	0.182	U	0.178	U	0.178	U	0.195	U	0.183	U	0.2	U	0.185	U	0.204	U	0.179	U	0.185	U

TABLE 1
SUMMARY OF SOIL ANALYTICAL RESULTS
Block 4434 Lot 1
Brooklyn, New York

Sample ID:		NYSDEC Subpart 375-6 Remedial Program Soil Cleanup Objectives					023/LSB-10A		024/LSB-10B		030/LSB-11A		032/LSB-11C		021/LSB-12A		022/LSB-12B		025/LSB-13A		026/LSB-13B		017/LSB-14A		018/LSB-14B	
Material							Hist. Fill		Fill Above Ash		Hist. Fill		Fill Above Ash		Hist. Fill		Fill Between Ash Layers		Hist. Fill		Hist. Fill		Hist. Fill		Fill Above Ash	
Laboratory Sample Number:			Protection of Public Health - Restricted Use SCOs				18E0487-03		18E0487-04		18E0514-01		18E0514-03		18E0487-01		18E0487-02		18E0487-05		18E0487-06		18E0411-17		18E0411-18	
Sample Date:							5/9/2018		5/9/2018		5/9/2018		5/9/2018		5/9/2018		5/9/2018		5/9/2018		5/9/2018		5/8/2018		5/8/2018	
Sample Depth/VOC Sample Depth (ft bgs):							0-2 (1.5-2)		15-17 (16-16.5)		0-2 (1-1.5)		11.5-13.5 (13-13.5)		0-2 (1-1.5)		16-18 (16.5-17)		0-2 (1-1.5)		8-10 (9.5-10)		0-2 (1.5-2)		8-10 (9-9.5)	
Units:	CAS Number	Unrestricted Use	Residential	Restricted-Residential	Commercial	Industrial	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q
Pesticides, EPA TCL List																										
4,4'-DDD	72-54-8	0.0033	2.6	13	92	180	0.0018	U	0.00177	U	0.00176	U	0.00193	U	0.0018	U	**0.022**	**D**	0.00182	U	0.00202	U	0.00176	U	0.00183	U
4,4'-DDE	72-55-9	0.0033	1.8	8.9	62	120	0.0018	U	0.00177	U	0.00176	U	0.00193	U	0.0018	U	0.00197	U	0.00182	U	0.00202	U	0.00176	U	0.00183	U
4,4'-DDT	50-29-3	0.0033	1.7	7.9	47	94	**0.0223**	**D**	0.00177	U	**0.00673**	**D**	0.00193	U	0.0018	U	**0.00762**	**DP**	**0.0247**	**D**	0.00202	U	**0.0181**	**D**	0.00183	U
Aldrin	309-00-2	0.005	0.019	0.097	0.68	1.4	0.0018	U	0.00177	U	0.00176	U	0.00193	U	0.0018	U	0.00197	U	0.00182	U	0.00202	U	0.00176	U	0.00183	U
alpha-BHC	319-84-6	0.02	0.097	0.48	3.4	6.8	0.0018	U	0.00177	U	0.00176	U	0.00193	U	0.0018	U	0.00197	U	0.00182	U	0.00202	U	0.00176	U	0.00183	U
alpha-Chlordane	5103-71-9	0.094	0.91	4.2	24	47	0.0224	DP	0.00177	U	0.00328	D	0.00193	U	0.0018	U	0.00197	U	0.0173	DP	0.00202	U	0.00176	U	0.00183	U
beta-BHC	319-85-7	0.036	0.072	0.36	3	14	0.0018	U	0.00177	U	0.00176	U	0.00193	U	0.0018	U	0.00197	U	0.00182	U	0.00202	U	0.00176	U	0.00183	U
Biphenyl	92-52-4	---	---	---	---	---	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Chlordane, total	57-74-9	---	---	---	---	---	0.037	DP	0.0354	U	0.0351	U	0.0386	U	0.036	U	0.0393	U	0.0365	U	0.0405	U	0.0353	U	0.0365	U
Chlrodane, gamma	5103-74-2	---	0.54	---	---	---	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Chlordecone (Kepone)	143-50-0	---	---	---	---	---	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
delta-BHC	319-86-8	0.04	100	100	500	1,000	0.0018	U	0.00177	U	0.00176	U	0.00193	U	0.0018	U	0.00197	U	0.00182	U	0.00202	U	0.00176	U	0.00183	U
Dieldrin	60-57-1	0.005	0.039	0.2	1.4	2.8	0.0018	U	0.00177	U	0.00176	U	0.00193	U	0.0018	U	**0.00522**	**D**	**0.0111**	**D**	0.00202	U	0.00176	U	0.00183	U
Endosulfan I	959-98-8	2.4	4.8	24	200	920	0.0018	U	0.00177	U	0.00176	U	0.00193	U	0.0018	U	0.00197	U	0.00182	U	0.00202	U	0.00176	U	0.00183	U
Endosulfan II	33213-65-9	2.4	4.8	24	200	920	0.0018	U	0.00177	U	0.00176	U	0.00193	U	0.0018	U	0.00197	U	0.00182	U	0.00202	U	0.00176	U	0.00183	U
Endosulfan sulfate	1031-07-8	2.4	4.8	24	200	920	0.0018	U	0.00177	U	0.00176	U	0.00193	U	0.0018	U	0.00197	U	0.00182	U	0.00202	U	0.00176	U	0.00183	U
