SITE MANAGEMENT PLAN

for

Long Island City Center
43-30 24th Street
Queens County
Long Island City, New York

NYSDEC Site Number: C241189
USEPA ID #NYR000248476

Prepared for:

CP VIII LIC Owner LLC
c/o Carmel Partners
510 Madison Ave, 8th Floor
New York, NY 10022

Prepared by:

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

DECEMBER 2023

Revisions to Final Approved Site Management Plan:

Revision No.	Date Submitted	Summary of Revision	NYSDEC Approval Date

LANGAN

CERTIFICATION STATEMENT

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

Jessica Friscia P.E.

12/27/2023 DATE

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LIST OF ACRONYMS

BCA	Brownfield Cleanup Agreement
BCP	Brownfield Cleanup Program
CAMP	Community Air Monitoring Plan
C&D	Construction and Demolition
CFR	Code of Federal Regulation
COC	Certificate of Completion
CP	Commissioner Policy
DER	Division of Environmental Remediation
ECL	Environmental Conservation Law
ELAP	Environmental Laboratory Approval Program
HASP	Health and Safety Plan
IC	Institutional Control
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYCRR	New York Codes, Rules and Regulations
OSHA	Occupational Safety and Health Administration
PID	Photoionization Detector
PRP	Potentially Responsible Party
PRR	Periodic Review Report
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
RAO	Remedial Action Objective
RAWP	Remedial Action Work Plan
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RP	Remedial Party
SCG	Standards, Criteria and Guidelines
SCO	Soil Cleanup Objective
SMP	Soil Management Plan
SOP	Standard Operating Procedures
SPDES	State Pollutant Discharge Elimination System
TAL	Target Analyte List
TCL	Target Compound List
TCLP	Toxicity Characteristic Leachate Procedure
USEPA	United States Environmental Protection Agency

EXECUTIVE SUMMARY

This Site Management Plan (SMP) was prepared for the Long Island City Center property at 43-30 24th Street in Long Island City, New York (the "site"). The site is enrolled in the New York State Brownfield Cleanup Program (BCP) as Site No. C241189. The Brownfield Cleanup Agreement (BCA), Index No. C241189-10-16, was initially executed by the New York State Department of Environmental Conservation (NYSDEC) and LICCD LLC, Long Island City Center LLC, and Long Island City Center II LLC (collectively, Stawski Partners) on December 8, 2016 for Queens Block 436, former Lot 1 and a part of former Lot 21. The BCA was subsequently amended on August 1, 2019 to reflect that former Lot 1 and a part of former Lot 21 were merged into the current Lot 1 configuration. On May 13, 2022, the BCA was again amended to reflect a real property transaction (which had occurred on March 16, 2022) to the sole new site owner, CP VIII LIC Owner, LLC, which was also substituted for Stawski Partners as the sole Volunteer. The site achieved a Track 2 Restricted-Residential cleanup and, after construction, will be improved with a 67-story residential and commercial building with a footprint area of about 56,500 square feet.

The following provides a summary of the controls implemented for the Site, as well as the inspections and reporting activities required by this SMP:

Site Identification: C241189 Long Island City Center, 43-30 24th Street, Long Island City, New York

Institutional Controls:	1. The property may be used for Restricted-Residential use as defined in 6 NYCRR Part 375-1.8(g)(2)(ii), Commercial use as defined in 6 NYCRR Part 375-1.8(g)(2)(iii), and Industrial use as defined in 6 NYCRR Part 375-1.8(g)(2)(iv)
	2. The use of groundwater underlying the property is prohibited without necessary water quality treatment as determined by the NYSDOH and NYCDOHMH to render it safe for use as drinking water or for industrial purposes, and the user must first notify and obtain written approval to do so from the NYSDEC
	3. Data and information pertinent to site management must be reported at the frequency and in a manner as defined in this SMP

	4. All future activities that will disturb remaining contaminated material must be conducted in accordance with this SMP	
	5. Access to the site must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice to the property owner to assure compliance with the restrictions identified by the EE	
	6. Vegetable gardens and farming on the site are prohibited	
	7. Volunteer must provide all persons who acquire any interest in the site a complete copy of the SMP that the NYSDEC approves for the site and all NYSDEC-approved amendments to the SMP	
Inspections:		Frequency
1. Site-Wide Inspection		Annually
Evaluations		Frequency
Climate Change Vulnerability Assessment		After severe weather events
Soil Vapor Intrusion Evaluation		Upon change in use/as needed
Reporting:		
1. Inspections		With Periodic Review Report
2. Certification/Periodic Review Report		Beginning 30 days after the initial 15 month certifying period, then at a frequency determined by the Department

Further descriptions of the above requirements are provided in detail in the subsequent sections of this SMP.

1.0 INTRODUCTION

1.1 GENERAL

This Site Management Plan (SMP) is a required element of the remedial program for the Long Island City Center property at 43-30 24th Road located in Long Island City, Queens, New York (the site). The site is enrolled in the New York State Brownfield Cleanup Program (BCP) as Site No. C241189. The Brownfield Cleanup Agreement (BCA), Index No. C241189-10-16, was initially executed by the New York State Department of Environmental Conservation (NYSDEC) and LICCD LLC, Long Island City Center LL, and Long Island City Center II LLC (collectively, Stawski Partners) on December 8, 2016 for Queens Block 436, former Lot 1 and a part of former Lot 21. The BCA was subsequently amended as follows:

- Amendment #1: August 1, 2019 to reflect that former Lot 1 and a part of former Lot 21 were merged into the current Lot 1 configuration.

- Amendment #2: May 13, 2022, to reflect a real property transaction (which had occurred on March 16, 2022) to the sole new site owner, CP VIII LIC Owner, LLC, which was also substituted for Stawski Partners as the sole remedial party.

- Amendment #3: November 21, 2023, to demonstrate that the site is eligible for tangible property tax credits as an Affordable Housing project.

The site was remediated for Restricted-Residential (including Commercial) use and, after construction, will be improved with a 67-story residential and commercial building with a footprint area of about 56,500 square feet.

A site location map and site layout plan showing the site location, layout, and Institutional Controls boundary are provided as **Figures 1 and 2**, respectively. The boundaries of the site are described further in the metes and bounds site description that is part of the Environmental Easement (EE) provided in **Appendix A**.

Remediation was completed in accordance with the July 2019 Remedial Action Work Plan (RAWP). Site remediation included removal of soil exceeding the NYSDEC Title 6 of the New York Codes, Rules and Regulation (6 NYCRR) Part 375 Restricted-Residential (RURR) Soil Cleanup Objectives (SCOs) to a maximum depth of 15 feet below grade surface (bgs). Following completion of the remedial work, some contamination exceeding RURR SCOs remains at this site, which is hereafter referred to as "remaining contamination." Institutional Controls (IC) have been incorporated into the site remedy to control exposure to remaining contamination for protection of public health and the environment. No Engineering Controls (EC) are required for this site. An EE granted to the NYSDEC and recorded with the NYC Office of the City Register, requires compliance with this SMP and all ICs placed on the site.

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

It is important to note that:

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

- Failure to comply with this SMP is also a violation of Environmental Conservation Law, 6NYCRR Part 375 and the BCA for the site, and thereby subject to applicable penalties.

All reports associated with the site can be viewed by contacting the NYSDEC or its successor agency managing environmental issues in New York State. Site-related contact information is provided in **Appendix B** of this SMP.

Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C. (Langan) prepared this SMP on behalf of the remedial party in accordance with the requirements of the NYSDEC's Division of Environmental Remediation (DER) Technical Guidance for Site Investigation and Remediation, dated May 3, 2010 (DER-10), and the guidelines provided by the NYSDEC.

1.2 REVISIONS

Revisions to this plan will be proposed in writing to the NYSDEC's project manager. NYSDEC can also make changes to the SMP or request revisions from the remedial party. Revisions will be necessary upon, but not limited to, the following occurring: a post-remedial removal of contaminated sediment or soil, or other significant change to the site conditions. In accordance with the EE, the NYSDEC project manager will provide a notice of any approved changes to the SMP and append these notices to the SMP that is retained in the agency's files.

1.3 NOTIFICATIONS

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

- 60-day advance notice of any proposed changes in site use that are required under the terms of the BCA, 6 NYCRR Part 375 and/or ECL.
- 7-day advance notice of any field activity associated with the remedial program.
- 15-day advance notice of any proposed ground-intrusive activity pursuant to the Excavation Work Plan (EWP). If the ground-intrusive activity qualifies as a change of use as defined in 6 NYCRR Part 375, the above-mentioned 60-day advance notice is also required.

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

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

Table 1 includes contact information for the above notification. The information on this table will be updated as necessary to provide accurate contact information. A full listing of site-related contact information is provided in Appendix B. Responsibilities of the Owner and Remedial Party are provided in Appendix C.

Table 1 - Notifications*

Name	Contact Information
Remedial Engineer	Jessica Friscia, P.E. Phone No.: 973-560-4900 Email: jfriscia@langan.com
Program Manager	Steve Ciambruschini Phone No.: 973-560-4900 Email: sciambruschini@langan.com
Project Manager	Jessica Friscia, PE Phone No.: 973-560-4488 Email: jfriscia@langan.com
NYSDEC Project Manager	Christopher Allan Phone No.: 718-482-4065 Email: christopher.allan@dec.ny.gov
NYSDEC Project Manager's Supervisor	Cris-Sandra Maycock Phone No.: 718-482-4679 Email: cris-sandra.maycock@dec.ny.gov
NYSDEC Site Control	Email: dersitecontrol@dec.ny.gov
NYSDOH Project Manager	Sarita Wagh Phone No.: 518-402-7860 Email: BEEI@health.ny.gov
Site Owner and Remedial Party	Matthew Feldman Phone No.: 212-202-5783 Email: mfeldman@carmelpartners.com

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

2.0 SUMMARY OF PREVIOUS INVESTIGATIONS AND REMEDIAL ACTIONS

2.1 SITE LOCATION AND DESCRIPTION

The 56,458.69-square-foot (1.297-acre) site is located at 43-30 24th Street in the Long Island City neighborhood of Queens, New York and is identified as Block 436, Lot 1 on the New York City (NYC) Queens Borough Tax Map. When construction is completed, the development will consist of a 67-story residential and commercial building spanning the site footprint with a full cellar. The site was formerly identified as Lots 1 and 21, prior to merger of the southern portion of former Lot 21 into former Lot 1 to create the current Lot 1 configuration, and is bound to the north by Block 436, Lot 21 (a five-story office building) and Block 436, Lot 10 (a two-story office building with a basement); to the west by 23rd Street; to the south by 44th Road; and to the east by

24th Street. The elevated NYC Transit (NYCT) No. 7 subway structure runs along 23rd Street. The NYCT subway E/M lines are located approximately 280 feet south of the site and run under 44th Drive. A site location map and site layout plan are provided as Figures 1 and 2, respectively. The boundaries of the site are described in the metes and bounds site description that is part of the EE, which is included as Appendix A.

The owner and operator at the time of issuance of this SMP, which is the party responsible for implementing the SMP under the BCA is:

CP VIII LIC Owner, LLC
510 Madison Ave, 8th Floor
New York, NY 10022

2.2 PHYSICAL SETTING

2.2.1 LAND USE

The site is currently zoned as a manufacturing and residential district (M1-6 and R10). According to the New York City Department of City Planning zoning map, dated October 21, 2021, the site is also located within the Special Long Island City Mixed Use District (LIC). The Special Long Island City Mixed Use District promotes the development and expansion, at varying densities, of the longstanding mix of residential, commercial, industrial and cultural uses found in its four sub-districts—Court Square, Queens Plaza, Hunters Point and Dutch Kills. It encourages tower development near subway stations in the Queens Plaza sub-district and high lot coverage buildings within the other sub-districts.

The properties adjoining the site and in the neighborhood surrounding the site primarily include residential, commercial, and industrial properties. The site is adjoined by a NYCT elevated No. 7 line structure, followed by industrial buildings to the northwest; commercial buildings to the southeast and northeast; and mixed residential and commercial buildings to the southwest.

2.2.2 GEOLOGY

Prior to redevelopment, environmental investigations identified fill material of unknown origin consisting predominantly of brown to black, fine- to medium-grained sand and silt with varying amounts of gravel, brick, concrete, asphalt, slag, coal, ash, and glass. Fill material was encountered to depths ranging from approximately 0.5 to 2 feet bgs in the southwestern corner of the site and from approximately 9 to 17 feet bgs across the remainder of the site. Fill material is underlain by native soil typically comprised of brown and black, fine- to coarse-grained sand with varying amounts of silt and fine gravel, or by a brown silt with trace amounts of sand and gravel. Pockets of organic silt, silty clays, and peat are intermixed within the native soil in the northern portion of the site. Bedrock was encountered at depths ranging from approximately 20 to 60 feet bgs during Langan's June 2016 geotechnical investigation. The USGS "Bedrock and Engineering Geologic Maps of New York County and Parts Kings and Queens Counties, New York, and Parts of Bergen and Hudson Counties, New Jersey" indicates that the bedrock underlying the site consists of fine- to coarse-grained, gray to tan-weathering, quartzofeldspathic, muscovite-biotite-garnet schist and gray sillimanite-garnet-microcline gneiss (Ravenswood Granodiorite). Boring logs from previous investigations are included in Appendix C of the 2018 Remedial Investigation Report (RIR).

2.2.3 HYDROGEOLOGY

Synoptic groundwater measurements were collected in July 2017 from six on-site monitoring wells. Groundwater was encountered at depths ranging from approximately 11 to 16 feet bgs with an inferred flow direction to the west toward the East River. Underground utilities and other subsurface structures may locally influence the direction of groundwater flow. Groundwater elevation data recorded during the RI is summarized in the 2018 RIR.

2.3 INVESTIGATION AND REMEDIAL HISTORY

The following narrative provides a remedial history timeline and a summary of the available project records to document key investigative and remedial milestones for the site. Full titles for each of the reports referenced below are provided in Section 6.0 - References.

2.3.1 PAST USES

Historical Sanborn Fire Insurance Maps indicate that the site is in an urban area that was first developed as early as 1898. The former one-story building located on former Lot 21 was constructed in 1948, was historically used as a shipping and loading facility by Goldsmith Bros. and Volunteers of America between 1948 and at least 1990, and was most recently used as a parking garage. The former two-story building located on former Lot 1 was constructed in 1963 and was historically used as an electronic parts storage and service center by Panasonic from 1963 until at least 1986 and as a production warehouse from 1988 to 2001. From about 2001 to 2016, a portion of former Lot 21 was operated as a parking garage and former Lot 1 was operated as a warehouse. The parking garage was demolished in August 2016 and the warehouse building was demolished in April 2017.

2.3.2 PREVIOUS ENVIRONMENTAL REPORTS

The reports listed below describe site conditions prior to implementation of the remedy and were performed to characterize the nature and extent of contamination, and to fill data gaps to confirm environmental conditions and subsurface geology to develop remediation and mitigation strategies at the site.

- *Waste Characterization Report*, dated June 29, 2016, and prepared by Langan
- *Subsurface Investigation Letter Report*, dated July 11, 2016, and prepared by Langan
- *Remedial Investigation Work Plan*, dated July 18, 2017, and prepared by Langan
- *Remedial Investigation Report,* dated April 24, 2018, and prepared by Langan
- *Remedial Action Work Plan*, dated July 16, 2019, and prepared by Langan
- *Supplemental Waste Characterization Report*, dated November 12, 2020, and prepared by Langan

June 29, 2016 Waste Characterization Report, Prepared by Langan

Langan completed a waste characterization investigation in conjunction with the subsurface investigation (discussed above) that included:

- Advancement of 22 soil borings to depths between 15 and 27 feet below grade and the collection and analysis of 34 composite soil samples and 39 grab soil samples
- Installation of one temporary monitoring well to approximately 25 feet bgs and the collection and analysis of one groundwater sample

Findings of the waste characterization investigation were as follows:

- Soil: In 12 of the 34 composite samples, metals (arsenic, barium, cadmium, copper, lead and mercury) exceeded Part 375 RURR SCOs. In 13 of the 34 composite samples, semivolatile organic compounds (SVOC) exceeded Part 375 RURR SCOs.
- Toxic Characteristic Leaching Procedure (TCLP) lead was detected in two composite soil samples (COMP-E_5-10 in the south and COMP-J_5-10 in the east) exceeding the Resource Conservation and Recovery Act (RCRA) toxicity characteristic limit of 5 milligrams per liter (mg/L). TCLP lead was also detected just below the RCRA toxicity characteristic in sample COMP-K_5-10 in the east at a concentration of 4.9 mg/L. The discrete locations associated with these composite sample hazardous impacts were EB-10 (referred to in later investigations as Hot Spot 1), EB-19 (Hot Spot 2), EB-20 (Hot Spot 3), and EB-21 (Hot Spot 4).
- Groundwater: Two volatile organic compounds (VOC), 1,1,1-trichloroethane (TCA) and tetrachloroethene (PCE), exceeded NYSDEC Technical and Operational Guidance Series (TOGS) 1.1.1 Ambient Water Quality Standards (AWQS) and Guidance Values for Class GA water (collectively referred to as SGVs). PCE also exceeded the limitation for discharge to the New York City Department of Environmental Protection (NYCDEP) sewer system.

July 11, 2016 Subsurface Investigation Letter Report, Prepared by Langan

Langan conducted a subsurface investigation to evaluate possible impacts to soil, groundwater, and soil vapor due to historical use of the site and surrounding areas; and presented its findings in a letter report providing a description of the site background, investigation methodologies, investigation results and conclusions. The scope of the subsurface investigation included:

- A geophysical survey of the site to identify subsurface obstructions or anomalies
- Advancement of eight soil borings to between 20 and 27 feet bgs and collection and analysis of 28 soil samples
- Installation of six temporary monitoring wells to approximately 25 feet bgs and collection and analysis of six groundwater samples
- Installation of six sub-slab soil vapor probes and collection and analysis of six soil vapor samples and one indoor air sample

Findings of the subsurface investigation were as follows:

- Soil: Fill consisting of sand and silt with varying amounts of brick, slag, coal, and glass was identified to a depth of approximately 14 feet below grade. SVOCs, primarily polycyclic aromatic hydrocarbons (PAHs), exceeded 6 NYCRR Part 375 RURR SCOs. Total metals, including arsenic, barium, cadmium, copper, lead, mercury, nickel, silver and zinc, also exceeded Part 375 RURR SCOs.
- Groundwater: Chlorinated VOCs, including 1,1,1- TCA, cis-1,2-dichloroethene (DCE), PCE, trichloroethene (TCE), and vinyl chloride, exceeded NYSDEC SGVs. Two SVOCs, benzo(b)fluoranthene and chrysene, exceeded SGVs. Five metals including iron, magnesium, manganese, selenium, and sodium, exceeded SGVs.
- Soil Vapor: Chlorinated VOCs, including 1,1,1-TCA and PCE, and petroleum-related VOCs, including benzene, ethylbenzene, xylenes, and toluene, were detected in soil vapor samples.