Endrin	72-20-8	0.014	2.2	11	89	410	0.0018	U	0.00177	U	0.00176	U	0.00193	U	0.0018	U	0.00197	U	0.00182	U	0.00202	U	0.00176	U	0.00183	U
Endrin aldehyde	7421-93-4	---	---	---	---	---	0.0018	U	0.00177	U	0.00176	U	0.00193	U	0.0018	U	0.00197	U	0.00182	U	0.00202	U	0.00176	U	0.00183	U
Endrin ketone	53494-70-5	---	---	---	---	---	0.0018	U	0.00177	U	0.00176	U	0.00193	U	0.0018	U	0.00197	U	0.00182	U	0.00202	U	0.00176	U	0.00183	U
Furan	110-00-9	---	---	---	---	---	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
gamma-BHC (Lindane)	58-89-9	0.1	0.28	1.3	9.2	23	0.0018	U	0.00177	U	0.00176	U	0.00193	U	0.0018	U	0.00197	U	0.00182	U	0.00202	U	0.00176	U	0.00183	U
gamma-Chlordane	5566-34-7	---	---	---	---	---	0.0146	DP	0.00177	U	0.00372	DP	0.00193	U	0.0018	U	0.00197	U	0.0113	DP	0.00202	U	0.00176	U	0.00183	U
Heptachlor	76-44-8	---	0.42	2.1	15	29	0.0018	U	0.00177	U	0.00176	U	0.00193	U	0.0018	U	0.00197	U	0.00182	U	0.00202	U	0.00176	U	0.00183	U
Heptachlor epoxide	1024-57-3	---	0.077	---	---	---	0.0018	U	0.00177	U	0.00176	U	0.00193	U	0.0018	U	0.00197	U	0.00182	U	0.00202	U	0.00176	U	0.00183	U
Methoxychlor	72-43-5	---	100	---	---	---	0.00898	U	0.00884	U	0.00879	U	0.00964	U	0.00901	U	0.00983	U	0.00912	U	0.0101	U	0.00882	U	0.00913	U
Parathion	56-38-2	---	100	---	---	---	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Toxaphene	8001-35-2	---	---	---	---	---	0.0909	U	0.0895	U	0.0889	U	0.0975	U	0.0912	U	0.0995	U	0.0923	U	0.102	U	0.0893	U	0.0924	U
PCBs, EPA TCL List																										
Aroclor 1016	12674-11-2	0.1	1	1	1	25	0.0181	U	0.0179	U	0.0177	U	0.0195	U	0.0182	U	0.0198	U	0.0184	U	0.0204	U	0.0178	U	0.0184	U
Aroclor 1221	11104-28-2	0.1	1	1	1	25	0.0181	U	0.0179	U	0.0177	U	0.0195	U	0.0182	U	0.0198	U	0.0184	U	0.0204	U	0.0178	U	0.0184	U
Aroclor 1232	11141-16-5	0.1	1	1	1	25	0.0181	U	0.0179	U	0.0177	U	0.0195	U	0.0182	U	0.0198	U	0.0184	U	0.0204	U	0.0178	U	0.0184	U
Aroclor 1242	53469-21-9	0.1	1	1	1	25	0.0181	U	0.0179	U	0.0177	U	0.0195	U	0.0182	U	0.0198	U	0.0184	U	0.0204	U	0.0178	U	0.0184	U
Aroclor 1248	12672-29-6	0.1	1	1	1	25	0.0181	U	0.0179	U	0.0177	U	0.0195	U	0.0182	U	0.0198	U	0.0184	U	0.0204	U	0.0178	U	0.0184	U
Aroclor 1254	11097-69-1	0.1	1	1	1	25	**0.225**		0.0179	U	0.0177	U	0.0195	U	0.0182	U	0.0198	U	**0.19**		0.0204	U	0.0178	U	0.0184	U
Aroclor 1260	11096-82-5	0.1	1	1	1	25	**0.113**		0.0179	U	0.0393		**0.918**	**E**	**0.113**		0.0198	U	**0.104**		0.0204	U	**0.127**		0.044	P
Total PCBs	1336-36-3	0.1	1	1	1	25	**0.338**		0.0179	U	0.0393		**0.918**		**0.113**		**0.252**		**0.294**		0.0204	U	**0.127**		0.044	P
Metals, Target Analyte																										
Aluminum	7429-90-5	---	---	---	---	---	6,250		5,790		5,490		4,920		4,900		5,170		6,690		6,900		5,160		5,030	
Antimony	7440-36-0	---	---	---	---	---	1.47		0.536	U	0.534	U	0.587	U	0.599		1.96		0.733		0.613	U	4.58		30.9	
Arsenic	7440-38-2	13	16	16	16	16	3.11		4.06		3.17		2.1		1.95		2.6		3.61		5.6		1.1		1.81	
Barium	7440-39-3	350	350	400	400	10,000	242		71.8		191		**419**		156		**572**		178		326		171		**385**	
Beryllium	7440-41-7	7.2	14	72	590	2,700	0.208		0.165		0.267		0.242		0.182		0.373		0.255		0.256		0.248		0.202	
Boron	7440-42-8	---	---	---	---	---	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Cadmium	7440-43-9	2.5	2.5	4.3	9.3	60	1.14		0.342		1.14		0.511		1.16		1.64		0.845		1.15		2.45		**6.82**	
Calcium	7440-70-2	---	---	---	---	---	9,910		68,000		8,670		2,040		19,400		11,200		18,800		14,000		5,270		13,200	