July 18, 2017 Remedial Investigation Work Plan, Prepared by Langan

A Remedial Investigation Work Plan (RIWP) dated July 18, 2017 was prepared by Langan on behalf of Stawski Partners. The RIWP was prepared to investigate and characterize the nature and extent of the contamination in all media at or emanating from the site, to generate sufficient data to evaluate the remedial action alternatives, and to generate sufficient data to evaluate the actual and potential threats to human health and the environment.

The scope of work presented in the RIWP consisted of:

- A geophysical survey to clear boring locations to avoid potential subsurface utilities structures and/or underground storage tanks (USTs);
- Site wide sampling by advancement of 14 soil borings and collection of up to 42 soil samples (plus quality assurance/quality control [QA/QC] sampling);
- Lead delineation sampling at the aforementioned Hot Spots by advancement of 28 soil boings to horizontally and vertically delineate the extent of hazardous or potentially hazardous lead-impacted soil and the collection of up to 20 soil samples (plus QA/QC sampling);
- Installation of 6 permanent monitoring wells and collection of groundwater samples (plus QA/QC sampling); and
- Installation of two soil vapor sampling points and collection of soil vapor samples (plus QA/QC sampling) and one ambient sample.

NYSDEC reviewed the RIWP and issued an approval letter on August 21, 2017.

April 24, 2018 Remedial Investigation Report, Prepared by Langan

A RIR dated April 24, 2018 was prepared by Langan for Stawski Partners and submitted to NYSDEC to summarize the remedial investigation completed between June 26 and July 26, 2017 per the RIWP prepared by Langan and dated July 18, 2017.

Findings of the remedial investigation were as follows:

- Soil: Fill material consisting of brown to black, fine- to medium-grained sand and silt with varying amounts of gravel, brick, concrete, asphalt, slag, coal, ash, and glass was identified to depths ranging from approximately 0.5 to 2 feet bgs in the southwestern corner of the site and from approximately 9 to 17 feet bgs across the remainder of the site, with the deepest fill material in the northwestern portion of the site. SVOCs exceeded 6 NYCRR Part 375 RURR SCOs. Total metals, including arsenic, barium, cadmium, copper, lead, mercury, nickel, and zinc exceeded Part 375 RURR SCOs. Two additional areas of hazardous lead-impacted soil (i.e., hot spots that exceeded the RCRA toxicity characteristic) were identified and described below.
- Lead Delineation:
  - Total and TCLP lead were vertically and horizontally delineated for hazardous lead-impacted soil at Hot Spot 1, located in the central-southern portion of the subject property, and Hot Spots 2 through 4, located in the eastern portion of the subject property.

    - Two additional Hot Spot areas, the 0- to 2-foot depth interval at boring SB-01 (Hot Spot 5) in the southwestern portion of the site and the 10- to 12-foot depth interval at boring SB-10 (Hot Spot 6) in the northern portion of the site, were identified but were not delineated during the RI. Delineation activities for Hot Spots 5 and 6 are described in the 2020 Supplemental Waste Classification Report, as discussed below.

- Groundwater: The SVOC, bis(2-ethylhexyl)phthalate, exceeded the SGVs. Total and dissolved metals, including iron, magnesium, manganese, selenium, and/or sodium, also exceeded the SGVs.
- Soil Vapor: Chlorinated VOCs, including PCE and TCE, and petroleum-related VOCs, including benzene, ethylbenzene, xylenes, and toluene, were detected in soil vapor samples.

NYSDEC reviewed the RIR and issued an approval letter on May 15, 2018.

July 16, 2019 Remedial Action Work Plan, Prepared by Langan

A Remedial Action Work Plan (RAWP) dated July 16, 2019 was prepared by Langan for Stawski Partners and submitted to NYSDEC to select a remedy that is consistent with the procedures defined in DER-10 and complies with applicable standards, criteria, and guidance, as well as with applicable federal, state and local laws, regulations and requirements.

A Track 2 Site-specific cleanup utilizing a combination of the NYSDEC RURR SCOs and implementation of long-term institutional controls was selected for the remediation of the site. The selected Track 2 cleanup would include the following tasks:

- Construction of the support of excavation (SOE) system to facilitate the excavation of fill material and native soil exceeding RURR SCOs;
- Excavation, stockpiling, off-site transport, and disposal of contaminated fill material and native soil exceeding RURR SCOs to a maximum depth of 15 feet bgs, and any source material below 15 feet bgs;
- Collection and analysis of bottom confirmation and/or documentation soil samples to confirm RURR SCOs are achieved and/or to evaluate soil to remain in place after the remedy;
- Dewatering and treatment, as necessary, of impacted groundwater to accommodate the removal of material that exceeds RURR SCOs and to facilitate SOE installation and foundation construction;

- Completion of a topographic survey of either the confirmation sample locations or final excavation sub-grade;
- Backfilling of remediated areas to development grade with imported clean material (i.e., material meeting RURR SCOs), virgin stone, or recycled concrete aggregate (RCA);
- Reuse of site soil meeting RURR SCOs;
- Installation of a vapor barrier/waterproofing membrane as an element of construction for the proposed building;
- Development and implementation of a Health and Safety Plan (HASP) and Community Air Monitoring Program (CAMP) for the protection of on-site workers, the community, and the environment during the remediation phase; and
- Recording of an EE to memorialize institutional controls and require future owners of the site to continue to maintain these controls.

The NYSDEC reviewed the RAWP and issued an approval letter on July 24, 2019. With the approval letter, the NYSDEC issued a Decision Document dated July 2019 approving the proposed remedial action which was to be completed in conjunction with the construction of the proposed new building under NYSDEC oversight. The NYSDEC issued a revised Decision Document dated August 2019 that included an additional component of a vapor barrier on the foundation to improve energy efficiency as an element of construction.

November 12, 2020 Supplemental Waste Characterization Report, Prepared by Langan

Langan completed a supplemental waste characterization investigation to delineate two hazardous lead-impacted soil areas, identified as Hot Spots 5 and 6 in the April 2018 RIR, which included the advancement of 14 soil borings to depths between 6 and 14 feet below grade and the collection and analysis of 27 grab soil samples for total and TCLP lead analysis.

Findings of the waste characterization investigation were as follows:

- Hot Spot 5 (SB01R): The RCRA toxicity characteristic was exceeded in two samples at concentrations of 27.1 mg/L in SB01_E2_0-2 and 35.8 mg/L in SB01_E1_0-2. Total lead was detected above the SCOs in four samples at concentrations ranging from 415 milligrams per kilogram (mg/kg) in the duplicate samples of SB01R_0-2 to 3,400 mg/kg in SB01_E2_0-2. Total and TCLP lead was vertically delineated at Hot Spot 5. Total and TCLP lead was also horizontally delineated to the north, south, and west.

- Hot Spot 6 (SB10R): The RCRA toxicity characteristic was exceeded in seven samples at concentrations ranging from 5.79 mg/L in SB10_W1_9-10 to 37.3 mg/L in SB10R_9-10. Total lead was detected above the SCOs in 11 samples at concentrations ranging from 452 mg/kg in SB10_S1_12-13 to 28,800 mg/kg in SB10_E1_9-10. Total and TCLP lead was not vertically delineated below 14 feet bgs at Hot Spot 6. Total and TCLP lead was horizontally delineated in all directions.

2.4 REMEDIAL ACTION OBJECTIVES

The Remedial Action Objectives (RAO) for the site as listed in the Decision Document dated July 2019 are as follows.

2.4.1 GROUNDWATER

<u>RAOs for Public Health Protection</u>

- Prevent contact with, or inhalation of volatiles, from contaminated groundwater.

2.4.2 SOIL

<u>RAOs for Public Health Protection</u>

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

<u>RAOs for Environmental Protection</u>

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

2.4.3 SOIL VAPOR

<u>RAOs for Public Health Protection</u>

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

2.5 REMAINING CONTAMINATION

2.5.1 SOIL

Confirmation and documentation soil samples were collected from the base and sidewalls of the excavation during implementation of the RAWP at a frequency of approximately one sample per 2,000 square feet. Support of excavation (e.g., sheeting) precluded collection of sidewall samples from the site perimeter. In total, 30 base (EP01 through EP30) and 8 sidewall (EP31 through

EP38) confirmation/documentation samples plus QA/QC samples were collected. Confirmation/documentation samples were analyzed for SVOCs and metals at a minimum. Selected samples were analyzed for VOCs, hexavalent chromium, trivalent chromium, cyanide, pesticides, herbicides, polychlorinated biphenyls (PCB), per- and polyfluoroalkyl substances (PFAS), and 1,4-dioxane by a NYSDOH Environmental Laboratory Approval Program (ELAP)-certified laboratory in accordance with the RAWP and at the direction of NYSDEC. Results were compared to the RURR SCOs listed in **Table 2**. Fill/soil was removed to depths ranging from approximately 12 to 22 feet bgs across the site. The remedial excavation extents are provided in **Figure 3**.

Figure 4 shows the location of confirmation/documentation soil samples, and **Tables 3 and 4** summarize the results of confirmation/documentation soil samples and lead hot spot delineation samples, respectively, and collectively summarize remaining soil exceeding UUSCOs after completion of the remedial action.

2.5.2 GROUNDWATER

Seven samples (including one QA/QC sample) were collected from six monitoring wells during the RI. The groundwater samples were compared to the NYSDEC SGVs and were analyzed by an NYSDOH ELAP-certified laboratory. The following constituents were detected in RI groundwater samples at concentrations exceeding the SGVs:

- One SVOC (bis[2-ethylhexyl]phthalate) was detected at concentrations above the SGVs in groundwater samples collected from RI monitoring wells MW08 and MW13, installed in the central and southeastern parts of the site, respectively. These concentrations are likely due to entrained sediments related to on-site fill material or are attributable to well installation materials.
- Total and dissolved metals, including aluminum, iron, lead, magnesium, manganese, selenium, and sodium, were detected at concentrations above the SGVs in groundwater samples collected from across the site. Total metals concentrations are likely due to entrained sediments related to on-site fill material (specifically the total lead concentration detected in the groundwater sample collected from MW03) or may be attributable to regional groundwater conditions (or a combination of the two). Dissolved metals concentrations detected above the SGVs are attributable to regional groundwater conditions and are not considered indicative of a release.
- Perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS) were detected in groundwater at concentrations greater than the NYSDEC April 2023 Ambient Water Quality Guidance Values; however, the site is not a source of PFAS.

Table 5 and **Figures 5A and 5B** summarize the results of all samples of groundwater that exceed the Ambient Water Quality Standards after completion of the remedial action. Groundwater and Site use restrictions to prevent exposure to remaining groundwater contamination are included in the Environmental Easement.

2.5.3 SOIL VAPOR

PCE was detected in soil vapor samples collected from across the site at a maximum concentration of 15.1 micrograms per cubic meter (µg/m³). TCE was detected in one soil vapor sample (SV02) at a concentration of 31 µg/m³. PCE and TCE were detected in soil samples collected during the RI but at concentrations below the UU SCOs.

Contaminated fill was removed from the site to depths ranging from 12 to 22 feet bgs. Additionally, a vapor barrier/waterproofing membrane was installed beneath the minimum 6- to 96-inch concrete slab that spans the entirety of the building footprint as an element of construction.

Table 6 and **Figure 6** summarize the results of all samples of soil vapor after completion of the remedial action.

3.0 INSTITUTIONAL CONTROL PLAN

3.1 GENERAL

Since remaining contamination exists at the Site under the building and sidewalk, Institutional Controls (ICs) are required to protect human health and the environment. This IC Plan describes the procedures for the implementation and management of all ICs at the site. The IC Plan is one component of the SMP and is subject to revision by the NYSDEC.

This plan provides:

- A description of all ICs on the site;
- The basic implementation and intended role of each IC;
- A description of the key components of the ICs set forth in the EE;
- A description of the controls to be evaluated during each required inspection and periodic review;
- A description of plans and procedures to be followed for implementation of ICs, such as the implementation of the EWP (as provided in Appendix D) for the proper handling of remaining contamination that may be disturbed during maintenance or redevelopment work on the site;

- A HASP, CAMP, QAPP, and blank Request to Import/Reuse Fill or Soil to be implemented in conjunction with the EWP, are included as Appendices E, F, G, and H respectively; and
- Any other provisions necessary to identify or establish methods for implementing the ICs required by the site remedy, as determined by the NYSDEC project manager.

3.2 INSTITUTIONAL CONTROLS

A series of ICs is required by the Decision Document to:

1. Prevent future exposure to remaining contamination
2. Limit the use and development of the site to only Restricted-Residential, Commercial, and Industrial uses until extinguishment of the EE.

Adherence to these ICs is required by the EE and will be implemented under this SMP. ICs identified in the EE may not be discontinued without an amendment to or extinguishment of the EE, as approved by the NYSDEC and NYSDOH. The ICs are:

- The property may be used for Restricted-Residential use as defined in 6 NYCRR Part 375-1.8(g)(2)(ii), Commercial use as defined in 6 NYCRR Part 375-1.8(g)(2)(iii), and Industrial use as defined in 6 NYCRR Part 375-1.8(g)(2)(iv)
- The use of groundwater underlying the property is prohibited without necessary water quality treatment as determined by the NYSDOH and NYCDOHMH to render it safe for use as drinking water or for industrial purposes, and the user must first notify and obtain written approval to do so from the NYSDEC
- Data and information pertinent to site management must be reported at the frequency and in a manner as defined in this SMP
- All future activities that will disturb remaining contaminated material must be conducted in accordance with this SMP
- Access to the site must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice to the property owner to assure compliance with the restrictions identified by the EE
- Vegetable gardens and farming on the site are prohibited
- Volunteer must provide all persons who acquire any interest in the site a complete copy of the SMP that the NYSDEC approves for the site and all NYSDEC-approved amendments to the SMP

3.3 SITE–WIDE INSPECTION

Site-wide inspections will be performed at a minimum of once per year. These periodic inspections must be conducted when the ground surface is visible (i.e. no snow cover). Site-wide inspections will be performed by a qualified environmental professional (QEP) as defined in 6 NYCRR Part 375, a P.E who is licensed and registered in New York State, or a qualified person who directly reports to a P.E who is licensed and registered in New York State. Modification to the frequency or duration of the inspections will require approval from the NYSDEC. A comprehensive site-wide inspection will be conducted and documented according to the SMP schedule, regardless of the frequency of the Periodic Review Report (PRR).

During an inspection, the inspection form provided in Appendix I – Site Inspection Forms will be completed. The inspections will determine and document the following:

- Compliance with all ICs, including site usage
- General site conditions at the time of the inspection
- The site management activities being conducted and a health and safety inspection
- If these controls continue to be protective of human health and the environment
- Compliance with requirements of this SMP and the EE
- If site records are complete and up to date

Reporting requirements are outlined in Section 5.0 of this plan.

Inspections will also be performed in the event of an emergency. An inspection of the site will be conducted within 5 days of the event to verify the effectiveness of the ICs implemented at the site. Written confirmation must be provided to the NYSDEC within 7 days of the event that includes a summary of emergency response actions taken, or to be taken, and the potential impact to the environment and the public.

4.0 PERIODIC ASSESSMENTS/EVALUATIONS

4.1 CLIMATE CHANGE VULNERABILITY ASSESSMENT

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

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

As stated in Section 3.3, site-wide inspections will be performed after severe weather events. According to the Federal Emergency Management Agency (FEMA) Flood Map Service Center (Preliminary Map Number 3604970202F, dated September 5, 2007), the site is located in Zone X, which is designated for areas outside the 0.2% annual chance floodplain.

During periods of severe rain events, stormwater will be captured by on-site detention systems. The site would not be susceptible to a spill or contaminant release because source material has been removed and/or is adequately protected by the building foundation.

4.2 SOIL VAPOR INTRUSION EVALUATION

During the RI, PCE was detected in soil vapor samples collected from across the site at a maximum concentration of 15.1 $\mu g/m^3$, and TCE was detected in one soil vapor sample (SV02) at a concentration of 31 $\mu g/m^3$. PCE and TCE were detected in soil samples collected during the RI but at concentrations below the UU SCOs.

Contaminated fill/soil was excavated to depths ranging from 12 and 21 feet bgs across the site. Though not a remedy element or an engineering control, the new building construction included installation of a vapor barrier/waterproofing membrane and a minimum 6- to 96-inch concrete slab that span the entirety of the building footprint as an element of construction. The vapor barrier/waterproofing membrane extends beneath the entire building slab and up the subsurface walls to grade.

A soil vapor intrusion pathway is not expected to be a concern for the new development building due to the RI results and installation of the vapor barrier. Nevertheless, a soil vapor intrusion evaluation must be performed upon a change in use of the property that will result in occupancy of a previously unoccupied building or initial occupancy of a new building. The breadth of this evaluation will be determined based upon discussion with the NYSDEC and NYSDOH project managers. Based upon these discussions and agency requirements, a work plan may need to be developed that requires that sampling be performed. Upon completion of the evaluation, if an action is required, any actions taken or to be taken must be reflected in an updated SMP.

5.0 REPORTING REQUIREMENTS

5.1 SITE MANAGEMENT REPORTS

All site management inspection events will be recorded on the appropriate site management forms provided in Appendix I. These forms are subject to NYSDEC revision.

All applicable inspection forms and other records for the site during the reporting period will be provided in electronic format to the NYSDEC in accordance with the table below and summarized in the PRR.

Schedule of Inspection Reports

Task/Report	Reporting Frequency*
Annual Inspection Report	Submitted with PRR

* The frequency of events will be conducted as specified until otherwise approved by the NYSDEC project manager.

All inspections reports will include, at a minimum:

- Date of event or reporting period
- Name, company, and position of person(s) conducting monitoring/inspection activities
- Description of the activities performed
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents noted (included either on the checklist/form or on an attached sheet)
- Any observations, conclusions, or recommendations
- A determination as to whether contaminant conditions have changed since the last reporting event

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

- Date of event
- Name, company, and position of person(s) conducting non-routine maintenance/repair activities
- Description of non-routine activities performed
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents (included either on the form or on an attached sheet)

5.2 PERIODIC REVIEW REPORT

The PRR will consist only of the certification as specified in Section 5.2.1 except in the event where there have been changes to the site or environmental data gathered during the certifying period. Given such an event, the submittal of a comprehensive PRR will be necessary, as specified below.