Chromium, Total	7440-47-3	30	36	180	1500	6,800	**65.1**		18.8		14.4		13.2		18.6		19.3		20.6		21.5		21.7		**44.8**	
Chromium, Hexavalent	18540-29-9	1	22	110	400	800	0.546	U	0.536	U	0.534	U	0.587	U	0.548	U	0.598	U	0.554	U	0.613	U	0.537	U	0.556	U
Chromium, Trivalent	16065-83-1	30	36	180	1500	6,800	**65.1**		18.8		14.4		13.2		18.6		19.3		20.6		21.5		21.7		**44.8**	
Cobalt	7440-48-4	---	30	---	---	---	6.51		4.25		5.41		5.57		5.1		5.72		6.79		8.17		6.15		5.46	
Copper	7440-50-8	50	270	270	270	10,000	**112**		34.5		**80**		25.5		**112**		**225**		**102**		**69.7**		**97.8**		**191**	
Cyanide	57-12-5	27	27	27	27	10,000	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Iron	7439-89-6	---	2,000	---	---	---	**22,000**		**11,000**		**12,500**		**13,500**		**19,400**		**19,400**		**19,700**		**68,300**		**15,900**		**27,000**	
Lead	7439-92-1	63	400	400	1,000	3,900	**469**		**91.3**		**241**		**489**		**286**		**734**		**270**		**542**		**462**		**1,640**	
Lithium	7439-93-2	---	30	---	---	---	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Magnesium	7439-95-4	---	---	---	---	---	3,770		28,800		3,360		2,060		7,020		1,720		5,130		2,250		3,250		3,540	
Manganese	7439-96-5	1,600	2,000	2,000	10,000	10,000	191		214		161		181		210		154		265		467		205		225	
Mercury	7439-97-6	0.18	0.81	0.81	2.8	5.7	**0.587**		0.134		0.176		**0.287**		**0.496**		**0.689**		**0.667**		**0.664**		**0.266**		**0.263**	
Molybdemun	7439-98-7	---	---	---	---	---	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Nickel	7440-02-0	30	140	310	310	10,000	**31.5**		14.3		18		16		19.4		20.6		23.2		22.6		**42.6**		**63.4**	
Potassium	7440-09-7	---	---	---	---	---	591	B	586	B	669		864		610	B	517	B	753	B	663	B	572		605	
Selenium	7782-49-2	3.9	36	180	1,500	6,800	1.09	U	**8.44**		1.07	U	1.17	U	1.1	U	1.2	U	1.11	U	1.23	U	1.07	U	1.11	U
Silver	7440-22-4	2	36	180	1,500	6,800	0.546	U	0.536	U	0.534	U	0.587	U	0.548	U	0.598	U	0.554	U	0.613	U	0.537	U	0.556	U
Sodium	7440-23-5	---	---	---	---	---	183	B	215	B	149		177		189	B	161	B	183	B	389	B	160		456	
Technetium	7440-26-8	---	---	---	---	---	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Thallium	7440-28-0	---	---	---	---	---	1.09	U	1.07	U	1.07	U	1.17	U	1.1	U	1.2	U	1.11	U	1.23	U	1.07	U	1.11	U
Tin	7440-31-5	---	---	---	---	---	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Uranium	7440-61-1	---	---	---	---	---	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Vanadium	7440-62-2	---	100	---	---	---	21.3		20.8		17.6		15.3		21		18		25.2		19.3		16.8		19	
Zinc	7440-66-6	109	2,200	10,000	10,000	10,000	**439**		86		**257**		**377**		**330**		**451**		**333**		**437**		**2,500**		**5,070**	**D**
General Chemistry																										
Cyanide, total	57-12-5	27	27	27	27	10,000	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
% Solids	solids	---	---	---	---	---	91.6		93.3		93.6		85.2		91.3		83.7		90.2		81.5		93.2		90	

Notes:
Soil Cleanup Objectives are taken from the NYSDEC Subpart 375-6 Remedial Program SCOs (Revised Brownfields) criteria are from the NYSDEC Soil Cleanup Objective Tables 375-6.8(a) and 375-6.8(b), last revised 14 December 2006 and the NYSDEC CP-51 Soil Cleanup Guidance dated 21 October 2010.
ft bgs - feet below ground surface
NA: Not analyzed
U: The analyte was analyzed for, but was not detected at a level greater than or equal to the level of the RL or the sample concentration for results impacted by blank contamination.