A PRR will be submitted to the Department beginning 30 days after the initial 15 month certifying period. This initial certifying period commences upon issuance of the COC. After submittal of the initial PRR, subsequent PRRs shall be submitted to the Department at a frequency determined by the Department. If the site is subdivided into separate parcels with different ownership, a single PRR will be prepared that addresses the site described in Appendix A - Environmental Easement. The report will be prepared in accordance with NYSDEC's DER-10 and submitted within 30 days of the end of each certification period. The report will include:

- Identification, assessment and certification of all ICs required by the remedy for the site
- Results of the required annual site inspections and severe condition inspections, if applicable
- All applicable site management forms and other records generated for the site during the reporting period in the NYSDEC-approved electronic format, if not previously submitted
- A summary of any data and/or information generated during the reporting period, with comments and conclusions, if any
- A site evaluation, which includes the following:
    - The compliance of the remedy with the requirements of the site-specific RAWP or Decision Document
    - Any new conclusions or observations regarding site contamination based on inspections or data generated
    - Recommendations regarding any necessary changes to the remedy
    - The overall performance and effectiveness of the remedy

5.2.1 CERTIFICATION OF INSTITUTIONAL CONTROLS

Within 30 days after the end of each certifying period, as determined by the NYSDEC, the following certification will be provided to the Department:

"For each institutional control identified for the site, I certify that all of the following statements are true:

- *The institutional control employed at this site is unchanged from the date the control was put in place, or last approved by the Department;*
- *Nothing has occurred that would impair the ability of the control to protect the public health and environment;*
- *Nothing has occurred that would constitute a violation or failure to comply with any site management plan for this control;*
- *Access to the site will continue to be provided to the Department to evaluate the remedy, including access to evaluate the continued maintenance of this control;*
- *Use of the site is compliant with the environmental easement;*
- *The information presented in this report is accurate and complete;*
- *No new information has come to my attention, including groundwater monitoring data from wells located at the site boundary, if any, to indicate that the assumptions made in the qualitative exposure assessment of off-site contamination are no longer valid.*

I certify that all information and statements in this certification form are true. I understand that a false statement made herein is punishable as a Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law. I, Jessica Friscia, P.E., of Langan, Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C., am certifying as the Remedial Party's Designated Site Representative: I have been authorized and designated by all site owners/remedial parties to sign this certification for the site."

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

- *Based on the on-site data available to Langan and site observations, the assumptions made in the qualitative exposure assessment remain valid.*

The signed certification will be included in the PRR, if such report is required for the period. Otherwise, the certification will be submitted as a stand-alone document.

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

5.3 CORRECTIVE MEASURES WORK PLAN

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

6.0 REFERENCES

1. 6 NYCRR Part 375, Environmental Remediation Programs. December 14, 2006.
2. NYSDEC DER-10 – "Technical Guidance for Site Investigation and Remediation".
3. NYSDEC, 1998. Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1. June 1998 (April 2000 addendum).
4. New York State Department of Health, Final Guidance for the Evaluation of Soil Vapor Intrusion in the State of New York, dated October 2006, revised May 2017
5. New York State Department of Environmental Conservation, Division of Environmental Remediation, Draft Brownfield Cleanup Program Guide, dated May 2004.
6. Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C., "Final Geotechnical Engineering Study", dated June 3, 2016.
7. Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C., "Remedial Investigation Work Plan", dated July 18, 2017.
8. Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C., "Subsurface Investigation Report", dated July 11, 2016
9. Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C., "Waste Characterization Report", dated June 29, 2016
10. New York State Department of Environmental Conservation, DER-10 Technical Guidance for Site Investigation and Remediation, issued May 3, 2010; effective June 18, 2010.

11. NYSDEC Decision Document, dated July 24, 2019.

12. NYSDEC Revised Decision Document, dated August 13, 2019

13. Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C., "Remedial Investigation Report", dated April 24, 2018.

14. Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C., "Remedial Action Work Plan", dated July 16, 2019.

15. Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C., "Phase I Environmental Site Assessment for 23-15 44th Road, Block 436 Lot 1", dated June 28, 2022.

TABLES

Table 1
Site Management Plan
Notifications

43-30 24th Street
Long Island City, Queens, New York
NYSDEC BCP Site No.: C241189
Langan Project No.: 170362702

Name	Contact Information
Remedial Engineer	Jessica Friscia, P.E. Phone No.: 973-560-4900 Email: jfriscia@langan.com
Program Manager	Steven Ciambruschini, P.G. Phone No.: 973-560-4900 Email: ciambruschini@langan.com
Project Manager	Jessica Friscia, PE Phone No.: 973-560-4900 Email: jfriscia@langan.com
NYSDEC Project Manager	Christopher Allan Phone No.: 718-482-4065 Email: christopher.allan@dec.ny.gov
NYSDEC Project Manager’s Supervisor	Cris-Sandra Maycock Phone No.: 718-482-4679 Email: cris-sandra.maycock@dec.ny.gov
NYSDEC Site Control	Email: dersitecontrol@dec.ny.gov
NYSDOH Project Manager	Sarita Wagh Phone No.: 518-402-7860 Email: BEEI@health.ny.gov
Site Owner and Remedial Party	Matthew Feldman Phone No.: 212-202-5783 Email: mfeldman@carmelpartners.com

Table 2
Site Management Plan
Track 2 Soil Cleanup Objectives (SCOs)

43-30 24th Street
Long Island City, Queens, New York
NYSDEC BCP Site No.: C241189
Langan Project No.: 170362702

Analyte	CAS Number	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs
Volatile Organic Compounds		
1,1,1-Trichloroethane	71-55-6	100
1,1-Dichloroethane	75-34-3	26
1,1-Dichloroethene	75-35-4	100
1,2,4-Trimethylbenzene	95-63-6	52
1,2-Dichlorobenzene	95-50-1	100
1,2-Dichloroethane	107-06-2	3.1
1,3,5-Trimethylbenzene (Mesitylene)	108-67-8	52
1,3-Dichlorobenzene	541-73-1	49
1,4-Dichlorobenzene	106-46-7	13
1,4-Dioxane (P-Dioxane)	123-91-1	13
Acetone	67-64-1	100
Benzene	71-43-2	4.8
Carbon Tetrachloride	56-23-5	2.4
Chlorobenzene	108-90-7	100
Chloroform	67-66-3	49
Cis-1,2-Dichloroethene	156-59-2	100
Ethylbenzene	100-41-4	41
M,P-Xylene	179601-23-1	NS
Methyl Ethyl Ketone (2-Butanone)	78-93-3	100
Methylene Chloride	75-09-2	100
Naphthalene	91-20-3	100
n-Butylbenzene	104-51-8	100
n-Propylbenzene	103-65-1	100
o-Xylene (1,2-Dimethylbenzene)	95-47-6	NS
Sec-Butylbenzene	135-98-8	100
T-Butylbenzene	98-06-6	100
Tert-Butyl Methyl Ether	1634-04-4	100
Tetrachloroethene (PCE)	127-18-4	19
Toluene	108-88-3	100
Total Xylenes	1330-20-7	100
Trans-1,2-Dichloroethene	156-60-5	100
Trichloroethene (TCE)	79-01-6	21
Vinyl Chloride	75-01-4	0.9

Table 2
Site Management Plan
Track 2 Soil Cleanup Objectives (SCOs)

43-30 24th Street
Long Island City, Queens, New York
NYSDEC BCP Site No.: C241189
Langan Project No.: 170362702

Analyte	CAS Number	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs
Semi-Volatile Organic Compounds		
1,4-Dioxane (P-Dioxane)	123-91-1	13
2-Methylphenol (o-Cresol)	95-48-7	100
3 & 4 Methylphenol (m&p Cresol)	65794-96-9	100
Acenaphthene	83-32-9	100
Acenaphthylene	208-96-8	100
Anthracene	120-12-7	100
Benzo(a)anthracene	56-55-3	1
Benzo(a)pyrene	50-32-8	1
Benzo(b)fluoranthene	205-99-2	1
Benzo(g,h,i)Perylene	191-24-2	100
Benzo(k)fluoranthene	207-08-9	3.9
Chrysene	218-01-9	3.9
Dibenz(a,h)anthracene	53-70-3	0.33
Dibenzofuran	132-64-9	59
Fluoranthene	206-44-0	100
Fluorene	86-73-7	100
Hexachlorobenzene	118-74-1	1.2
Indeno(1,2,3-cd)pyrene	193-39-5	0.5
Naphthalene	91-20-3	100
Pentachlorophenol	87-86-5	6.7
Phenanthrene	85-01-8	100
Phenol	108-95-2	100
Pyrene	129-00-0	100
Pesticides		
4,4'-DDD	72-54-8	13
4,4'-DDE	72-55-9	8.9
4,4'-DDT	50-29-3	7.9
Aldrin	309-00-2	0.097
Alpha BHC (Alpha Hexachlorocyclohexane)	319-84-6	0.48
Alpha Chlordane	5103-71-9	4.2
Alpha Endosulfan	959-98-8	24
Beta Bhc (Beta Hexachlorocyclohexane)	319-85-7	0.36
Beta Endosulfan	33213-65-9	24
Delta Bhc (Delta Hexachlorocyclohexane)	319-86-8	100
Dieldrin	60-57-1	0.2
Endosulfan Sulfate	1031-07-8	24
Endrin	72-20-8	11
Gamma Bhc (Lindane)	58-89-9	1.3
Heptachlor	76-44-8	2.1

Table 2
Site Management Plan
Track 2 Soil Cleanup Objectives (SCOs)

43-30 24th Street
Long Island City, Queens, New York
NYSDEC BCP Site No.: C241189
Langan Project No.: 170362702

Analyte	CAS Number	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs
Herbicides		
Silvex (2,4,5-Tp)	93-72-1	100
Polychlorinated Biphenyl		
PCB-1016 (Aroclor 1016)	12674-11-2	NS
PCB-1221 (Aroclor 1221)	11104-28-2	NS
PCB-1232 (Aroclor 1232)	11141-16-5	NS
PCB-1242 (Aroclor 1242)	53469-21-9	NS
PCB-1248 (Aroclor 1248)	12672-29-6	NS
PCB-1254 (Aroclor 1254)	11097-69-1	NS
PCB-1260 (Aroclor 1260)	11096-82-5	NS
Total PCBs	1336-36-3	1
Metals		
Arsenic	7440-38-2	16
Barium	7440-39-3	400
Beryllium	7440-41-7	72
Cadmium	7440-43-9	4.3
Chromium, Hexavalent	18540-29-9	110
Chromium, Total	7440-47-3	NS
Chromium, Trivalent	16065-83-1	180
Copper	7440-50-8	270
Cyanide	57-12-5	27
Lead	7439-92-1	400
Manganese	7439-96-5	2000
Mercury	7439-97-6	0.81
Nickel	7440-02-0	310
Selenium	7782-49-2	180
Silver	7440-22-4	180
Zinc	7440-66-6	10000
General Chemistry		
Cyanide	57-12-5	27
Solids, Percent	SOLID	NS

Table 3
Site Management Plan
Remaining Soil Analytical Results

43-30 24th Street
Long Island City, Queens, New York
NYSDEC BCP Site No.: C241189
Langan Project No.: 170362702

Analyte	CAS Number	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs/Guidance Values	Location	EP01	EP01	EP01	EP02	EP02	EP03	EP04	EP04	EP05	EP06
			Sample Name	EP01_10.5	DUP03_031123	EP01_3	EP02_12	EP02_6	EP03_4	EP04_4.25	DUP02_121422	EP05_4.25	EP06_4.25
			Sample Date	03/11/2023	03/11/2023	03/16/2023	08/29/2022	03/09/2023	03/02/2023	12/14/2022	12/14/2022	11/03/2022	11/03/2022
			Sample Elevation	10.5	10.5	3	12	6	4	4.25	4.25	4.25	4.25
			Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Volatile Organic Compounds													
1,1,1-Trichloroethane	71-55-6	100	mg/kg	<0.0031 U	<0.0056 UJ	NA	NA	NA	<0.0049 U	<0.0046 U	<0.0046 U	<0.0032 U	<0.003 U
1,1-Dichloroethane	75-34-3	26	mg/kg	<0.0031 U	<0.0056 UJ	NA	NA	NA	<0.0049 U	<0.0046 U	<0.0046 U	<0.0032 U	<0.003 U
1,1-Dichloroethene	75-35-4	100	mg/kg	<0.0031 U	<0.0056 UJ	NA	NA	NA	<0.0049 U	<0.0046 U	<0.0046 U	<0.0032 U	<0.003 U
1,2,4-Trimethylbenzene	95-63-6	52	mg/kg	<0.0031 U	<0.0056 UJ	NA	NA	NA	<0.0049 U	<0.0046 U	<0.0046 U	<0.0032 U	<0.003 U
1,2-Dichlorobenzene	95-50-1	100	mg/kg	0.029 J	0.013 J	NA	NA	NA	<0.0049 U	<0.0046 U	<0.0046 U	<0.0032 U	<0.003 U
1,2-Dichloroethane	107-06-2	3.1	mg/kg	<0.0031 U	<0.0056 UJ	NA	NA	NA	<0.0049 U	<0.0046 U	<0.0046 U	<0.0032 U	<0.003 U
1,3,5-Trimethylbenzene (Mesitylene)	108-67-8	52	mg/kg	<0.0031 U	<0.0056 UJ	NA	NA	NA	<0.0049 U	<0.0046 U	<0.0046 U	<0.0032 U	<0.003 U
1,3-Dichlorobenzene	541-73-1	49	mg/kg	<0.0031 U	<0.0056 UJ	NA	NA	NA	<0.0049 U	<0.0046 U	<0.0046 U	<0.0032 U	<0.003 U
1,4-Dichlorobenzene	106-46-7	13	mg/kg	0.0018 J	<0.0056 UJ	NA	NA	NA	<0.0049 U	<0.0046 U	<0.0046 U	<0.0032 U	<0.003 U
1,4-Dioxane (P-Dioxane)	123-91-1	13	mg/kg	<0.061 U	<0.11 UJ	NA	NA	NA	<0.099 U	<0.091 U	<0.091 U	<0.064 U	<0.06 U
Acetone	67-64-1	100	mg/kg	<0.0061 U	<0.011 UJ	NA	NA	NA	0.027	<0.0091 U	0.007 J	<0.0064 U	<0.0077 U
Benzene	71-43-2	4.8	mg/kg	<0.0031 U	<0.0056 UJ	NA	NA	NA	<0.0049 U	<0.0046 U	<0.0046 U	<0.0032 U	<0.003 U
Carbon Tetrachloride	56-23-5	2.4	mg/kg	<0.0031 U	<0.0056 UJ	NA	NA	NA	<0.0049 U	<0.0046 U	<0.0046 U	<0.0032 U	<0.003 U
Chlorobenzene	108-90-7	100	mg/kg	<0.0031 U	<0.0056 UJ	NA	NA	NA	<0.0049 U	<0.0046 U	<0.0046 U	<0.0032 U	<0.003 U
Chloroform	67-66-3	49	mg/kg	<0.0031 U	<0.0056 UJ	NA	NA	NA	<0.0049 U	<0.0046 U	<0.0046 U	<0.0032 U	<0.003 U
Cis-1,2-Dichloroethene	156-59-2	100	mg/kg	<0.0031 U	<0.0056 UJ	NA	NA	NA	<0.0049 U	<0.0046 U	<0.0046 U	<0.0032 U	<0.003 U
Ethylbenzene	100-41-4	41	mg/kg	<0.0031 U	<0.0056 UJ	NA	NA	NA	<0.0049 U	<0.0046 U	<0.0046 U	<0.0032 U	<0.003 U
M,P-Xylene	179601-23-1	NS	mg/kg	<0.0061 U	<0.011 UJ	NA	NA	NA	<0.0099 U	<0.0091 U	<0.0091 U	<0.0064 U	<0.006 U
Methyl Ethyl Ketone (2-Butanone)	78-93-3	100	mg/kg	<0.0031 U	<0.0056 UJ	NA	NA	NA	<0.0049 U	<0.0046 U	<0.0046 U	<0.0032 U	<0.003 U
Methylene Chloride	75-09-2	100	mg/kg	<0.0061 U	<0.011 UJ	NA	NA	NA	<0.0099 U	<0.0091 U	<0.0091 U	<0.0064 U	<0.006 U
Naphthalene	91-20-3	100	mg/kg	<0.0061 U	<0.011 UJ	NA	NA	NA	<0.0099 U	<0.0091 U	<0.0091 U	<0.0064 U	<0.006 U
n-Butylbenzene	104-51-8	100	mg/kg	<0.0031 U	<0.0056 UJ	NA	NA	NA	<0.0049 U	<0.0046 U	<0.0046 U	<0.0032 UJ	<0.003 UJ
n-Propylbenzene	103-65-1	100	mg/kg	<0.0031 U	<0.0056 UJ	NA	NA	NA	<0.0049 U	<0.0046 U	<0.0046 U	<0.0032 U	<0.003 U
o-Xylene (1,2-Dimethylbenzene)	95-47-6	NS	mg/kg	<0.0031 U	<0.0056 UJ	NA	NA	NA	<0.0049 U	<0.0046 U	<0.0046 U	<0.0032 U	<0.003 U
Sec-Butylbenzene	135-98-8	100	mg/kg	<0.0031 U	<0.0056 UJ	NA	NA	NA	<0.0049 U	<0.0046 U	<0.0046 U	<0.0032 U	<0.003 U
T-Butylbenzene	98-06-6	100	mg/kg	<0.0031 U	<0.0056 UJ	NA	NA	NA	<0.0049 U	<0.0046 UJ	<0.0046 UJ	<0.0032 U	<0.003 U
Tert-Butyl Methyl Ether	1634-04-4	100	mg/kg	<0.0031 U	<0.0056 UJ	NA	NA	NA	<0.0049 U	<0.0046 U	<0.0046 U	<0.0032 U	<0.003 U
Tetrachloroethene (PCE)	127-18-4	19	mg/kg	<0.0031 U	<0.0056 UJ	NA	NA	NA	<0.0049 UJ	<0.0046 U	<0.0046 U	<0.0032 U	<0.003 U
Toluene	108-88-3	100	mg/kg	<0.0031 U	<0.0056 UJ	NA	NA	NA	<0.0049 U	<0.0046 U	<0.0046 U	<0.0032 U	<0.003 U
Total Xylenes	1330-20-7	100	mg/kg	<0.0092 U	<0.017 UJ	NA	NA	NA	<0.015 U	<0.014 U	<0.014 U	<0.0096 U	<0.009 U
Trans-1,2-Dichloroethene	156-60-5	100	mg/kg	<0.0031 U	<0.0056 UJ	NA	NA	NA	<0.0049 U	<0.0046 U	<0.0046 U	<0.0032 U	<0.003 U
Trichloroethene (TCE)	79-01-6	21	mg/kg	<0.0031 U	<0.0056 UJ	NA	NA	NA	<0.0049 U	<0.0046 U	<0.0046 U	<0.0032 U	<0.003 U
Vinyl Chloride	75-01-4	0.9	mg/kg	<0.0031 U	<0.0056 UJ	NA	NA	NA	<0.0049 U	<0.0046 U	<0.0046 U	<0.0032 U	<0.003 U
Semi-Volatile Organic Compounds													
1,4-Dioxane (P-Dioxane)	123-91-1	13	mg/kg	<0.0192 U	<0.0194 U	NA	NA	NA	<0.0194 U	<0.0189 U	<0.0189 U	<0.0196 U	<0.0196 U
2-Methylphenol (o-Cresol)	95-48-7	100	mg/kg	<0.093 U	<0.0902 U	NA	<0.0898 U	<0.0876 U	<0.0888 U	<0.0924 U	<0.0924 U	<0.0954 U	<0.0926 U
3 & 4 Methylphenol (m&p Cresol)	65794-96-9	100	mg/kg	<0.093 U	0.0454 JD	NA	<0.0898 U	<0.0876 U	<0.0888 U	<0.0924 U	<0.0924 U	<0.0954 U	<0.0926 U
Acenaphthene	83-32-9	100	mg/kg	<0.093 U	<0.0902 U	NA	<0.0898 U	<0.0876 U	<0.0888 U	<0.0924 U	<0.0924 U	0.0679 JD	<0.0926 U
Acenaphthylene	208-96-8	100	mg/kg	<0.093 U	<0.0902 U	NA	<0.0898 U	<0.0876 U	<0.0888 U	<0.0924 U	<0.0924 U	<0.0954 U	<0.0926 U
Anthracene	120-12-7	100	mg/kg	<0.093 U	<0.0902 U	NA	<0.0898 U	<0.0876 U	<0.0888 U	<0.0924 U	<0.0924 U	0.239 D	<0.0926 U
Benzo(a)anthracene	56-55-3	**1**	mg/kg	0.0587 JD	0.118 D	NA	<0.0898 U	<0.0876 U	<0.0888 U	<0.0924 U	<0.0924 U	0.65 D	<0.0926 U
Benzo(a)pyrene	50-32-8	**1**	mg/kg	0.0483 JD	0.105 D	NA	<0.0898 U	<0.0876 U	<0.0888 U	<0.0924 U	<0.0924 U	0.565 D	<0.0926 U
Benzo(b)fluoranthene	205-99-2	**1**	mg/kg	<0.093 U	0.115 D	NA	<0.0898 U	<0.0876 U	<0.0888 U	<0.0924 U	<0.0924 U	0.612 D	<0.0926 U
Benzo(g,h,i)Perylene	191-24-2	100	mg/kg	<0.093 U	0.0728 JD	NA	<0.0898 U	<0.0876 U	<0.0888 U	<0.0924 U	<0.0924 U	0.41 D	<0.0926 U
Benzo(k)fluoranthene	207-08-9	**3.9**	mg/kg	<0.093 U	0.0873 JD	NA	<0.0898 U	<0.0876 U	<0.0888 U	<0.0924 U	<0.0924 U	0.439 D	<0.0926 U
Chrysene	218-01-9	**3.9**	mg/kg	0.0573 JD	0.112 D	NA	<0.0898 U	<0.0876 U	<0.0888 U	<0.0924 U	<0.0924 U	0.623 D	<0.0926 U
Dibenz(a,h)anthracene	53-70-3	**0.33**	mg/kg	<0.093 U	<0.0902 U	NA	<0.0898 U	<0.0876 U	<0.0888 U	<0.0924 U	<0.0924 U	0.139 D	<0.0926 U
Dibenzofuran	132-64-9	59	mg/kg	<0.093 U	<0.0902 U	NA	<0.0898 U	<0.0876 U	<0.0888 U	<0.0924 U	<0.0924 U	<0.0954 U	<0.0926 U
Fluoranthene	206-44-0	100	mg/kg	0.124 D	0.254 D	NA	<0.0898 U	<0.0876 U	<0.0888 U	<0.0924 U	0.0532 JD	1.65 D	<0.0926 U
Fluorene	86-73-7	100	mg/kg	<0.093 U	<0.0902 U	NA	<0.0898 U	<0.0876 U	<0.0888 U	<0.0924 U	<0.0924 U	0.061 JD	<0.0926 U
Hexachlorobenzene	118-74-1	1.2	mg/kg	<0.093 U	<0.0902 U	NA	<0.0898 U	<0.0876 U	<0.0888 U	<0.0924 U	<0.0924 U	<0.0954 U	<0.0926 U
Indeno(1,2,3-cd)pyrene	193-39-5	**0.5**	mg/kg	<0.093 U	0.0736 JD	NA	<0.0898 U	<0.0876 U	<0.0888 U	<0.0924 U	<0.0924 U	0.381 D	<0.0926 U
Naphthalene	91-20-3	100	mg/kg	<0.093 U	<0.0902 U	NA	<0.0898 U	<0.0876 U	<0.0888 U	<0.0924 U	<0.0924 U	<0.0954 U	<0.0926 U
Pentachlorophenol	87-86-5	6.7	mg/kg	<0.093 U	<0.0902 U	NA	<0.0898 U	<0.0876 U	<0.0888 U	<0.0924 U	<0.0924 U	<0.0954 U	<0.0926 U
Phenanthrene	85-01-8	100	mg/kg	0.103 D	0.121 D	NA	<0.0898 U	<0.0876 U	<0.0888 U	0.0465 JD	0.0717 JD	0.75 D	<0.0926 U
Phenol	108-95-2	100	mg/kg	<0.093 U	<0.0902 U	NA	<0.0898 U	<0.0876 U	<0.0888 U	<0.0924 U	<0.0924 U	<0.0954 U	<0.0926 U
Pyrene	129-00-0	100	mg/kg	0.124 D	0.244 D	NA	<0.0898 U	<0.0876 U	<0.0888 U	<0.0924 U	<0.0924 U	1.22 D	<0.0926 U

Table 3
Site Management Plan
Remaining Soil Analytical Results

43-30 24th Street
Long Island City, Queens, New York
NYSDEC BCP Site No.: C241189
Langan Project No.: 170362702

Analyte	CAS Number	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs/Guidance Values	Location	EP01	EP01	EP01	EP02	EP02	EP03	EP04	EP04	EP05	EP06
			Sample Name	EP01_10.5	DUP03_031123	EP01_3	EP02_12	EP02_6	EP03_4	EP04_4.25	DUP02_121422	EP05_4.25	EP06_4.25
			Sample Date	03/11/2023	03/11/2023	03/16/2023	08/29/2022	03/09/2023	03/02/2023	12/14/2022	12/14/2022	11/03/2022	11/03/2022
			Sample Elevation	10.5	10.5	3	12	6	4	4.25	4.25	4.25	4.25
			Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Pesticides													
4,4'-DDD	72-54-8	13	mg/kg	<0.00164 U	<0.00164 U	NA	NA	<0.00164 U	<0.0016 U	<0.00162 U	<0.00163 U	<0.00164 U	<0.00162 U
4,4'-DDE	72-55-9	8.9	mg/kg	<0.00164 U	<0.00164 U	NA	NA	<0.00164 U	<0.0016 U	<0.00162 U	<0.00163 U	<0.00164 U	<0.00162 U
4,4'-DDT	50-29-3	7.9	mg/kg	<0.00164 U	<0.00164 U	NA	NA	<0.00164 U	<0.0016 U	<0.00162 U	<0.00163 U	<0.00164 U	<0.00162 U
Aldrin	309-00-2	0.097	mg/kg	<0.00164 U	<0.00164 U	NA	NA	<0.00164 U	<0.0016 U	<0.00162 U	<0.00163 U	<0.00164 U	<0.00162 U
Alpha BHC (Alpha Hexachlorocyclohexane)	319-84-6	0.48	mg/kg	<0.00164 U	<0.00164 U	NA	NA	<0.00164 U	<0.0016 U	<0.00162 U	<0.00163 U	<0.00164 U	<0.00162 U
Alpha Chlordane	5103-71-9	4.2	mg/kg	<0.00164 U	<0.00164 U	NA	NA	<0.00164 U	<0.0016 U	<0.00162 U	<0.00163 U	<0.00164 U	<0.00162 U
Alpha Endosulfan	959-98-8	24	mg/kg	<0.00164 U	<0.00164 U	NA	NA	<0.00164 U	<0.0016 U	<0.00162 U	<0.00163 U	<0.00164 U	<0.00162 U
Beta Bhc (Beta Hexachlorocyclohexane)	319-85-7	0.36	mg/kg	<0.00164 U	<0.00164 U	NA	NA	<0.00164 U	<0.0016 U	<0.00162 U	<0.00163 U	<0.00164 U	<0.00162 U
Beta Endosulfan	33213-65-9	24	mg/kg	<0.00164 U	<0.00164 U	NA	NA	<0.00164 U	<0.0016 U	<0.00162 U	<0.00163 U	<0.00164 U	<0.00162 U
Delta Bhc (Delta Hexachlorocyclohexane)	319-86-8	100	mg/kg	<0.00164 U	<0.00164 U	NA	NA	<0.00164 U	<0.0016 U	<0.00162 U	<0.00163 U	<0.00164 U	<0.00162 U
Dieldrin	60-57-1	0.2	mg/kg	<0.00164 U	<0.00164 U	NA	NA	<0.00164 U	<0.0016 U	<0.00162 U	<0.00163 U	<0.00164 U	<0.00162 U
Endosulfan Sulfate	1031-07-8	24	mg/kg	<0.00164 U	<0.00164 U	NA	NA	<0.00164 U	<0.0016 U	<0.00162 U	<0.00163 U	<0.00164 U	<0.00162 U
Endrin	72-20-8	11	mg/kg	<0.00164 U	<0.00164 U	NA	NA	<0.00164 U	<0.0016 U	<0.00162 U	<0.00163 U	<0.00164 U	<0.00162 U
Gamma Bhc (Lindane)	58-89-9	1.3	mg/kg	<0.00164 U	<0.00164 U	NA	NA	<0.00164 U	<0.0016 U	<0.00162 U	<0.00163 U	<0.00164 U	<0.00162 U
Heptachlor	76-44-8	2.1	mg/kg	<0.00164 U	<0.00164 U	NA	NA	<0.00164 U	<0.0016 U	<0.00162 U	<0.00163 U	<0.00164 U	<0.00162 U
Herbicides													
Silvex (2,4,5-Tp)	93-72-1	100	mg/kg	<0.0226 U	<0.0221 U	NA	NA	<0.0211 U	<0.0209 U	<0.0225 U	<0.0224 U	<0.0229 U	<0.0218 U
Polychlorinated Biphenyl													
PCB-1016 (Aroclor 1016)	12674-11-2	NS	mg/kg	<0.019 U	<0.0184 U	NA	NA	NA	<0.0173 U	<0.0184 U	<0.0185 U	<0.0191 U	<0.0183 U
PCB-1221 (Aroclor 1221)	11104-28-2	NS	mg/kg	<0.019 U	<0.0184 U	NA	NA	NA	<0.0173 U	<0.0184 U	<0.0185 U	<0.0191 U	<0.0183 U
PCB-1232 (Aroclor 1232)	11141-16-5	NS	mg/kg	<0.019 U	<0.0184 U	NA	NA	NA	<0.0173 U	<0.0184 U	<0.0185 U	<0.0191 U	<0.0183 U
PCB-1242 (Aroclor 1242)	53469-21-9	NS	mg/kg	<0.019 U	<0.0184 U	NA	NA	NA	<0.0173 U	<0.0184 U	<0.0185 U	<0.0191 U	<0.0183 U
PCB-1248 (Aroclor 1248)	12672-29-6	NS	mg/kg	<0.019 U	<0.0184 U	NA	NA	NA	<0.0173 U	<0.0184 U	<0.0185 U	<0.0191 U	<0.0183 U
PCB-1254 (Aroclor 1254)	11097-69-1	NS	mg/kg	<0.019 U	<0.0184 U	NA	NA	NA	<0.0173 U	<0.0184 U	<0.0185 U	<0.0191 U	<0.0183 U
PCB-1260 (Aroclor 1260)	11096-82-5	NS	mg/kg	<0.019 U	<0.0184 U	NA	NA	NA	<0.0173 U	<0.0184 U	<0.0185 U	<0.0191 U	<0.0183 U
Total PCBs	1336-36-3	1	mg/kg	<0.019 U	<0.0184 U	NA	NA	NA	<0.0173 U	<0.0184 U	<0.0185 U	<0.0191 U	<0.0183 U
Metals													
Arsenic	7440-38-2	16	mg/kg	<1.43 U	1.86	NA	<1.67 U	<1.35 U	<1.34 U	2.57	2.16	<1.44 U	2.08
Barium	7440-39-3	400	mg/kg	44.1	58.3	NA	114	35.5	68.8	73.7	79.1	57.6	53.9
Beryllium	7440-41-7	72	mg/kg	0.494	0.544	NA	<0.056 U	0.224	0.678	1.34	1.34	<0.048 U	<0.047 U
Cadmium	7440-43-9	**4.3**	mg/kg	<0.286 U	<0.278 U	NA	3.45	<0.27 U	<0.268 U	<0.281 U	<0.28 U	<0.288 U	<0.28 U
Chromium, Hexavalent	18540-29-9	110	mg/kg	<0.573 U	<0.555 U	NA	NA	<0.539 U	<0.536 U	1.57	0.895	<0.576 U	<0.559 U
Chromium, Total	7440-47-3	NS	mg/kg	12	12.4	NA	20.8	11.4	13.7	17.8	17.5	12 J	17.8
Chromium, Trivalent	16065-83-1	180	mg/kg	12	12.4	NA	NA	NA	13.7	16.2	16.6	12	17.8
Copper	7440-50-8	**270**	mg/kg	30	36.8 J	NA	**642**	12.2	19.2	25.4	23.6	22.3	18
Cyanide	57-12-5	27	mg/kg	NA	NA	NA	NA	NA	NA	<0.561 U	<0.56 U	<0.576 U	<0.559 U
Lead	7439-92-1	**400**	mg/kg	26	27.8 J	NA	**453**	5.97	8	14.2	9.41	49.5 J	24.6 B
Manganese	7439-96-5	2000	mg/kg	313	437 J	NA	446	293	394	637	601	287	187
Mercury	7439-97-6	**0.81**	mg/kg	<0.0344 UJ	0.293 J	NA	0.175	<0.0323 U	<0.0321 U	<0.0337 U	<0.0336 U	0.0427	<0.0335 U
Nickel	7440-02-0	310	mg/kg	9.95	11.6 J	NA	<1.11 U	10.3	13.6	22.6	22.8	12.6	15
Selenium	7782-49-2	180	mg/kg	<2.39 U	<2.31 UJ	NA	<2.78 U	<2.25 U	<2.23 UJ	<2.34 UJ	<2.33 UJ	<2.4 U	<2.33 U
Silver	7440-22-4	180	mg/kg	<0.481 U	<0.466 UJ	NA	<0.556 U	<0.453 UJ	<0.45 UJ	<0.471 U	<0.47 U	<0.484 UJ	<0.47 U
Zinc	7440-66-6	**10000**	mg/kg	60.2	66.4	NA	412	21.3	21.3	42.8	33.6	49 J	36.9
General Chemistry													
Cyanide	57-12-5	27	mg/kg	<0.573 U	<0.555 U	NA	NA	<0.539 U	<0.536 U	NA	NA	NA	NA
Solids, Percent	SOLID	NS	Percent	87.3	90	90	91.4	92.8	93.3	87.3	86.3	86.8	89.4

Table 3
Site Management Plan
Remaining Soil Analytical Results

43-30 24th Street
Long Island City, Queens, New York
NYSDEC BCP Site No.: C241189
Langan Project No.: 170362702