J: The analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample.
D: Compound analyzed at a secondary dilution factor.
B: analyte found in the analysis batch blank
P: this flag is used for pesticide and PCB (Aroclor) target compounds when there is a % difference for detected concentrations that exceed method dictated limits between the two GC columns used for analysis
*: Analytical results for these compounds are reported by the laboratory as both VOCs and SVOCs. NYSDEC only provides SCOs for these compounds as VOCs; therefore, the SVOC analytical reusults for these compounds are screened against the VOC SCOs
Total Chromium is compared to the Trivalent Chromium SCOs for screening purposes.
Italicized results indicate Reporting Limits (RL) greater than or equal to the most stringent criteria.

TABLE 2
SUMMARY OF GROUNDWATER ANALYTICAL RESULTS
Block 4434 Lot 1
Brooklyn, New York

Sample ID: Langan Sample Number: Laboratory Sample Number: Sampling Date: Units:	CAS Number	TOGS 1.1.1 ug/L	Part 703 ug/L	Ground Water Quality Standards[1] ug/L	059/LMW-4 059 18E0702-07 5/14/2018 ug/L	Q	055/LMW-6 055 18E0702-03 5/14/2018 ug/L	Q
Volatile Organic Compounds (VOCs)								
1,1,1-Trichloroethane	71-55-6	5	5	5	0.200	U	0.200	U
1,1'-Biphenyl	92-52-4	5	5	5	2.86	U	2.63	U
1,1-Dichloroethane	75-34-3	5	5	5	0.200	U	0.200	U
1,1-Dichloroethene	75-35-4	5	5	5	0.200	U	0.200	U
1,1,1-Trichloroethane	71-55-6	5	5	5	0.200	U	0.200	U
1,1,2-Trichloroethane	79-00-5	1	1	1	0.200	U	0.200	U
1,1,1,2-Tetrachloroethane	630-20-6	5	5	5	0.200	U	0.200	U
1,1,2,2-Tetrachloroethane	79-34-5	5	5	5	0.200	U	0.200	U
1,2-Dichlorobenzene	95-50-1	3	3	3	0.200	U	0.200	U
1,2-Dichloroethane	107-06-2	0.6	0.6	0.6	0.200	U	0.200	U
1,2-Dichloroethene (cis)	156-59-2	5	5	5	0.200	U	0.200	U
1,2-Dichloroethene (trans)	156-60-5	5	5	5	0.200	U	0.200	U
1,2-Dichloropropane	78-87-5	1	1	1	0.200	U	0.200	U
1,2-Dichloropropene (cis)	10061-01-5			0.4	0.200	U	0.200	U
1,3-Dichlorobenzene	541-73-1	3	3	3	0.200	U	0.200	U
1,2,3-Trichlorobenzene	87-61-6	5	5	5	0.200	U	0.200	U
1,2,2-Trifluorethane (113 Freon)	76-13-1	5	---	5	0.200	U	0.200	U
1,2,3-Trichloropropane	96-18-4	0.04	0.04	0.04	*0.200*	*U*	*0.200*	*U*
1,2,4-Trichlorobenzene	120-82-1	5	5	5	0.200	U	0.200	U
1,2,4-Trimethylbenzene	95-63-6	5	5	5	0.200	U	0.200	U
1,3,5-Trimethylbenzene	108-67-8	5	5	5	0.200	U	0.200	U
1,3-Dichloropropene (trans)	10061-02-6			0.4	0.200	U	0.200	U
1,3-Dichlorobenzene	541-73-1	3	3	3	0.200	U	0.200	U
1,4-Dichlorobenzene	106-46-7	3	3	3	0.200	U	0.750	
1,4-Dioxane	123-91-1	---	---	---	40	U	40	U
2-Butanone	78-93-3	50	---	50	1.62		0.20	U
Acetone	67-64-1	50	0	50	2.94		1.44	J
Acrolein	107-02-8	5	5	5	0.200	U	0.200	U
Acrylonitrile	107-13-1	5	5	5	0.200	U	0.200	U
Benzene	71-43-2	1	1	1	0.200	U	0.200	U
Bromochloromethane	74-97-5	5	5	5	0.200	U	0.200	U
Bromodichloromethane	75-27-4	50	---	50	0.200	U	0.200	U
Bromoform	75-25-2	50	---	50	0.200	U	0.200	U
Bromomethane	74-83-9	5	5	5	0.200	U	0.200	U
n-Butylbenzene	104-51-8	5	5	5	0.200	U	0.310	J