Analyte	CAS Number	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs/Guidance Values	Location	EP01	EP01	EP01	EP02	EP02	EP03	EP04	EP04	EP05	EP06
			Sample Name	EP01_10.5	DUP03_031123	EP01_3	EP02_12	EP02_6	EP03_4	EP04_4.25	DUP02_121422	EP05_4.25	EP06_4.25
			Sample Date	03/11/2023	03/11/2023	03/16/2023	08/29/2022	03/09/2023	03/02/2023	12/14/2022	12/14/2022	11/03/2022	11/03/2022
			Sample Elevation	10.5	10.5	3	12	6	4	4.25	4.25	4.25	4.25
			Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Perfluorooctanoic acids													
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid	763051-92-9	NS	mg/kg	NA	NA	<0.000826 U	NA	NA	<0.000796 U	<0.000916 U	<0.000912 U	NA	NA
1h,1h,2h,2h-Perfluorohexanesulfonic Acid (4:2)	757124-72-4	NS	mg/kg	NA	NA	<0.000819 U	NA	NA	<0.000789 U	<0.000916 U	<0.000912 U	NA	NA
3:3 FTCA	356-02-5	NS	mg/kg	NA	NA	<0.00109 U	NA	NA	<0.00105 U	<0.00115 U	<0.00114 U	NA	NA
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	919005-14-4	NS	mg/kg	NA	NA	<0.000826 U	NA	NA	<0.000796 U	<0.000916 U	<0.000912 U	NA	NA
5:3 FTCA	914637-49-3	NS	mg/kg	NA	NA	<0.00546 U	NA	NA	<0.00526 U	<0.00573 U	<0.0057 U	NA	NA
7:3 FTCA	812-70-4	NS	mg/kg	NA	NA	<0.00546 U	NA	NA	<0.00526 U	<0.00573 U	<0.0057 U	NA	NA
9-Chlorohexadecafluoro-3-Oxanonane-1-Sulfonic Acid	756426-58-1	NS	mg/kg	NA	NA	<0.000817 U	NA	NA	<0.000787 U	<0.000916 U	<0.000912 U	NA	NA
N-ethyl perfluorooctane- sulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	NS	mg/kg	NA	NA	<0.000218 U	NA	NA	<0.000211 U	<0.000229 U	<0.000228 U	<0.000265 U	<0.000272 U
N-ethylperfluorooctane sulfonamide	4151-50-2	NS	mg/kg	NA	NA	<0.000218 U	NA	NA	<0.000211 UJ	<0.000229 U	<0.000228 U	NA	NA
N-ethylperfluorooctane sulfonamidoe	1691-99-2	NS	mg/kg	NA	NA	<0.00218 U	NA	NA	<0.00211 UJ	<0.00229 U	<0.00228 U	NA	NA
N-methyl perfluorooctane- sulfonamidoacetic Acid (NMeFOSAA)	2355-31-9	NS	mg/kg	NA	NA	<0.000218 U	NA	NA	<0.000211 U	<0.000229 U	<0.000228 U	<0.000265 U	<0.000272 U
N-methylperfluorooctane sulfonamide	31506-32-8	NS	mg/kg	NA	NA	<0.000218 U	NA	NA	<0.000211 U	<0.000229 U	<0.000228 U	NA	NA
N-methylperfluorooctanesulfonamidol	24448-09-7	NS	mg/kg	NA	NA	<0.00218 U	NA	NA	<0.00211 UJ	<0.00229 U	<0.00228 U	NA	NA
Nonafluoro-3,6-dioxaheptanoic acid	151772-58-6	NS	mg/kg	NA	NA	<0.000437 U	NA	NA	<0.000421 U	<0.000458 U	<0.000456 U	NA	NA
Perfluoro(2-ethoxyethane)sulfonic acid	113507-82-7	NS	mg/kg	NA	NA	<0.000389 U	NA	NA	<0.000375 U	<0.000458 U	<0.000456 U	NA	NA
Perfluoro-3-methoxypropanoic acid	377-73-1	NS	mg/kg	NA	NA	<0.000437 U	NA	NA	<0.000421 U	<0.000458 U	<0.000456 U	NA	NA
Perfluoro-4-methoxybutanoic acid	863090-89-5	NS	mg/kg	NA	NA	<0.000437 U	NA	NA	<0.000421 U	<0.000458 U	<0.000456 U	NA	NA
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	NS	mg/kg	NA	NA	<0.000193 U	NA	NA	<0.000186 U	<0.000229 U	<0.000228 U	<0.000265 U	<0.000272 U
Perfluorobutanoic acid (PFBA)	375-22-4	NS	mg/kg	NA	NA	<0.000874 U	NA	NA	<0.000842 U	<0.000916 U	<0.000912 U	<0.000265 U	<0.000272 U
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	NS	mg/kg	NA	NA	<0.000211 U	NA	NA	<0.000203 U	<0.000229 U	<0.000228 U	<0.000265 U	<0.000272 U
Perfluorodecanoic Acid (PFDA)	335-76-2	NS	mg/kg	NA	NA	<0.000218 U	NA	NA	<0.000211 U	<0.000229 U	<0.000228 U	<0.000265 U	<0.000272 U
Perfluorododecanesulfonic Acid (PFDOS)	79780-39-5	NS	mg/kg	NA	NA	<0.000212 U	NA	NA	<0.000204 U	<0.000229 U	<0.000228 U	NA	NA
Perfluorododecanoic Acid (PFDoA)	307-55-1	NS	mg/kg	NA	NA	<0.000218 U	NA	NA	<0.000211 U	<0.000229 U	<0.000228 U	<0.000265 U	<0.000272 U
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	NS	mg/kg	NA	NA	<0.000218 U	NA	NA	<0.000211 U	<0.000229 U	<0.000228 U	<0.000265 U	<0.000272 U
Perfluoroheptanoic acid (PFHpA)	375-85-9	NS	mg/kg	NA	NA	<0.000218 U	NA	NA	<0.000211 U	<0.000229 U	<0.000228 U	<0.000265 U	<0.000272 U
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	NS	mg/kg	NA	NA	<0.0002 U	NA	NA	<0.000193 U	<0.000229 U	<0.000228 U	<0.000265 U	<0.000272 U
Perfluorohexanoic Acid (PFHxA)	307-24-4	NS	mg/kg	NA	NA	<0.000218 U	NA	NA	<0.000211 U	<0.000229 U	<0.000228 U	<0.000265 U	<0.000272 U
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	NS	mg/kg	NA	NA	<0.00021 U	NA	NA	<0.000202 U	<0.000229 U	<0.000228 U	NA	NA
Perfluorononanoic Acid (PFNA)	375-95-1	NS	mg/kg	NA	NA	<0.000218 U	NA	NA	<0.000211 U	<0.000229 U	<0.000228 U	<0.000265 U	<0.000272 U
Perfluorooctanesulfonamide (FOSA)	754-91-6	NS	mg/kg	NA	NA	<0.000218 U	NA	NA	<0.000211 U	<0.000229 U	<0.000228 U	<0.000265 U	<0.000272 U
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	0.044	mg/kg	NA	NA	<0.000203 U	NA	NA	<0.000196 U	<0.000229 U	<0.000228 U	<0.000265 U	<0.000272 U
Perfluorooctanoic Acid (PFOA)	335-67-1	0.033	mg/kg	NA	NA	<0.000218 U	NA	NA	<0.000211 U	<0.000229 U	<0.000228 U	<0.000265 U	<0.000272 U
Perfluoropentanesulfonic Acid	2706-91-4	NS	mg/kg	NA	NA	<0.000205 U	NA	NA	<0.000198 U	<0.000229 U	<0.000228 U	NA	NA
Perfluoropentanoic Acid (PFPeA)	2706-90-3	NS	mg/kg	NA	NA	<0.000437 U	NA	NA	<0.000421 U	<0.000458 U	<0.000456 U	<0.000265 U	<0.000272 U
Perfluorotetradecanoic Acid (PFTA)	376-06-7	NS	mg/kg	NA	NA	<0.000218 U	NA	NA	<0.000211 U	<0.000229 U	<0.000228 U	<0.000265 U	<0.000272 U
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	NS	mg/kg	NA	NA	<0.000218 U	NA	NA	<0.000211 U	<0.000229 U	<0.000228 U	<0.000265 U	<0.000272 U
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	NS	mg/kg	NA	NA	<0.000218 U	NA	NA	<0.000211 U	<0.000229 U	<0.000228 U	<0.000265 U	<0.000272 U
Sodium 1H,1H,2H,2H-Perfluorodecane Sulfonate (8:2) (8:2FTS)	39108-34-4	NS	mg/kg	NA	NA	<0.000839 U	NA	NA	<0.000808 U	<0.000916 U	<0.000912 U	<0.000265 U	<0.000272 U
Sodium 1H,1H,2H,2H-Perfluorooctane Sulfonate (6:2) (6:2FTS)	27619-97-2	NS	mg/kg	NA	NA	<0.00083 U	NA	NA	<0.0008 U	<0.000916 U	<0.000912 U	<0.000265 U	<0.000272 UJ
Tetrafluoro-2- (heptafluoropropoxy) propanoic Acid	13252-13-6	NS	mg/kg	NA	NA	<0.000874 U	NA	NA	<0.000842 U	<0.000916 U	<0.000912 U	NA	NA

Table 3
Site Management Plan
Remaining Soil Analytical Results

43-30 24th Street
Long Island City, Queens, New York
NYSDEC BCP Site No.: C241189
Langan Project No.: 170362702

Analyte	CAS Number	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs/Guidance Values	Location	EP07	EP08	EP09	EP09	EP10	EP10	EP11	EP12	EP12	EP13
			Sample Name	EP07_5	EP08_5	EP09_12	EP09_5	EP10_4.25	EP10_-1.9	EP11_4.25	EP12_4.25	EP12_-5.8	EP13_4.25
			Sample Date	10/25/2022	09/27/2022	08/17/2022	03/02/2023	12/05/2022	03/02/2023	11/30/2022	11/04/2022	01/05/2023	11/18/2022
			Sample Elevation	5	5	12	5	4.25		4.25	4.25		4.25
			Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Volatile Organic Compounds													
1,1,1-Trichloroethane	71-55-6	100	mg/kg	NA	NA	NA	NA	<0.0043 U	NA	<0.0035 U	<0.0068 U	NA	<0.0055 U
1,1-Dichloroethane	75-34-3	26	mg/kg	NA	NA	NA	NA	<0.0043 U	NA	<0.0035 U	<0.0068 U	NA	<0.0055 U
1,1-Dichloroethene	75-35-4	100	mg/kg	NA	NA	NA	NA	<0.0043 U	NA	<0.0035 U	<0.0068 U	NA	<0.0055 U
1,2,4-Trimethylbenzene	95-63-6	52	mg/kg	NA	NA	NA	NA	<0.0043 U	NA	<0.0035 U	<0.0068 U	NA	<0.0055 U
1,2-Dichlorobenzene	95-50-1	100	mg/kg	NA	NA	NA	NA	<0.0043 U	NA	<0.0035 U	<0.0068 U	NA	<0.0055 U
1,2-Dichloroethane	107-06-2	3.1	mg/kg	NA	NA	NA	NA	<0.0043 U	NA	<0.0035 U	<0.0068 U	NA	<0.0055 U
1,3,5-Trimethylbenzene (Mesitylene)	108-67-8	52	mg/kg	NA	NA	NA	NA	<0.0043 U	NA	<0.0035 U	<0.0068 U	NA	<0.0055 U
1,3-Dichlorobenzene	541-73-1	49	mg/kg	NA	NA	NA	NA	<0.0043 U	NA	<0.0035 U	<0.0068 U	NA	<0.0055 U
1,4-Dichlorobenzene	106-46-7	13	mg/kg	NA	NA	NA	NA	<0.0043 U	NA	<0.0035 U	<0.0068 U	NA	<0.0055 U
1,4-Dioxane (P-Dioxane)	123-91-1	13	mg/kg	NA	NA	NA	NA	<0.086 U	NA	<0.069 U	<0.14 U	NA	<0.11 U
Acetone	67-64-1	100	mg/kg	NA	NA	NA	NA	0.0044 J	NA	<0.0069 U	0.012 J	NA	0.023
Benzene	71-43-2	4.8	mg/kg	NA	NA	NA	NA	<0.0043 U	NA	<0.0035 U	<0.0068 U	NA	<0.0055 U
Carbon Tetrachloride	56-23-5	2.4	mg/kg	NA	NA	NA	NA	<0.0043 U	NA	<0.0035 U	<0.0068 U	NA	<0.0055 U
Chlorobenzene	108-90-7	100	mg/kg	NA	NA	NA	NA	<0.0043 U	NA	<0.0035 U	<0.0068 U	NA	<0.0055 U
Chloroform	67-66-3	49	mg/kg	NA	NA	NA	NA	<0.0043 U	NA	<0.0035 U	<0.0068 U	NA	<0.0055 U
Cis-1,2-Dichloroethene	156-59-2	100	mg/kg	NA	NA	NA	NA	<0.0043 U	NA	<0.0035 U	<0.0068 U	NA	<0.0055 U
Ethylbenzene	100-41-4	41	mg/kg	NA	NA	NA	NA	<0.0043 U	NA	<0.0035 U	<0.0068 U	NA	<0.0055 U
M,P-Xylene	179601-23-1	NS	mg/kg	NA	NA	NA	NA	<0.0086 U	NA	<0.0069 U	<0.014 U	NA	<0.011 U
Methyl Ethyl Ketone (2-Butanone)	78-93-3	100	mg/kg	NA	NA	NA	NA	<0.0043 U	NA	<0.0035 U	<0.0068 U	NA	<0.0055 U
Methylene Chloride	75-09-2	100	mg/kg	NA	NA	NA	NA	<0.0086 U	NA	<0.0069 U	<0.014 U	NA	<0.011 U
Naphthalene	91-20-3	100	mg/kg	NA	NA	NA	NA	<0.0086 U	NA	<0.0069 U	<0.014 U	NA	<0.011 U
n-Butylbenzene	104-51-8	100	mg/kg	NA	NA	NA	NA	<0.0043 U	NA	<0.0035 U	<0.0068 U	NA	<0.0055 U
n-Propylbenzene	103-65-1	100	mg/kg	NA	NA	NA	NA	<0.0043 U	NA	<0.0035 U	<0.0068 U	NA	<0.0055 U
o-Xylene (1,2-Dimethylbenzene)	95-47-6	NS	mg/kg	NA	NA	NA	NA	<0.0043 U	NA	<0.0035 U	<0.0068 U	NA	<0.0055 U
Sec-Butylbenzene	135-98-8	100	mg/kg	NA	NA	NA	NA	<0.0043 U	NA	<0.0035 U	<0.0068 U	NA	<0.0055 U
T-Butylbenzene	98-06-6	100	mg/kg	NA	NA	NA	NA	<0.0043 U	NA	<0.0035 U	<0.0068 U	NA	<0.0055 U
Tert-Butyl Methyl Ether	1634-04-4	100	mg/kg	NA	NA	NA	NA	<0.0043 U	NA	<0.0035 U	<0.0068 U	NA	<0.0055 U
Tetrachloroethene (PCE)	127-18-4	19	mg/kg	NA	NA	NA	NA	<0.0043 U	NA	<0.0035 U	<0.0068 U	NA	<0.0055 U
Toluene	108-88-3	100	mg/kg	NA	NA	NA	NA	<0.0043 U	NA	<0.0035 U	<0.0068 U	NA	<0.0055 U
Total Xylenes	1330-20-7	100	mg/kg	NA	NA	NA	NA	<0.013 U	NA	<0.01 U	<0.02 U	NA	<0.017 U
Trans-1,2-Dichloroethene	156-60-5	100	mg/kg	NA	NA	NA	NA	<0.0043 U	NA	<0.0035 U	<0.0068 U	NA	<0.0055 U
Trichloroethene (TCE)	79-01-6	21	mg/kg	NA	NA	NA	NA	<0.0043 U	NA	<0.0035 U	<0.0068 U	NA	<0.0055 U
Vinyl Chloride	75-01-4	0.9	mg/kg	NA	NA	NA	NA	<0.0043 U	NA	<0.0035 U	<0.0068 U	NA	<0.0055 U
Semi-Volatile Organic Compounds													
1,4-Dioxane (P-Dioxane)	123-91-1	13	mg/kg	NA	NA	NA	NA	<0.0198 U	NA	<0.0196 U	<0.0196 UJ	NA	<0.0189 U
2-Methylphenol (o-Cresol)	95-48-7	100	mg/kg	<0.0929 U	<0.0967 U	<0.0876 U	NA	<0.0906 U	NA	<0.0897 U	<0.112 U	NA	<0.0955 U
3 & 4 Methylphenol (m&p Cresol)	65794-96-9	100	mg/kg	<0.0929 U	<0.0967 U	<0.0876 U	NA	<0.0906 U	NA	<0.0897 U	<0.112 U	NA	<0.0955 U
Acenaphthene	83-32-9	100	mg/kg	<0.0929 U	0.585 D	0.0511 JD	NA	2.8 D	NA	<0.0897 U	<0.112 U	NA	<0.0955 U
Acenaphthylene	208-96-8	100	mg/kg	<0.0929 U	0.0649 JD	0.0483 JD	NA	0.147 D	NA	<0.0897 U	<0.112 U	NA	<0.0955 U
Anthracene	120-12-7	100	mg/kg	<0.0929 U	0.812 D	0.184 D	NA	2.42 D	NA	<0.0897 U	<0.112 U	NA	<0.0955 U
Benzo(a)anthracene	56-55-3	**1**	mg/kg	<0.0929 U	0.354 D	0.438 D	NA	0.464 D	NA	<0.0897 U	0.119 D	NA	0.0611 JD
Benzo(a)pyrene	50-32-8	**1**	mg/kg	<0.0929 U	0.198 D	0.4 D	NA	0.112 D	NA	<0.0897 U	0.109 JD	NA	0.0557 JD
Benzo(b)fluoranthene	205-99-2	**1**	mg/kg	<0.0929 U	0.208 D	0.344 D	NA	0.12 D	NA	<0.0897 U	0.102 JD	NA	0.0527 JD
Benzo(g,h,i)Perylene	191-24-2	100	mg/kg	<0.0929 U	0.0997 D	0.242 D	NA	<0.0906 U	NA	<0.0897 U	0.078 JD	NA	<0.0955 U
Benzo(k)fluoranthene	207-08-9	**3.9**	mg/kg	<0.0929 U	0.19 D	0.333 D	NA	0.106 D	NA	<0.0897 U	0.0986 JD	NA	<0.0955 U
Chrysene	218-01-9	**3.9**	mg/kg	<0.0929 U	0.359 D	0.407 D	NA	0.382 D	NA	<0.0897 U	0.114 D	NA	0.0603 JD
Dibenz(a,h)anthracene	53-70-3	**0.33**	mg/kg	<0.0929 U	<0.0967 U	0.0574 JD	NA	<0.0906 U	NA	<0.0897 U	<0.112 U	NA	<0.0955 U
Dibenzofuran	132-64-9	59	mg/kg	<0.0929 U	<0.0967 U	<0.0876 U	NA	2.98 D	NA	<0.0897 U	<0.112 U	NA	<0.0955 U
Fluoranthene	206-44-0	100	mg/kg	<0.0929 U	1.51 D	0.905 D	NA	3.27 D	NA	<0.0897 U	0.197 D	NA	0.142 D
Fluorene	86-73-7	100	mg/kg	<0.0929 U	0.611 D	0.0602 JD	NA	4.55 D	NA	<0.0897 U	<0.112 U	NA	<0.0955 U
Hexachlorobenzene	118-74-1	1.2	mg/kg	<0.0929 U	<0.0967 U	<0.0876 U	NA	<0.0906 U	NA	<0.0897 U	<0.112 U	NA	<0.0955 U
Indeno(1,2,3-cd)pyrene	193-39-5	**0.5**	mg/kg	<0.0929 U	0.0966 JD	0.207 D	NA	<0.0906 U	NA	<0.0897 U	0.0735 JD	NA	<0.0955 U
Naphthalene	91-20-3	100	mg/kg	<0.0929 U	0.104 D	<0.0876 U	NA	1.39 D	NA	<0.0897 U	<0.112 U	NA	<0.0955 U
Pentachlorophenol	87-86-5	6.7	mg/kg	<0.0929 U	<0.0967 U	<0.0876 U	NA	<0.0906 U	NA	<0.0897 U	<0.112 U	NA	<0.0955 U
Phenanthrene	85-01-8	100	mg/kg	<0.0929 U	2.06 D	0.54 D	NA	10.2 D	NA	<0.0897 U	0.095 JD	NA	0.0985 D
Phenol	108-95-2	100	mg/kg	<0.0929 U	<0.0967 U	<0.0876 U	NA	<0.0906 U	NA	<0.0897 U	<0.112 U	NA	<0.0955 U
Pyrene	129-00-0	100	mg/kg	<0.0929 U	1.19 D	0.743 D	NA	2.16 D	NA	<0.0897 U	0.176 D	NA	0.12 D

Table 3
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43-30 24th Street
Long Island City, Queens, New York
NYSDEC BCP Site No.: C241189
Langan Project No.: 170362702