Carbon Disulfide	75-15-0	60	60	60	0.200	U	0.200	U
Carbon tetrachloride	56-23-5	5	5	5	0.200	U	0.200	U
Chlorobenzene	108-90-7	5	5	5	0.20	U	0.24	J
Chloroethane	75-00-3	5	5	5	0.200	U	0.200	U
Chloroform	67-66-3	7	7	7	0.200	U	0.200	U
Cyclohexane	110-82-7	---	---	---	0.200	U	0.840	
Dibromochloromethane	124-48-1	50	---	50	0.200	U	0.200	U
Dibromomethane	74-95-3	5	5	5	0.200	U	0.200	U
Dichlorodifluoromethane	75-71-8	5	5	5	0.200	U	0.200	U
Ethylbenzene	100-41-4	5	5	5	0.200	U	0.200	U
Ethylene Dibromide	106-93-4	0.0006	0.0006	0.0006	*0.200*	*U*	*0.200*	*U*
Hexachlorobutadiene	87-68-3	0.5	0.5	0.5	0.200	U	0.200	U
Hexachlorobenzene	118-74-1	0.04	0.04	0.04	0.0229	U	0.0211	U
2-Hexanone	591-78-6	50	---	50	0.200	U	0.200	U
Isopropyl Benzene	98-82-8	5	5	5	0.200	U	0.240	J
p-Isopropyltoluene	99-87-6	5	5	5	0.540		0.200	U
Methanol	67-56-1	---	---	---	NA		NA	
Methyl acetate	79-20-9	---	---	---	0.200	U	0.200	U
Methyl ethyl ketone (MEK / 2-butanone)	78-93-3	50	---	50	1.620		0.200	U
Methyl tert-butyl ether	1634-04-4	10	---	10	**19.900**		2.500	
Methylene chloride	75-09-2	5	5	5	1.000	U	1.000	U
Methylcyclohexane	108-87-2	---	---	---	0.200	U	1.200	
4-Methyl-2-Pentanone	108-10-1	---	---	---	0.200	U	0.200	U
Naphthalene	91-20-3	10	---	10	NA		NA	
N-nitrosodiphenylamine	86-30-6	50	---	50	2.860	U	2.630	U
Propylbenzene-n	103-65-1	5	5	5	0.200	U	0.200	U
Sec-Butylbenzene	135-98-8	5	5	5	0.200	U	0.320	J
Styrene	100-42-5	5	5	5	0.200	U	0.200	U
Tert Butyl Alcohol (TBA)	75-65-0	---	---	---	0.500	U	0.500	U
Tert-Butylbenzene	98-06-6	5	5	5	0.200	U	0.200	U
Tetrachloroethene	127-18-4	5	5	5	0.200	U	0.200	U
Toluene	108-88-3	5	5	5	0.230	J	0.200	U
Trichloroethene	79-01-6	5	5	5	0.200	U	0.200	U
Trichlorofluoromethane (Freon 11)	75-69-4	5	5	5	0.200	U	0.200	U
Vinyl Chloride	75-01-4	2	2	2	0.200	U	0.200	U
1,2-Xylene (o-Xylene)	95-47-6	5	5	5	0.200	U	0.390	J
m&p-Xylene	179601-23-1	---	---	5	0.500	U	0.500	U
Xylene (mixed)	1330-20-7	---	---	5	0.600	U	0.620	J

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SUMMARY OF GROUNDWATER ANALYTICAL RESULTS
Block 4434 Lot 1
Brooklyn, New York

Sample ID: Langan Sample Number: Laboratory Sample Number: Sampling Date: Units:	CAS Number	TOGS 1.1.1 ug/L	Part 703 ug/L	Ground Water Quality Standards[1] ug/L	059/LMW-4 059 18E0702-07 5/14/2018 ug/L	Q	055/LMW-6 055 18E0702-03 5/14/2018 ug/L	Q
Semi-Volatile Organic Compounds (SVOCs)								
1,1'-Biphenyl	92-52-4	5	5	5	2.860	U	2.630	U
1,2-Diphenylhydrazine (as Azobenzene)	122-66-7	---	---	---	2.860	U	2.630	U
2-Chloronaphthalene	91-58-7	10	---	10	2.860	U	2.630	U
2-Chlorophenol	95-57-8	---	---	---	2.860	U	2.630	U
2-Methylnaphthalene	91-57-6	---	---	---	2.860	U	2.630	U
2-Nitroaniline	88-74-4	5	5	5	2.860	U	2.630	U
2-Nitrophenol	88-75-5	---	---	---	2.860	U	2.630	U
2,4-Dichlorophenol	120-83-2	1	1	1	*2.860*	*U*	*2.630*	*U*
2,4-Dimethylphenol	105-67-9	1	1	1	*2.860*	*U*	*2.630*	*U*
2,4-Dinitrophenol	51-28-5	1	1	1	*2.860*	*U*	*2.630*	*U*
2,4-Dinitrotoluene	121-14-2	5	5	5	2.860	U	2.630	U
2,6-Dinitrotoluene	606-20-2	5	5	5	2.860	U	2.630	U
3-Chloroaniline	108-42-9	5	5	5	NA		NA	
3-Chlorophenol	108-43-0	1	---	1	NA		NA	
3-Nitroaniline	99-09-2	5	5	5	2.860	U	2.630	U
3,3'-Dichlorobenzidine	91-94-1	5	5	5	2.860	U	2.630	U
3- & 4-Methylphenols	65794-96-9			1	**6.430**		*2.630*	*U*
4-Nitroaniline	100-01-6	5	5	5	2.860	U	2.630	U
4-Nitrophenol	100-02-7	1	---	1	*5.710*	*U*	*5.260*	*U*
4,6-Dinitro-2-methylphenol	534-52-1			---	2.860	U	2.630	U
Acenaphthene	83-32-9	20	---	20	0.126		0.158	
Acenaphthylene	208-96-8	---	---	---	0.057	U	0.053	U
Atrazine	1912-24-9	7.5	7.5	7.5	0.571	U	0.526	U
Anthracene	120-12-7	50	---	50	0.080		0.063	
Benzidine	92-87-5	5	5	5	*5.710*	*U*	*5.260*	*U*
Benzo(a)anthracene	56-55-3	0.002	---	0.002	*0.057*	*U*	*0.053*	*U*
Benzo(a)pyrene	50-32-8	ND	ND	ND	0.057	U	0.053	U
Benzo(b)fluoranthene	205-99-2	0.002	---	0.002	*0.057*	*U*	*0.053*	*U*
Benzo(g,h,i)perylene	191-24-2	---	---	---	0.057	U	0.053	U
Benzo(k)fluoranthene	207-08-9	0.002	---	0.002	*0.057*	*U*	*0.053*	*U*
Benzoic acid	65-85-0	---	---	---	28.600	U	26.300	U
Benzyl alcohol	100-51-6	---	---	---	2.860	U	2.630	U
Bis(2-chloroethoxy)methane	111-91-1	5	5	5	2.860	U	2.630	U
bis(2-Chloroethyl)ether	111-44-4	1	---	1	*1.140*	*U*	*1.050*	*U*
bis(2-Ethylhexyl)phthalate	117-81-7	5	5	5	0.571	U	0.526	U
4-Bromophenyl phenyl ether	101-55-3	---	---	---	2.860	U	2.630	U
Butyl benzyl phthalate	85-68-7	50	---	50	2.860	U	2.630	U
Carbazole	86-74-8	---	---	---	2.860	U	2.630	U
4-Chlorophenyl phenyl ether	7005-72-3	---	---	---	2.860	U	2.630	U
Chrysene	218-01-9	0.002	---	0.002	*0.057*	*U*	*0.053*	*U*
Dibenzo(a,h)anthracene	53-70-3	---	---	---	0.057	U	0.053	U
Dibenzofuran	132-64-9	---	---	---	2.860	U	2.630	U
Diethyl phthalate	84-66-2	50	---	50	2.860	U	2.630	U
Dimethyl phthalate	131-11-3	50	---	50	2.860	U	2.630	U
Di-n-butyl phthalate	84-74-2	50	50	50	2.860	U	2.630	U
Di-n-octyl phthalate	117-84-0	50	---	50	2.860	U	2.630	U
Fluoranthene	206-44-0	50	---	50	0.194		0.063	
Fluorene	86-73-7	50	---	50	0.286		0.284	
Hexachlorobenzene	118-74-1	0.04	0.04	0.04	0.023	U	0.021	U
Hexachlorobutadiene	87-68-3	0.5	0.5	0.5	0.200	U	0.200	U
Hexachlorocyclopentadiene	77-47-4	5	5	5	*5.710*	*U*	*5.260*	*U*
Hexachloroethane	67-72-1	5	5	5	0.571	U	0.526	U
Indeno(1,2,3-cd)pyrene	193-39-5	0.002	---	0.002	*0.057*	*U*	*0.053*	*U*
Isophorone	78-59-1	50	---	50	2.860	U	2.630	U
Naphthalene	91-20-3	10	---	10	0.206		0.305	
Nitrobenzene	98-95-3	0.4	0.4	0.4	0.286	U	0.263	U
N-Nitrosodimethylamine	62-75-9	---	---	---	0.571	U	0.526	U
N-nitroso-di-n-propylamine	621-64-7	---	---	---	2.860	U	2.630	U
n-Nitrosodiphenylamine	86-30-6	50	---	50	2.860	U	2.630	U
o-Cresol(s) (2-Methylphenol)	95-48-7	1	---	1	*2.860*	*U*	*2.630*	*U*
p-Cresol(s) (4-Methylphenol)	106-44-5	1	---	1	NA		NA	
Pentachlorophenol	87-86-5	1	1	1	0.286	U	0.263	U
Phenanthrene	85-01-8	50	---	50	0.389		0.358	
Phenol (total)	108-95-2	1	1	1	*2.860*	*U*	*2.630*	*U*
Pyrene	129-00-0	50	---	50	0.103		0.053	U

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SUMMARY OF GROUNDWATER ANALYTICAL RESULTS