Analyte	CAS Number	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs/Guidance Values	Location	EP07	EP08	EP09	EP09	EP10	EP10	EP11	EP12	EP12	EP13
			Sample Name	EP07_5	EP08_5	EP09_12	EP09_5	EP10_4.25	EP10_-1.9	EP11_4.25	EP12_4.25	EP12_-5.8	EP13_4.25
			Sample Date	10/25/2022	09/27/2022	08/17/2022	03/02/2023	12/05/2022	03/02/2023	11/30/2022	11/04/2022	01/05/2023	11/18/2022
			Sample Elevation	5	5	12	5	4.25		4.25	4.25		4.25
			Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Pesticides													
4,4'-DDD	72-54-8	13	mg/kg	NA	NA	NA	NA	<0.00162 U	NA	<0.00164 U	<0.00163 U	NA	<0.00165 U
4,4'-DDE	72-55-9	8.9	mg/kg	NA	NA	NA	NA	<0.00162 U	NA	<0.00164 U	<0.00163 U	NA	<0.00165 U
4,4'-DDT	50-29-3	7.9	mg/kg	NA	NA	NA	NA	<0.00162 U	NA	<0.00164 U	<0.00163 U	NA	<0.00165 U
Aldrin	309-00-2	0.097	mg/kg	NA	NA	NA	NA	<0.00162 U	NA	<0.00164 U	<0.00163 U	NA	<0.00165 U
Alpha BHC (Alpha Hexachlorocyclohexane)	319-84-6	0.48	mg/kg	NA	NA	NA	NA	<0.00162 U	NA	<0.00164 U	<0.00163 U	NA	<0.00165 U
Alpha Chlordane	5103-71-9	4.2	mg/kg	NA	NA	NA	NA	<0.00162 U	NA	<0.00164 U	<0.00163 U	NA	<0.00165 U
Alpha Endosulfan	959-98-8	24	mg/kg	NA	NA	NA	NA	<0.00162 U	NA	<0.00164 U	<0.00163 U	NA	<0.00165 U
Beta Bhc (Beta Hexachlorocyclohexane)	319-85-7	0.36	mg/kg	NA	NA	NA	NA	<0.00162 U	NA	<0.00164 U	<0.00163 U	NA	<0.00165 U
Beta Endosulfan	33213-65-9	24	mg/kg	NA	NA	NA	NA	<0.00162 U	NA	<0.00164 U	<0.00163 U	NA	<0.00165 U
Delta Bhc (Delta Hexachlorocyclohexane)	319-86-8	100	mg/kg	NA	NA	NA	NA	<0.00162 U	NA	<0.00164 U	<0.00163 U	NA	<0.00165 U
Dieldrin	60-57-1	0.2	mg/kg	NA	NA	NA	NA	<0.00162 U	NA	<0.00164 U	<0.00163 U	NA	<0.00165 U
Endosulfan Sulfate	1031-07-8	24	mg/kg	NA	NA	NA	NA	<0.00162 U	NA	<0.00164 U	<0.00163 U	NA	<0.00165 U
Endrin	72-20-8	11	mg/kg	NA	NA	NA	NA	<0.00162 U	NA	<0.00164 U	<0.00163 U	NA	<0.00165 U
Gamma Bhc (Lindane)	58-89-9	1.3	mg/kg	NA	NA	NA	NA	<0.00162 U	NA	<0.00164 U	<0.00163 U	NA	<0.00165 U
Heptachlor	76-44-8	2.1	mg/kg	NA	NA	NA	NA	<0.00162 U	NA	<0.00164 U	<0.00163 U	NA	<0.00165 U
Herbicides													
Silvex (2,4,5-Tp)	93-72-1	100	mg/kg	NA	NA	NA	NA	<0.0217 U	NA	<0.0217 U	<0.0267 U	NA	<0.0227 U
Polychlorinated Biphenyl													
PCB-1016 (Aroclor 1016)	12674-11-2	NS	mg/kg	NA	NA	NA	NA	<0.0179 U	NA	<0.0182 U	<0.0222 U	NA	<0.0193 U
PCB-1221 (Aroclor 1221)	11104-28-2	NS	mg/kg	NA	NA	NA	NA	<0.0179 U	NA	<0.0182 U	<0.0222 U	NA	<0.0193 U
PCB-1232 (Aroclor 1232)	11141-16-5	NS	mg/kg	NA	NA	NA	NA	<0.0179 U	NA	<0.0182 U	<0.0222 U	NA	<0.0193 U
PCB-1242 (Aroclor 1242)	53469-21-9	NS	mg/kg	NA	NA	NA	NA	<0.0179 U	NA	<0.0182 U	<0.0222 U	NA	<0.0193 U
PCB-1248 (Aroclor 1248)	12672-29-6	NS	mg/kg	NA	NA	NA	NA	<0.0179 U	NA	<0.0182 U	<0.0222 U	NA	<0.0193 U
PCB-1254 (Aroclor 1254)	11097-69-1	NS	mg/kg	NA	NA	NA	NA	<0.0179 U	NA	<0.0182 U	<0.0222 U	NA	<0.0193 U
PCB-1260 (Aroclor 1260)	11096-82-5	NS	mg/kg	NA	NA	NA	NA	<0.0179 U	NA	<0.0182 U	<0.0222 U	NA	<0.0193 U
Total PCBs	1336-36-3	1	mg/kg	NA	NA	NA	NA	<0.0179 U	NA	<0.0182 U	<0.0222 U	NA	<0.0193 U
Metals													
Arsenic	7440-38-2	16	mg/kg	1.65	2.03	<1.66 U	NA	1.85	NA	2.34	5.84	NA	<1.45 U
Barium	7440-39-3	400	mg/kg	45.4	68	99.1 J	NA	44.1	NA	47.8	84.9	NA	84.2
Beryllium	7440-41-7	72	mg/kg	<0.047 U	<0.058 U	<0.055 U	NA	0.451	NA	0.089	<0.057 U	NA	<0.049 U
Cadmium	7440-43-9	**4.3**	mg/kg	<0.28 U	<0.349 U	<0.333 U	NA	<0.273 U	NA	<0.273 U	<0.338 U	NA	<0.289 U
Chromium, Hexavalent	18540-29-9	110	mg/kg	<0.561 U	<0.581 U	NA	<0.54 U	<0.547 U	NA	<0.547 UJ	<0.677 UJ	NA	<0.578 U
Chromium, Total	7440-47-3	NS	mg/kg	12.4	14.1	21.7	10.7	12	NA	14.3	21.4	NA	14.9
Chromium, Trivalent	16065-83-1	180	mg/kg	NA	14.1	NA	10.7	12	NA	14.3	21.4	NA	14.9
Copper	7440-50-8	**270**	mg/kg	16.8	25.3 J	163	NA	19.7	NA	21	61.3	NA	36.1
Cyanide	57-12-5	27	mg/kg	<0.561 U	<0.581 UJ	NA	NA	<0.547 U	NA	<0.547 U	<0.677 UJ	NA	<0.578 U
Lead	7439-92-1	**400**	mg/kg	12.6	51.2	99	NA	10.7	NA	10	74.4	NA	54.7
Manganese	7439-96-5	2000	mg/kg	119	353	409	NA	352	NA	392	447	NA	175
Mercury	7439-97-6	**0.81**	mg/kg	<0.0336 U	0.128	0.3	NA	<0.0328 U	NA	<0.0328 U	0.129	NA	0.102
Nickel	7440-02-0	310	mg/kg	11.3	14.5	23.8	NA	12.8	NA	11.1	19	NA	13.8
Selenium	7782-49-2	180	mg/kg	<2.34 U	<2.91 U	<2.77 U	NA	<2.28 UJ	NA	<2.28 U	<2.82 U	NA	4.7
Silver	7440-22-4	180	mg/kg	<0.471 U	<0.581 U	<0.555 U	NA	<0.459 U	NA	<0.459 U	<0.568 U	NA	<0.486 U
Zinc	7440-66-6	**10000**	mg/kg	29.9	64.7	197 J	NA	28.2	NA	27.6	120	NA	65.9
General Chemistry													
Cyanide	57-12-5	27	mg/kg	NA	NA	NA	<0.54 U	NA	NA	NA	NA	NA	NA
Solids, Percent	SOLID	NS	Percent	89.2	86	94.9	92.6	91.4	89.5	91.4	73.9	82.6	86.5

Table 3
Site Management Plan
Remaining Soil Analytical Results

43-30 24th Street
Long Island City, Queens, New York
NYSDEC BCP Site No.: C241189
Langan Project No.: 170362702

Analyte	CAS Number	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs/Guidance Values											
			Location	EP07	EP08	EP09	EP09	EP10	EP10	EP11	EP12	EP12	EP13
			Sample Name	EP07_5	EP08_5	EP09_12	EP09_5	EP10_4.25	EP10_-1.9	EP11_4.25	EP12_4.25	EP12_-5.8	EP13_4.25
			Sample Date	10/25/2022	09/27/2022	08/17/2022	03/02/2023	12/05/2022	03/02/2023	11/30/2022	11/04/2022	01/05/2023	11/18/2022
			Sample Elevation	5	5	12	5	4.25		4.25	4.25		4.25
			Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Perfluorooctanoic acids													
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid	763051-92-9	NS	mg/kg	NA	NA	NA	NA	NA	<0.000834 UJ	<0.00087 U	NA	<0.000953 U	NA
1h,1h,2h,2h-Perfluorohexanesulfonic Acid (4:2)	757124-72-4	NS	mg/kg	NA	NA	NA	NA	NA	<0.000828 UJ	<0.00087 U	NA	<0.000953 U	NA
3:3 FTCA	356-02-5	NS	mg/kg	NA	NA	NA	NA	NA	<0.0011 UJ	<0.00109 U	NA	<0.00119 UJ	NA
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	919005-14-4	NS	mg/kg	NA	NA	NA	NA	NA	<0.000834 UJ	<0.00087 U	NA	<0.000953 U	NA
5:3 FTCA	914637-49-3	NS	mg/kg	NA	NA	NA	NA	NA	<0.00552 UJ	<0.00544 U	NA	<0.00596 UJ	NA
7:3 FTCA	812-70-4	NS	mg/kg	NA	NA	NA	NA	NA	<0.00552 UJ	<0.00544 U	NA	<0.00596 UJ	NA
9-Chlorohexadecafluoro-3-Oxanonane-1-Sulfonic Acid	756426-58-1	NS	mg/kg	NA	NA	NA	NA	NA	<0.000826 UJ	<0.00087 U	NA	<0.000953 U	NA
N-ethyl perfluorooctane- sulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	NS	mg/kg	NA	NA	NA	NA	NA	<0.000221 UJ	<0.000218 U	NA	<0.000238 U	NA
N-ethylperfluorooctane sulfonamide	4151-50-2	NS	mg/kg	NA	NA	NA	NA	NA	<0.000221 UJ	<0.000218 U	NA	<0.000238 U	NA
N-ethylperfluorooctane sulfonamidoe	1691-99-2	NS	mg/kg	NA	NA	NA	NA	NA	<0.00221 UJ	<0.00218 U	NA	<0.00238 U	NA
N-methyl perfluorooctane- sulfonamidoacetic Acid (NMeFOSAA)	2355-31-9	NS	mg/kg	NA	NA	NA	NA	NA	<0.000221 UJ	<0.000218 U	NA	<0.000238 U	NA
N-methylperfluorooctane sulfonamide	31506-32-8	NS	mg/kg	NA	NA	NA	NA	NA	<0.000221 UJ	<0.000218 U	NA	<0.000238 U	NA
N-methylperfluorooctanesulfonamidol	24448-09-7	NS	mg/kg	NA	NA	NA	NA	NA	<0.00221 UJ	<0.00218 U	NA	<0.00238 U	NA
Nonafluoro-3,6-dioxaheptanoic acid	151772-58-6	NS	mg/kg	NA	NA	NA	NA	NA	<0.000441 UJ	<0.000435 U	NA	<0.000476 U	NA
Perfluoro(2-ethoxyethane)sulfonic acid	113507-82-7	NS	mg/kg	NA	NA	NA	NA	NA	<0.000393 UJ	<0.000435 U	NA	<0.000476 U	NA
Perfluoro-3-methoxypropanoic acid	377-73-1	NS	mg/kg	NA	NA	NA	NA	NA	<0.000441 UJ	<0.000435 U	NA	<0.000476 U	NA
Perfluoro-4-methoxybutanoic acid	863090-89-5	NS	mg/kg	NA	NA	NA	NA	NA	<0.000441 UJ	<0.000435 U	NA	<0.000476 U	NA
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	NS	mg/kg	NA	NA	NA	NA	NA	<0.000195 UJ	<0.000218 U	NA	<0.000238 U	NA
Perfluorobutanoic acid (PFBA)	375-22-4	NS	mg/kg	NA	NA	NA	NA	NA	<0.000883 UJ	<0.00087 U	NA	<0.000953 U	NA
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	NS	mg/kg	NA	NA	NA	NA	NA	<0.000213 UJ	<0.000218 U	NA	<0.000238 U	NA
Perfluorodecanoic Acid (PFDA)	335-76-2	NS	mg/kg	NA	NA	NA	NA	NA	<0.000221 UJ	<0.000218 U	NA	<0.000238 U	NA
Perfluorododecanesulfonic Acid (PFDOS)	79780-39-5	NS	mg/kg	NA	NA	NA	NA	NA	<0.000214 UJ	<0.000218 U	NA	<0.000238 U	NA
Perfluorododecanoic Acid (PFDoA)	307-55-1	NS	mg/kg	NA	NA	NA	NA	NA	<0.000221 UJ	<0.000218 U	NA	<0.000238 U	NA
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	NS	mg/kg	NA	NA	NA	NA	NA	<0.000221 UJ	<0.000218 U	NA	<0.000238 U	NA
Perfluoroheptanoic acid (PFHpA)	375-85-9	NS	mg/kg	NA	NA	NA	NA	NA	<0.000221 UJ	<0.000218 U	NA	<0.000238 U	NA
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	NS	mg/kg	NA	NA	NA	NA	NA	<0.000202 UJ	<0.000218 U	NA	<0.000238 U	NA
Perfluorohexanoic Acid (PFHxA)	307-24-4	NS	mg/kg	NA	NA	NA	NA	NA	<0.000221 UJ	<0.000218 U	NA	<0.000238 U	NA
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	NS	mg/kg	NA	NA	NA	NA	NA	<0.000212 UJ	<0.000218 U	NA	<0.000238 U	NA
Perfluorononanoic Acid (PFNA)	375-95-1	NS	mg/kg	NA	NA	NA	NA	NA	<0.000221 UJ	<0.000218 U	NA	<0.000238 U	NA
Perfluorooctanesulfonamide (FOSA)	754-91-6	NS	mg/kg	NA	NA	NA	NA	NA	<0.000221 UJ	<0.000218 U	NA	<0.000238 U	NA
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	0.044	mg/kg	NA	NA	NA	NA	NA	<0.000205 UJ	<0.000218 U	NA	<0.000238 U	NA
Perfluorooctanoic Acid (PFOA)	335-67-1	0.033	mg/kg	NA	NA	NA	NA	NA	<0.000221 UJ	<0.000218 U	NA	<0.000238 U	NA
Perfluoropentanesulfonic Acid	2706-91-4	NS	mg/kg	NA	NA	NA	NA	NA	<0.000207 UJ	<0.000218 U	NA	<0.000238 U	NA
Perfluoropentanoic Acid (PFPeA)	2706-90-3	NS	mg/kg	NA	NA	NA	NA	NA	<0.000441 UJ	<0.000435 U	NA	<0.000476 U	NA
Perfluorotetradecanoic Acid (PFTA)	376-06-7	NS	mg/kg	NA	NA	NA	NA	NA	<0.000221 UJ	<0.000218 U	NA	<0.000238 U	NA
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	NS	mg/kg	NA	NA	NA	NA	NA	<0.000221 UJ	<0.000218 U	NA	<0.000238 U	NA
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	NS	mg/kg	NA	NA	NA	NA	NA	<0.000221 UJ	<0.000218 U	NA	<0.000238 U	NA
Sodium 1H,1H,2H,2H-Perfluorodecane Sulfonate (8:2) (8:2FTS)	39108-34-4	NS	mg/kg	NA	NA	NA	NA	NA	<0.000848 UJ	<0.00087 U	NA	<0.000953 U	NA
Sodium 1H,1H,2H,2H-Perfluorooctane Sulfonate (6:2) (6:2FTS)	27619-97-2	NS	mg/kg	NA	NA	NA	NA	NA	<0.000839 UJ	<0.00087 U	NA	<0.000953 U	NA
Tetrafluoro-2- (heptafluoropropoxy) propanoic Acid	13252-13-6	NS	mg/kg	NA	NA	NA	NA	NA	<0.000883 UJ	<0.00087 U	NA	<0.000953 U	NA

Table 3
Site Management Plan
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43-30 24th Street
Long Island City, Queens, New York
NYSDEC BCP Site No.: C241189
Langan Project No.: 170362702