Block 4434 Lot 1
Brooklyn, New York

Sample ID: Langan Sample Number: Laboratory Sample Number: Sampling Date: Units:	CAS Number	TOGS 1.1.1 ug/L	Part 703 ug/L	Ground Water Quality Standards[1] ug/L	059/LMW-4 059 18E0702-07 5/14/2018 ug/L	Q	055/LMW-6 055 18E0702-03 5/14/2018 ug/L	Q
Pesticides								
4,4'-DDE	72-55-9	0.2	0.2	0.2	0.00457	U	0.00444	U
4,4'-DDT	50-29-3	0.2	0.2	0.2	0.00457	U	0.00444	U
4,4'-DDD	72-54-8	0.3	0.3	0.3	0.00457	U	0.00444	U
Aldrin	309-00-2	ND	ND	ND	0.00457	U	0.00444	U
Alpha-BHC	319-84-6	0.01	0.01	0.01	0.00457	U	0.00444	U
Beta-BHC	319-85-7	0.04	0.04	0.04	0.00457	U	0.00444	U
Chlordane	57-74-9	0.05	0.05	0.05	0.02290	U	0.02220	U
Delta-BHC	319-86-8	0.04	0.04	0.04	0.00457	U	0.00444	U
Dieldrin	60-57-1	0.004	0.004	0.004	0.00229	U	0.00222	U
Endosulfan I	959-98-8	---	---	---	0.00457	U	0.00444	U
Endosulfan II	33213-65-9	---	---	---	0.00457	U	0.00444	U
Endosulfan Sulfate	1031-07-8	---	---	---	0.00457	U	0.00444	U
Endrin	72-20-8	ND	ND	ND	0.00457	U	0.00444	U
Endrin aldehyde	7421-93-4	5	5	5	0.0114	U	0.0111	U
Endrin ketone	53494-70-5	5	5	5	0.0114	U	0.0111	U
Heptachlor	76-44-8	0.04	0.04	0.04	0.00457	U	0.00444	U
Heptachlor epoxide	1024-57-3	0.03	0.03	0.03	0.00457	U	0.00444	U
Methoxychlor	72-43-5	35	35	35	0.00457	U	0.00444	U
Toxaphene	8001-35-2	0.06	0.06	0.06	*0.114*	*U*	*0.111*	*U*
Polychlorinated biphenyls (PCBs)		0.09	0.09	0.09				
Pcb-1016 (Aroclor 1016)	12674-11-2	0.09	0.09	0.09	0.0571	U	0.0556	U
Pcb-1221 (Aroclor 1221)	11104-28-2	0.09	0.09	0.09	0.0571	U	0.0556	U
Pcb-1232 (Aroclor 1232)	11141-16-5	0.09	0.09	0.09	0.0571	U	0.0556	U
Pcb-1242 (Aroclor 1242)	53469-21-9	0.09	0.09	0.09	0.0571	U	0.0556	U
Pcb-1248 (Aroclor 1248)	12672-29-6	0.09	0.09	0.09	0.0571	U	0.0556	U
Pcb-1254 (Aroclor 1254)	11097-69-1	0.09	0.09	0.09	0.0571	U	**0.3410**	
Pcb-1260 (Aroclor 1260)	11096-82-5	0.09	0.09	0.09	0.0571	U	0.0556	U
Total PCBs	1336-36-3	0.09	0.09	0.09	0.0571	U	**0.3410**	
Herbicides								
2,4,5-T	93-76-5	35	35	35	NA		NA	
2,4-D	94-75-7	50	50	50	NA		NA	
2,4,5,-TP	93-72-1	0.26	0.26	0.26	NA		NA	
Metals								
Aluminum	7429-90-5	---	---	---	232.00		600.00	
Antimony	7440-36-0	3	3	3	1.11	U	1.11	U
Arsenic	7440-38-2	25	25	25	9.57		1.11	U
Barium	7440-39-3	1000	1000	1,000	81		388	
Beryllium	7440-41-7	3	---	3	1.11	U	1.11	U
Cadmium	7440-43-9	5	5	5	1.11	U	1.11	U
Calcium	7440-70-2	---	---	---	82,500		102,000	
Chromium, Hexavalent	18540-29-9	50	50	50	10	U	10	U
Chromium, Trivalent	16065-83-1	---	---	---	10	U	10	U
Cobalt	7440-48-4	---	---	---	6.15		5.56	U
Copper	7440-50-8	200	200	200	5.56	U	12.5	
Cyanide	57-12-5	200	200	200	NA		NA	
Iron	7439-89-6	300	300	300	**532.00**		**34,400**	
Iron and Manganese	7493-89-6/7439-96-5	500	500	500	NA		NA	
Lead	7439-92-1	25	25	25	6	U	**117**	
Magnesium	7439-95-4	35000	---	35,000	7,610		10,000	
Manganese	7439-96-5	300	300	300	**439**		**877**	
Mercury (elemental)	7439-97-6	0.7	0.7	0.7	0.2	U	0.2	U
Molybdenum	7439-98-7	---	----	----	NA		NA	
Nickel	7440-02-0	100	100	100	5.56	U	5.56	U