Analyte	CAS Number	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs/Guidance Values	Location	EP14	EP15	EP16	EP16	EP17	EP17	EP17	EP18	EP18	EP19
			Sample Name	EP14_5	EP15_1.4	EP16_12	EP16_6	EP17_4.75	DUP01_112222	EP17_3.9	EP18_1	EP18_-5.6	EP19_4.75
			Sample Date	09/27/2022	10/10/2022	08/22/2022	02/16/2023	11/22/2022	11/22/2022	02/22/2023	01/05/2023	02/08/2023	11/22/2022
			Sample Elevation	5	1.4	12	6	4.75	4.75	3.9	1		4.75
			Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Volatile Organic Compounds													
1,1,1-Trichloroethane	71-55-6	100	mg/kg	NA	<0.0048 U	NA	NA	<0.0042 U	<0.0038 U	NA	NA	NA	<0.0044 U
1,1-Dichloroethane	75-34-3	26	mg/kg	NA	<0.0048 U	NA	NA	<0.0042 U	<0.0038 U	NA	NA	NA	<0.0044 U
1,1-Dichloroethene	75-35-4	100	mg/kg	NA	<0.0048 U	NA	NA	<0.0042 U	<0.0038 U	NA	NA	NA	<0.0044 U
1,2,4-Trimethylbenzene	95-63-6	52	mg/kg	NA	<0.0048 U	NA	NA	<0.0042 U	<0.0038 U	NA	NA	NA	<0.0044 U
1,2-Dichlorobenzene	95-50-1	100	mg/kg	NA	<0.0048 U	NA	NA	<0.0042 U	<0.0038 U	NA	NA	NA	<0.0044 U
1,2-Dichloroethane	107-06-2	3.1	mg/kg	NA	<0.0048 U	NA	NA	<0.0042 U	<0.0038 U	NA	NA	NA	<0.0044 U
1,3,5-Trimethylbenzene (Mesitylene)	108-67-8	52	mg/kg	NA	<0.0048 U	NA	NA	<0.0042 U	<0.0038 U	NA	NA	NA	<0.0044 U
1,3-Dichlorobenzene	541-73-1	49	mg/kg	NA	<0.0048 U	NA	NA	<0.0042 U	<0.0038 U	NA	NA	NA	<0.0044 U
1,4-Dichlorobenzene	106-46-7	13	mg/kg	NA	<0.0048 U	NA	NA	<0.0042 U	<0.0038 U	NA	NA	NA	<0.0044 U
1,4-Dioxane (P-Dioxane)	123-91-1	13	mg/kg	NA	<0.095 U	NA	NA	<0.084 U	<0.075 U	NA	NA	NA	<0.089 U
Acetone	67-64-1	100	mg/kg	NA	<0.0095 U	NA	NA	<0.0084 U	0.0081	NA	NA	NA	0.0066 J
Benzene	71-43-2	4.8	mg/kg	NA	<0.0048 U	NA	NA	<0.0042 U	<0.0038 U	NA	NA	NA	<0.0044 U
Carbon Tetrachloride	56-23-5	2.4	mg/kg	NA	<0.0048 U	NA	NA	<0.0042 U	<0.0038 U	NA	NA	NA	<0.0044 U
Chlorobenzene	108-90-7	100	mg/kg	NA	<0.0048 U	NA	NA	<0.0042 U	<0.0038 U	NA	NA	NA	<0.0044 U
Chloroform	67-66-3	49	mg/kg	NA	<0.0048 U	NA	NA	<0.0042 U	<0.0038 U	NA	NA	NA	<0.0044 U
Cis-1,2-Dichloroethene	156-59-2	100	mg/kg	NA	<0.0048 U	NA	NA	<0.0042 U	<0.0038 U	NA	NA	NA	<0.0044 U
Ethylbenzene	100-41-4	41	mg/kg	NA	<0.0048 U	NA	NA	<0.0042 U	<0.0038 U	NA	NA	NA	<0.0044 U
M,P-Xylene	179601-23-1	NS	mg/kg	NA	<0.0095 U	NA	NA	<0.0084 U	<0.0075 U	NA	NA	NA	<0.0089 U
Methyl Ethyl Ketone (2-Butanone)	78-93-3	100	mg/kg	NA	<0.0048 U	NA	NA	<0.0042 U	<0.0038 U	NA	NA	NA	<0.0044 U
Methylene Chloride	75-09-2	100	mg/kg	NA	<0.0095 U	NA	NA	<0.0084 U	<0.0075 U	NA	NA	NA	<0.0089 U
Naphthalene	91-20-3	100	mg/kg	NA	<0.0095 U	NA	NA	<0.0084 U	<0.0075 U	NA	NA	NA	<0.0089 U
n-Butylbenzene	104-51-8	100	mg/kg	NA	<0.0048 U	NA	NA	<0.0042 U	<0.0038 U	NA	NA	NA	<0.0044 U
n-Propylbenzene	103-65-1	100	mg/kg	NA	<0.0048 U	NA	NA	<0.0042 U	<0.0038 U	NA	NA	NA	<0.0044 U
o-Xylene (1,2-Dimethylbenzene)	95-47-6	NS	mg/kg	NA	<0.0048 U	NA	NA	<0.0042 U	<0.0038 U	NA	NA	NA	<0.0044 U
Sec-Butylbenzene	135-98-8	100	mg/kg	NA	<0.0048 U	NA	NA	<0.0042 U	<0.0038 U	NA	NA	NA	<0.0044 U
T-Butylbenzene	98-06-6	100	mg/kg	NA	<0.0048 U	NA	NA	<0.0042 U	<0.0038 U	NA	NA	NA	<0.0044 U
Tert-Butyl Methyl Ether	1634-04-4	100	mg/kg	NA	<0.0048 U	NA	NA	<0.0042 U	<0.0038 U	NA	NA	NA	<0.0044 U
Tetrachloroethene (PCE)	127-18-4	19	mg/kg	NA	<0.0048 U	NA	NA	<0.0042 U	<0.0038 U	NA	NA	NA	<0.0044 U
Toluene	108-88-3	100	mg/kg	NA	<0.0048 U	NA	NA	<0.0042 U	<0.0038 U	NA	NA	NA	<0.0044 U
Total Xylenes	1330-20-7	100	mg/kg	NA	<0.014 U	NA	NA	<0.013 U	<0.011 U	NA	NA	NA	<0.013 U
Trans-1,2-Dichloroethene	156-60-5	100	mg/kg	NA	<0.0048 U	NA	NA	<0.0042 U	<0.0038 U	NA	NA	NA	<0.0044 U
Trichloroethene (TCE)	79-01-6	21	mg/kg	NA	<0.0048 U	NA	NA	<0.0042 U	<0.0038 U	NA	NA	NA	<0.0044 U
Vinyl Chloride	75-01-4	0.9	mg/kg	NA	<0.0048 U	NA	NA	<0.0042 U	<0.0038 U	NA	NA	NA	<0.0044 U
Semi-Volatile Organic Compounds													
1,4-Dioxane (P-Dioxane)	123-91-1	13	mg/kg	NA	NA	NA	NA	<0.0183 U	<0.0183 U	NA	NA	NA	<0.0198 U
2-Methylphenol (o-Cresol)	95-48-7	100	mg/kg	<0.0985 U	<0.0907 U	<0.0885 U	<0.0895 U	<0.09 U	<0.0918 U	NA	<0.0458 U	NA	<0.0948 U
3 & 4 Methylphenol (m&p Cresol)	65794-96-9	100	mg/kg	<0.0985 U	<0.0907 U	<0.0885 U	<0.0895 U	<0.09 U	<0.0918 U	NA	<0.0458 U	NA	<0.0948 U
Acenaphthene	83-32-9	100	mg/kg	0.751 D	<0.0907 U	<0.0885 U	<0.0895 U	<0.09 U	<0.0918 U	NA	<0.0458 U	NA	0.126 D
Acenaphthylene	208-96-8	100	mg/kg	0.149 D	<0.0907 U	<0.0885 U	<0.0895 U	<0.09 U	<0.0918 U	NA	<0.0458 U	NA	0.0599 JD
Anthracene	120-12-7	100	mg/kg	0.829 D	<0.0907 U	0.154 D	0.0515 JD	<0.09 U	<0.0918 U	NA	<0.0458 U	NA	0.187 D
Benzo(a)anthracene	56-55-3	**1**	mg/kg	**1.02 D**	<0.0907 U	0.664 D	0.0522 JD	<0.09 U	<0.0918 U	NA	<0.0458 U	NA	0.503 D
Benzo(a)pyrene	50-32-8	**1**	mg/kg	0.896 D	<0.0907 U	0.794 D	<0.0895 U	<0.09 U	<0.0918 U	NA	<0.0458 U	NA	0.539 D
Benzo(b)fluoranthene	205-99-2	**1**	mg/kg	0.834 D	<0.0907 U	0.731 D	<0.0895 U	<0.09 U	<0.0918 U	NA	<0.0458 U	NA	0.472 D
Benzo(g,h,i)Perylene	191-24-2	100	mg/kg	0.532 D	<0.0907 U	0.518 D	<0.0895 U	<0.09 U	<0.0918 U	NA	<0.0458 U	NA	0.274 D
Benzo(k)fluoranthene	207-08-9	**3.9**	mg/kg	0.749 D	<0.0907 U	0.625 D	<0.0895 U	<0.09 U	<0.0918 U	NA	<0.0458 U	NA	0.414 D
Chrysene	218-01-9	**3.9**	mg/kg	1.04 D	<0.0907 U	0.669 D	<0.0895 U	<0.09 U	<0.0918 U	NA	<0.0458 U	NA	0.503 D
Dibenz(a,h)anthracene	53-70-3	**0.33**	mg/kg	0.177 D	<0.0907 U	0.12 D	<0.0895 U	<0.09 U	<0.0918 U	NA	<0.0458 U	NA	0.0622 JD
Dibenzofuran	132-64-9	59	mg/kg	0.398 D	<0.0907 U	<0.0885 U	<0.0895 U	<0.09 U	<0.0918 U	NA	<0.0458 U	NA	0.0842 JD
Fluoranthene	206-44-0	100	mg/kg	3.1 D	<0.0907 U	1.1 D	0.18 D	<0.09 U	<0.0918 U	NA	<0.0458 U	NA	0.906 D
Fluorene	86-73-7	100	mg/kg	0.629 D	<0.0907 U	0.0446 JD	<0.0895 U	<0.09 U	<0.0918 U	NA	<0.0458 U	NA	0.108 D
Hexachlorobenzene	118-74-1	1.2	mg/kg	<0.0985 U	<0.0907 U	<0.0885 U	<0.0895 U	<0.09 U	<0.0918 U	NA	<0.0458 U	NA	<0.0948 U
Indeno(1,2,3-cd)pyrene	193-39-5	**0.5**	mg/kg	0.485 D	<0.0907 U	**0.648 D**	<0.0895 U	<0.09 U	<0.0918 U	NA	<0.0458 U	NA	0.329 D
Naphthalene	91-20-3	100	mg/kg	0.362 D	<0.0907 U	<0.0885 U	<0.0895 U	<0.09 U	<0.0918 U	NA	<0.0458 U	NA	0.23 D
Pentachlorophenol	87-86-5	6.7	mg/kg	<0.0985 U	<0.0907 U	<0.0885 U	<0.0895 U	<0.09 U	<0.0918 U	NA	<0.0458 U	NA	<0.0948 U
Phenanthrene	85-01-8	100	mg/kg	2.79 D	<0.0907 U	0.513 D	0.129 D	<0.09 U	<0.0918 U	NA	<0.0458 U	NA	0.737 D
Phenol	108-95-2	100	mg/kg	<0.0985 U	<0.0907 U	<0.0885 U	<0.0895 U	<0.09 U	<0.0918 U	NA	<0.0458 U	NA	<0.0948 U
Pyrene	129-00-0	100	mg/kg	2.62 D	0.0536 JD	1 D	0.172 D	<0.09 U	<0.0918 U	NA	<0.0458 U	NA	0.813 D

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43-30 24th Street
Long Island City, Queens, New York
NYSDEC BCP Site No.: C241189
Langan Project No.: 170362702

Analyte	CAS Number	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs/Guidance Values	Location	EP14	EP15	EP16	EP16	EP17	EP17	EP17	EP18	EP18	EP19
			Sample Name	EP14_5	EP15_1.4	EP16_12	EP16_6	EP17_4.75	DUP01_112222	EP17_3.9	EP18_1	EP18_-5.6	EP19_4.75
			Sample Date	09/27/2022	10/10/2022	08/22/2022	02/16/2023	11/22/2022	11/22/2022	02/22/2023	01/05/2023	02/08/2023	11/22/2022
			Sample Elevation	5	1.4	12	6	4.75	4.75	3.9	1		4.75
			Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Pesticides													
4,4'-DDD	72-54-8	13	mg/kg	NA	NA	NA	NA	<0.00163 U	<0.00161 U	NA	NA	NA	<0.00164 UJ
4,4'-DDE	72-55-9	8.9	mg/kg	NA	NA	NA	NA	<0.00163 U	<0.00161 U	NA	NA	NA	<0.00164 UJ
4,4'-DDT	50-29-3	7.9	mg/kg	NA	NA	NA	NA	<0.00163 U	<0.00161 U	NA	NA	NA	<0.00164 UJ
Aldrin	309-00-2	0.097	mg/kg	NA	NA	NA	NA	<0.00163 U	<0.00161 U	NA	NA	NA	<0.00164 UJ
Alpha BHC (Alpha Hexachlorocyclohexane)	319-84-6	0.48	mg/kg	NA	NA	NA	NA	<0.00163 U	<0.00161 U	NA	NA	NA	<0.00164 UJ
Alpha Chlordane	5103-71-9	4.2	mg/kg	NA	NA	NA	NA	<0.00163 U	<0.00161 U	NA	NA	NA	<0.00164 UJ
Alpha Endosulfan	959-98-8	24	mg/kg	NA	NA	NA	NA	<0.00163 U	<0.00161 U	NA	NA	NA	<0.00164 UJ
Beta Bhc (Beta Hexachlorocyclohexane)	319-85-7	0.36	mg/kg	NA	NA	NA	NA	<0.00163 U	<0.00161 U	NA	NA	NA	<0.00164 UJ
Beta Endosulfan	33213-65-9	24	mg/kg	NA	NA	NA	NA	<0.00163 U	<0.00161 U	NA	NA	NA	<0.00164 UJ
Delta Bhc (Delta Hexachlorocyclohexane)	319-86-8	100	mg/kg	NA	NA	NA	NA	<0.00163 U	<0.00161 U	NA	NA	NA	<0.00164 UJ
Dieldrin	60-57-1	0.2	mg/kg	NA	NA	NA	NA	<0.00163 U	<0.00161 U	NA	NA	NA	<0.00164 UJ
Endosulfan Sulfate	1031-07-8	24	mg/kg	NA	NA	NA	NA	<0.00163 U	<0.00161 U	NA	NA	NA	<0.00164 UJ
Endrin	72-20-8	11	mg/kg	NA	NA	NA	NA	<0.00163 U	<0.00161 U	NA	NA	NA	<0.00164 UJ
Gamma Bhc (Lindane)	58-89-9	1.3	mg/kg	NA	NA	NA	NA	<0.00163 U	<0.00161 U	NA	NA	NA	<0.00164 UJ
Heptachlor	76-44-8	2.1	mg/kg	NA	NA	NA	NA	<0.00163 U	<0.00161 U	NA	NA	NA	<0.00164 UJ
Herbicides													
Silvex (2,4,5-Tp)	93-72-1	100	mg/kg	NA	NA	NA	NA	<0.0219 U	<0.0221 U	NA	NA	NA	<0.0223 U
Polychlorinated Biphenyl													
PCB-1016 (Aroclor 1016)	12674-11-2	NS	mg/kg	NA	<0.0182 U	NA	NA	<0.0182 U	<0.0182 U	NA	NA	NA	<0.0189 U
PCB-1221 (Aroclor 1221)	11104-28-2	NS	mg/kg	NA	<0.0182 U	NA	NA	<0.0182 U	<0.0182 U	NA	NA	NA	<0.0189 U
PCB-1232 (Aroclor 1232)	11141-16-5	NS	mg/kg	NA	<0.0182 U	NA	NA	<0.0182 U	<0.0182 U	NA	NA	NA	<0.0189 U
PCB-1242 (Aroclor 1242)	53469-21-9	NS	mg/kg	NA	<0.0182 U	NA	NA	<0.0182 U	<0.0182 U	NA	NA	NA	<0.0189 U
PCB-1248 (Aroclor 1248)	12672-29-6	NS	mg/kg	NA	<0.0182 U	NA	NA	<0.0182 U	<0.0182 U	NA	NA	NA	<0.0189 U
PCB-1254 (Aroclor 1254)	11097-69-1	NS	mg/kg	NA	<0.0182 U	NA	NA	<0.0182 U	<0.0182 U	NA	NA	NA	<0.0189 U
PCB-1260 (Aroclor 1260)	11096-82-5	NS	mg/kg	NA	<0.0182 U	NA	NA	<0.0182 U	<0.0182 U	NA	NA	NA	<0.0189 U
Total PCBs	1336-36-3	1	mg/kg	NA	<0.0182 U	NA	NA	<0.0182 U	<0.0182 U	NA	NA	NA	<0.0189 U
Metals													
Arsenic	7440-38-2	16	mg/kg	9.52	3.21	<1.72 U	1.63 J	<1.38 U	2.3	NA	<1.38 U	NA	6.73
Barium	7440-39-3	400	mg/kg	286	64.3	111 J	71.9	58.6	64	NA	48.8	NA	119
Beryllium	7440-41-7	72	mg/kg	<0.059 U	<0.055 U	<0.057 U	1.1	0.848	0.717	NA	0.456	NA	0.86
Cadmium	7440-43-9	**4.3**	mg/kg	<0.357 U	<0.329 U	0.573	<0.271 U	0.366	<0.281 U	NA	<0.276 U	NA	1.08
Chromium, Hexavalent	18540-29-9	110	mg/kg	<0.595 U	<0.549 U	NA	<0.542 U	<0.55 U	<0.561 U	NA	<0.552 U	NA	<0.572 U
Chromium, Total	7440-47-3	NS	mg/kg	31.1	14.9	26.4	18.1	17.7	16.1	NA	12.5	NA	21.5
Chromium, Trivalent	16065-83-1	180	mg/kg	31.1	14.9	NA	18.1	17.7	16.1	NA	10.9	NA	21.5
Copper	7440-50-8	**270**	mg/kg	170 J	19.5	216 J	27.3 J	17.9	21.2	NA	114	NA	147
Cyanide	57-12-5	27	mg/kg	<0.595 UJ	<0.549 U	NA	NA	<0.55 U	<0.561 U	NA	<0.552 U	NA	<0.572 U
Lead	7439-92-1	**400**	mg/kg	231	38.3	99.9	20.1 J	9.3 B	8.61 B	NA	7.58	NA	143 B
Manganese	7439-96-5	2000	mg/kg	270	315	387	423	225	279	NA	181	NA	290
Mercury	7439-97-6	**0.81**	mg/kg	0.269	<0.0329 U	0.202	<0.0325 U	<0.033 U	<0.0337 U	NA	<0.0331 U	NA	**0.876**
Nickel	7440-02-0	310	mg/kg	27.2	13	13.8 J	15 J	13.1	12.5	NA	11.5	NA	17.9
Selenium	7782-49-2	180	mg/kg	<2.97 U	<2.75 U	<2.87 U	<2.26 UJ	<2.29 UJ	<2.34 UJ	NA	<2.3 U	NA	<2.38 UJ
Silver	7440-22-4	180	mg/kg	<0.595 U	<0.549 U	<0.573 U	<0.455 UJ	<0.462 U	<0.472 U	NA	<0.464 U	NA	<0.481 U
Zinc	7440-66-6	**10000**	mg/kg	255	54.7	251	49.7 J	25.9 B	29.4 B	NA	87	NA	376 B
General Chemistry													
Cyanide	57-12-5	27	mg/kg	NA	NA	NA	<0.542 U	NA	NA	NA	NA	NA	NA
Solids, Percent	SOLID	NS	Percent	84.1	91.1	91.8	92.2	90.8	89.1	88.8	90.6	89.7	87.3

Table 3
Site Management Plan
Remaining Soil Analytical Results

43-30 24th Street
Long Island City, Queens, New York
NYSDEC BCP Site No.: C241189
Langan Project No.: 170362702