Potassium	7440-09-7	---	---	---	10,600	B	18,100	B
Selenium	7782-49-2	10	10	10	**20.90**		3.72	
Silver	7440-22-4	50	50	50	5.56	U	5.56	U
Sodium	7440-23-5	20000	20000	20,000	**76,100**	**B**	**181,000**	**B**
Thallium	7440-28-0	0.5	---	0.5	*1.11*	*U*	*1.11*	*U*
Vanadium	7440-62-2	---	---	---	11.100	U	11.100	U
Zinc	7440-66-6	2000	---	2,000	16.7	U	230	
Dissolved Metals								
Aluminum	7429-90-5D	---	---	---	55.6	U	55.6	U
Antimony	7440-36-0D	3	3	3	1.110	U	1.110	U
Arsenic	7440-38-2D	25	25	25	4.550		1.110	U
Barium	7440-39-3D	1000	1000	1,000	450		299	
Beryllium	7440-41-7D	3	---	3	1.110	U	1.110	U
Boron	7440-42-8D	1000	1000	1,000	NA		NA	
Cadmium	7440-43-9D	5	5	5	1.110	U	1.110	U
Calcium	7440-70-2D	---	---	---	156,000		135,000	
Chromium	7440-47-3D	50	50	50	5.56	U	5.56	U
Chromium, Hexavalent	18540-29-9D	50	50	50	NA		NA	
Chromium, Trivalent	16065-83-1D	0	0	0	NA		NA	
Cobalt	7440-48-4D	---	---	---	5.56	U	5.56	U
Copper	7440-50-8D	200	200	200	5.56	U	5.56	U
Cyanide	57-12-5D	200	200	200	NA		NA	
Iron	7439-89-6D	300	300	300	**2,940**		**9,800**	
Iron and Manganese	7493-89-6/7439-96-5	500	500	500	NA		NA	
Lead	7439-92-1D	25	25	25	5.56	U	5.56	U
Lithium	7439-93-2D	0	0	0	NA		NA	
Magnesium	7439-95-4D	35000	---	35,000	21,200		13,800	
Manganese	7439-96-5D	300	300	300	**309**		**513**	
Mercury (elemental)	7439-97-6D	0.7	0.7	0.7	0.2	U	0.2	U
Molybdenum	7439-98-7D	---	---	---	NA		NA	
Nickel	7440-02-0D	100	100	100	5.56	U	5.56	U
Potassium	7440-09-7D	---	---	---	20,800		13,300	
Selenium	7782-49-2D	10	10	10	**14.60**		1.86	
Silver	7440-22-4D	50	50	50	5.56	U	5.56	U
Sodium	7440-23-5D	20000	20000	20,000	**123,000**		**87,800**	
Technetium	7440-26-8D	0	0	0	NA		NA	
Thallium	7440-28-0D	0.5	---	0.5	*1.11*	*U*	*1.11*	*U*
Tin	7440-31-5D	0	0	0	NA		NA	
Uranium	7440-61-1D	0	0	0	NA		NA	
Vanadium	7440-62-2D	---	---	---	11.1	U	11.1	U
Zinc	7440-66-6D	2000	---	2,000	18.1		16.7	U

NOTES:

1. DEC establishes water quality standards and other criteria for many specific substances and are found in NYS regulation 6 NYCRR Part 703.5 (current through February 15, 2016). In the absence of established water quality standards, numeric guidance values are derived and compiled in Division of Water guidance (TOGS 1.1.1) (updated June 2004). Ambient standards and guidance values are supported by technical documents called "Fact Sheets" that are also available upon request from the NYSDEC.

http://www.dec.ny.gov/chemical/23853.html
http://www.dec.ny.gov/regulations/2652.html
ug/L: micrograms per liter
Exceedances of regulatory criteria are highlighted and **bold**.
Italicized results indicate the Reporting Limit (RL) is greater than or equal to the most stringent criteria.
--- : Indicates that no regulatory limit has been established for this analyte
NA: Compound not analyzed

Q is the Qualifier Column with definitions as follows:
J: Analyte detected at or above the MDL (method detection limit) but below the RL (Reporting Limit) - data is estimated
U: Analyte not detected at or above the level indicated