Analyte	CAS Number	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs/Guidance Values	Location	EP14	EP15	EP16	EP16	EP17	EP17	EP17	EP18	EP18	EP19
			Sample Name	EP14_5	EP15_1.4	EP16_12	EP16_6	EP17_4.75	DUP01_112222	EP17_3.9	EP18_1	EP18_-5.6	EP19_4.75
			Sample Date	09/27/2022	10/10/2022	08/22/2022	02/16/2023	11/22/2022	11/22/2022	02/22/2023	01/05/2023	02/08/2023	11/22/2022
			Sample Elevation	5	1.4	12	6	4.75	4.75	3.9	1		4.75
			Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Perfluorooctanoic acids													
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid	763051-92-9	NS	mg/kg	NA	NA	NA	NA	NA	NA	<0.000841 UJ	NA	<0.000834 UJ	NA
1h,1h,2h,2h-Perfluorohexanesulfonic Acid (4:2)	757124-72-4	NS	mg/kg	NA	NA	NA	NA	NA	NA	<0.000835 UJ	NA	<0.000828 UJ	NA
3:3 FTCA	356-02-5	NS	mg/kg	NA	NA	NA	NA	NA	NA	<0.00111 UJ	NA	<0.0011 UJ	NA
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	919005-14-4	NS	mg/kg	NA	NA	NA	NA	NA	NA	<0.000841 UJ	NA	<0.000834 UJ	NA
5:3 FTCA	914637-49-3	NS	mg/kg	NA	NA	NA	NA	NA	NA	<0.00556 UJ	NA	<0.00552 UJ	NA
7:3 FTCA	812-70-4	NS	mg/kg	NA	NA	NA	NA	NA	NA	<0.00556 UJ	NA	<0.00552 UJ	NA
9-Chlorohexadecafluoro-3-Oxanonane-1-Sulfonic Acid	756426-58-1	NS	mg/kg	NA	NA	NA	NA	NA	NA	<0.000832 UJ	NA	<0.000826 UJ	NA
N-ethyl perfluorooctane- sulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	NS	mg/kg	NA	NA	NA	NA	NA	NA	<0.000223 UJ	NA	<0.000221 UJ	NA
N-ethylperfluorooctane sulfonamide	4151-50-2	NS	mg/kg	NA	NA	NA	NA	NA	NA	<0.000223 UJ	NA	<0.000221 UJ	NA
N-ethylperfluorooctane sulfonamidoe	1691-99-2	NS	mg/kg	NA	NA	NA	NA	NA	NA	<0.00223 UJ	NA	<0.00221 UJ	NA
N-methyl perfluorooctane- sulfonamidoacetic Acid (NMeFOSAA)	2355-31-9	NS	mg/kg	NA	NA	NA	NA	NA	NA	<0.000223 UJ	NA	<0.000221 UJ	NA
N-methylperfluorooctane sulfonamide	31506-32-8	NS	mg/kg	NA	NA	NA	NA	NA	NA	<0.000223 UJ	NA	<0.000221 UJ	NA
N-methylperfluorooctanesulfonamidol	24448-09-7	NS	mg/kg	NA	NA	NA	NA	NA	NA	<0.00223 UJ	NA	<0.00221 UJ	NA
Nonafluoro-3,6-dioxaheptanoic acid	151772-58-6	NS	mg/kg	NA	NA	NA	NA	NA	NA	<0.000445 UJ	NA	<0.000441 UJ	NA
Perfluoro(2-ethoxyethane)sulfonic acid	113507-82-7	NS	mg/kg	NA	NA	NA	NA	NA	NA	<0.000396 UJ	NA	<0.000393 UJ	NA
Perfluoro-3-methoxypropanoic acid	377-73-1	NS	mg/kg	NA	NA	NA	NA	NA	NA	<0.000445 UJ	NA	<0.000441 UJ	NA
Perfluoro-4-methoxybutanoic acid	863090-89-5	NS	mg/kg	NA	NA	NA	NA	NA	NA	<0.000445 UJ	NA	<0.000441 UJ	NA
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	NS	mg/kg	NA	NA	NA	NA	NA	NA	<0.000197 UJ	NA	<0.000195 UJ	NA
Perfluorobutanoic acid (PFBA)	375-22-4	NS	mg/kg	NA	NA	NA	NA	NA	NA	<0.00089 UJ	NA	<0.000883 UJ	NA
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	NS	mg/kg	NA	NA	NA	NA	NA	NA	<0.000215 UJ	NA	<0.000213 UJ	NA
Perfluorodecanoic Acid (PFDA)	335-76-2	NS	mg/kg	NA	NA	NA	NA	NA	NA	<0.000223 UJ	NA	<0.000221 UJ	NA
Perfluorododecanesulfonic Acid (PFDOS)	79780-39-5	NS	mg/kg	NA	NA	NA	NA	NA	NA	<0.000216 UJ	NA	<0.000214 UJ	NA
Perfluorododecanoic Acid (PFDoA)	307-55-1	NS	mg/kg	NA	NA	NA	NA	NA	NA	<0.000223 UJ	NA	<0.000221 UJ	NA
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	NS	mg/kg	NA	NA	NA	NA	NA	NA	<0.000223 UJ	NA	<0.000221 UJ	NA
Perfluoroheptanoic acid (PFHpA)	375-85-9	NS	mg/kg	NA	NA	NA	NA	NA	NA	<0.000223 UJ	NA	<0.000221 UJ	NA
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	NS	mg/kg	NA	NA	NA	NA	NA	NA	<0.000204 UJ	NA	<0.000202 UJ	NA
Perfluorohexanoic Acid (PFHxA)	307-24-4	NS	mg/kg	NA	NA	NA	NA	NA	NA	<0.000223 UJ	NA	<0.000221 UJ	NA
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	NS	mg/kg	NA	NA	NA	NA	NA	NA	<0.000214 UJ	NA	<0.000212 UJ	NA
Perfluorononanoic Acid (PFNA)	375-95-1	NS	mg/kg	NA	NA	NA	NA	NA	NA	<0.000223 UJ	NA	<0.000221 UJ	NA
Perfluorooctanesulfonamide (FOSA)	754-91-6	NS	mg/kg	NA	NA	NA	NA	NA	NA	<0.000223 UJ	NA	<0.000221 UJ	NA
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	0.044	mg/kg	NA	NA	NA	NA	NA	NA	<0.000207 UJ	NA	<0.000205 UJ	NA
Perfluorooctanoic Acid (PFOA)	335-67-1	0.033	mg/kg	NA	NA	NA	NA	NA	NA	<0.000223 UJ	NA	<0.000221 UJ	NA
Perfluoropentanesulfonic Acid	2706-91-4	NS	mg/kg	NA	NA	NA	NA	NA	NA	<0.000209 UJ	NA	<0.000207 UJ	NA
Perfluoropentanoic Acid (PFPeA)	2706-90-3	NS	mg/kg	NA	NA	NA	NA	NA	NA	<0.000445 UJ	NA	<0.000441 UJ	NA
Perfluorotetradecanoic Acid (PFTA)	376-06-7	NS	mg/kg	NA	NA	NA	NA	NA	NA	<0.000223 UJ	NA	<0.000221 UJ	NA
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	NS	mg/kg	NA	NA	NA	NA	NA	NA	<0.000223 UJ	NA	<0.000221 UJ	NA
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	NS	mg/kg	NA	NA	NA	NA	NA	NA	<0.000223 UJ	NA	<0.000221 UJ	NA
Sodium 1H,1H,2H,2H-Perfluorodecane Sulfonate (8:2) (8:2FTS)	39108-34-4	NS	mg/kg	NA	NA	NA	NA	NA	NA	<0.000855 UJ	NA	<0.000848 UJ	NA
Sodium 1H,1H,2H,2H-Perfluorooctane Sulfonate (6:2) (6:2FTS)	27619-97-2	NS	mg/kg	NA	NA	NA	NA	NA	NA	<0.000846 UJ	NA	<0.000839 UJ	NA
Tetrafluoro-2- (heptafluoropropoxy) propanoic Acid	13252-13-6	NS	mg/kg	NA	NA	NA	NA	NA	NA	<0.00089 UJ	NA	<0.000883 UJ	NA

Table 3
Site Management Plan
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43-30 24th Street
Long Island City, Queens, New York
NYSDEC BCP Site No.: C241189
Langan Project No.: 170362702

Analyte	CAS Number	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs/Guidance Values	Location	EP19	EP19	EP20	EP20	EP21	EP22	EP22	EP23	EP24	EP25
			Sample Name	EP19_1	EP19_-5.8	EP20_4.75	EP20_-5.7	EP21_3	EP22_5	EP22_3	EP23_3	EP24_4	EP25_4.25
			Sample Date	01/04/2023	01/05/2023	11/22/2022	12/30/2022	10/28/2022	11/09/2022	11/21/2022	11/14/2022	01/24/2023	12/14/2022
			Sample Elevation	1		4.75		3	5	3	3	4	4.25
			Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Volatile Organic Compounds													
1,1,1-Trichloroethane	71-55-6	100	mg/kg	NA	NA	<0.0034 U	NA	<0.0024 U	<0.0068 U	<0.0074 U	<0.0042 U	<0.0051 U	<0.0061 U
1,1-Dichloroethane	75-34-3	26	mg/kg	NA	NA	<0.0034 U	NA	<0.0024 U	<0.0068 U	<0.0074 U	<0.0042 U	<0.0051 U	<0.0061 U
1,1-Dichloroethene	75-35-4	100	mg/kg	NA	NA	<0.0034 U	NA	<0.0024 U	<0.0068 U	<0.0074 U	<0.0042 U	<0.0051 U	<0.0061 U
1,2,4-Trimethylbenzene	95-63-6	52	mg/kg	NA	NA	<0.0034 U	NA	<0.0024 U	<0.0068 U	<0.0074 U	<0.0042 U	<0.0051 U	<0.0061 U
1,2-Dichlorobenzene	95-50-1	100	mg/kg	NA	NA	<0.0034 U	NA	<0.0024 U	<0.0068 U	<0.0074 U	<0.0042 U	<0.0051 U	<0.0061 U
1,2-Dichloroethane	107-06-2	3.1	mg/kg	NA	NA	<0.0034 U	NA	<0.0024 U	<0.0068 U	<0.0074 U	<0.0042 U	<0.0051 U	<0.0061 U
1,3,5-Trimethylbenzene (Mesitylene)	108-67-8	52	mg/kg	NA	NA	<0.0034 U	NA	<0.0024 U	<0.0068 U	<0.0074 U	<0.0042 U	<0.0051 U	<0.0061 U
1,3-Dichlorobenzene	541-73-1	49	mg/kg	NA	NA	<0.0034 U	NA	<0.0024 U	<0.0068 U	<0.0074 U	<0.0042 U	<0.0051 U	<0.0061 U
1,4-Dichlorobenzene	106-46-7	13	mg/kg	NA	NA	<0.0034 U	NA	<0.0024 U	<0.0068 U	<0.0074 U	<0.0042 U	<0.0051 U	<0.0061 U
1,4-Dioxane (P-Dioxane)	123-91-1	13	mg/kg	NA	NA	<0.068 U	NA	<0.047 U	<0.14 U	<0.15 U	<0.084 U	<0.1 U	<0.12 U
Acetone	67-64-1	100	mg/kg	NA	NA	0.018	NA	0.0025 J	<0.014 U	0.052	0.0052 J	0.028	<0.012 U
Benzene	71-43-2	4.8	mg/kg	NA	NA	<0.0034 U	NA	<0.0024 U	<0.0068 U	<0.0074 U	<0.0042 U	<0.0051 U	<0.0061 U
Carbon Tetrachloride	56-23-5	2.4	mg/kg	NA	NA	<0.0034 U	NA	<0.0024 U	<0.0068 U	<0.0074 U	<0.0042 U	<0.0051 U	<0.0061 U
Chlorobenzene	108-90-7	100	mg/kg	NA	NA	<0.0034 U	NA	<0.0024 U	<0.0068 U	<0.0074 U	<0.0042 U	<0.0051 U	<0.0061 U
Chloroform	67-66-3	49	mg/kg	NA	NA	<0.0034 U	NA	<0.0024 U	<0.0068 U	<0.0074 U	<0.0042 U	<0.0051 U	<0.0061 U
Cis-1,2-Dichloroethene	156-59-2	100	mg/kg	NA	NA	<0.0034 U	NA	<0.0024 U	<0.0068 U	<0.0074 U	<0.0042 U	<0.0051 U	<0.0061 U
Ethylbenzene	100-41-4	41	mg/kg	NA	NA	<0.0034 U	NA	<0.0024 U	<0.0068 U	<0.0074 U	<0.0042 U	<0.0051 U	<0.0061 U
M,P-Xylene	179601-23-1	NS	mg/kg	NA	NA	<0.0068 U	NA	<0.0047 U	<0.014 U	<0.015 U	<0.0084 U	<0.01 U	<0.012 U
Methyl Ethyl Ketone (2-Butanone)	78-93-3	100	mg/kg	NA	NA	0.0018 J	NA	<0.0024 U	<0.0068 U	0.011	0.0026 J	<0.0051 U	<0.0061 U
Methylene Chloride	75-09-2	100	mg/kg	NA	NA	<0.0068 U	NA	<0.0047 U	<0.014 U	<0.015 U	<0.0084 U	<0.01 U	<0.012 U
Naphthalene	91-20-3	100	mg/kg	NA	NA	0.32 J	NA	<0.0047 U	<0.014 U	0.22	0.0034 J	<0.01 U	<0.012 U
n-Butylbenzene	104-51-8	100	mg/kg	NA	NA	<0.0034 U	NA	<0.0024 U	<0.0068 U	<0.0074 U	<0.0042 U	<0.0051 U	<0.0061 U
n-Propylbenzene	103-65-1	100	mg/kg	NA	NA	<0.0034 U	NA	<0.0024 U	<0.0068 U	<0.0074 U	<0.0042 U	<0.0051 U	<0.0061 U
o-Xylene (1,2-Dimethylbenzene)	95-47-6	NS	mg/kg	NA	NA	<0.0034 U	NA	<0.0024 U	<0.0068 U	<0.0074 U	<0.0042 U	<0.0051 U	<0.0061 U
Sec-Butylbenzene	135-98-8	100	mg/kg	NA	NA	<0.0034 U	NA	<0.0024 U	<0.0068 U	<0.0074 U	<0.0042 U	<0.0051 U	<0.0061 U
T-Butylbenzene	98-06-6	100	mg/kg	NA	NA	<0.0034 U	NA	<0.0024 U	<0.0068 U	<0.0074 U	<0.0042 U	<0.0051 U	<0.0061 UJ
Tert-Butyl Methyl Ether	1634-04-4	100	mg/kg	NA	NA	<0.0034 U	NA	<0.0024 U	<0.0068 U	<0.0074 U	<0.0042 U	<0.0051 U	<0.0061 U
Tetrachloroethene (PCE)	127-18-4	19	mg/kg	NA	NA	<0.0034 U	NA	<0.0024 U	<0.0068 U	<0.0074 U	<0.0042 U	<0.0051 U	<0.0061 U
Toluene	108-88-3	100	mg/kg	NA	NA	0.0021 J	NA	<0.0024 U	<0.0068 U	<0.0074 U	<0.0042 U	<0.0051 U	<0.0061 U
Total Xylenes	1330-20-7	100	mg/kg	NA	NA	<0.01 U	NA	<0.0071 U	<0.02 U	<0.022 U	<0.013 U	<0.015 U	<0.018 U
Trans-1,2-Dichloroethene	156-60-5	100	mg/kg	NA	NA	<0.0034 U	NA	<0.0024 U	<0.0068 U	<0.0074 U	<0.0042 U	<0.0051 U	<0.0061 U
Trichloroethene (TCE)	79-01-6	21	mg/kg	NA	NA	<0.0034 U	NA	<0.0024 U	<0.0068 U	<0.0074 U	<0.0042 U	<0.0051 U	<0.0061 U
Vinyl Chloride	75-01-4	0.9	mg/kg	NA	NA	<0.0034 U	NA	<0.0024 U	<0.0068 U	<0.0074 U	<0.0042 U	<0.0051 U	<0.0061 U
Semi-Volatile Organic Compounds													
1,4-Dioxane (P-Dioxane)	123-91-1	13	mg/kg	NA	NA	<0.0198 U	NA	<0.0198 U	<0.0183 U	<0.0185 U	<0.0198 U	<0.0192 U	<0.019 U
2-Methylphenol (o-Cresol)	95-48-7	100	mg/kg	NA	NA	<0.0914 U	NA	<0.0937 U	<0.101 U	<0.0986 UJ	<0.0902 U	<0.0892 U	<0.0915 U
3 & 4 Methylphenol (m&p Cresol)	65794-96-9	100	mg/kg	NA	NA	<0.0914 U	NA	<0.0937 U	<0.101 U	<0.0986 UJ	<0.0902 U	<0.0892 U	<0.0915 U
Acenaphthene	83-32-9	100	mg/kg	NA	NA	0.811 D	NA	<0.0937 U	<0.101 U	0.308 D	<0.0902 U	<0.0892 U	<0.0915 U
Acenaphthylene	208-96-8	100	mg/kg	NA	NA	<0.0914 U	NA	<0.0937 U	<0.101 U	<0.0986 U	<0.0902 U	<0.0892 U	<0.0915 U
Anthracene	120-12-7	100	mg/kg	NA	NA	0.43 D	NA	<0.0937 U	<0.101 U	0.26 D	<0.0902 U	<0.0892 U	<0.0915 U
Benzo(a)anthracene	56-55-3	**1**	mg/kg	NA	NA	0.314 D	NA	0.0681 JD	<0.101 U	0.441 D	<0.0902 U	<0.0892 U	<0.0915 U
Benzo(a)pyrene	50-32-8	**1**	mg/kg	NA	NA	0.162 D	NA	<0.0937 U	<0.101 U	0.373 D	<0.0902 U	<0.0892 U	<0.0915 U
Benzo(b)fluoranthene	205-99-2	**1**	mg/kg	NA	NA	0.16 D	NA	<0.0937 U	<0.101 U	0.344 D	<0.0902 U	<0.0892 U	<0.0915 U
Benzo(g,h,i)Perylene	191-24-2	100	mg/kg	NA	NA	0.101 D	NA	<0.0937 U	<0.101 U	0.237 D	<0.0902 U	<0.0892 U	<0.0915 U
Benzo(k)fluoranthene	207-08-9	**3.9**	mg/kg	NA	NA	0.14 D	NA	<0.0937 U	<0.101 U	0.288 D	<0.0902 U	<0.0892 U	<0.0915 U
Chrysene	218-01-9	**3.9**	mg/kg	NA	NA	0.28 D	NA	0.0644 JD	<0.101 U	0.417 D	<0.0902 U	<0.0892 U	<0.0915 U
Dibenz(a,h)anthracene	53-70-3	**0.33**	mg/kg	NA	NA	<0.0914 U	NA	<0.0937 U	<0.101 U	0.0741 JD	<0.0902 U	<0.0892 U	<0.0915 U
Dibenzofuran	132-64-9	59	mg/kg	NA	NA	0.565 D	NA	<0.0937 U	<0.101 U	0.199 D	<0.0902 U	<0.0892 U	<0.0915 U
Fluoranthene	206-44-0	100	mg/kg	NA	NA	1.39 D	NA	0.122 D	<0.101 U	1 D	<0.0902 U	<0.0892 U	<0.0915 U
Fluorene	86-73-7	100	mg/kg	NA	NA	0.775 D	NA	<0.0937 U	<0.101 U	0.245 D	<0.0902 U	<0.0892 U	<0.0915 U
Hexachlorobenzene	118-74-1	1.2	mg/kg	NA	NA	<0.0914 U	NA	<0.0937 U	<0.101 U	<0.0986 U	<0.0902 U	<0.0892 U	<0.0915 U
Indeno(1,2,3-cd)pyrene	193-39-5	**0.5**	mg/kg	NA	NA	0.129 D	NA	<0.0937 U	<0.101 U	0.293 D	<0.0902 U	<0.0892 U	<0.0915 U
Naphthalene	91-20-3	100	mg/kg	NA	NA	0.278 D	NA	<0.0937 U	<0.101 U	0.208 D	<0.0902 U	<0.0892 U	<0.0915 U
Pentachlorophenol	87-86-5	6.7	mg/kg	NA	NA	<0.0914 U	NA	<0.0937 U	<0.101 U	<0.0986 UJ	<0.0902 U	<0.0892 U	<0.0915 U
Phenanthrene	85-01-8	100	mg/kg	NA	NA	2.1 D	NA	0.0636 JD	<0.101 U	1.12 D	<0.0902 U	<0.0892 U	<0.0915 U
Phenol	108-95-2	100	mg/kg	NA	NA	<0.0914 U	NA	<0.0937 U	<0.101 U	<0.0986 UJ	<0.0902 U	<0.0892 U	<0.0915 U
Pyrene	129-00-0	100	mg/kg	NA	NA	1.02 D	NA	0.129 D	<0.101 U	1.03 D	<0.0902 U	<0.0892 U	<0.0915 U

Table 3
Site Management Plan
Remaining Soil Analytical Results

43-30 24th Street
Long Island City, Queens, New York
NYSDEC BCP Site No.: C241189
Langan Project No.: 170362702

Analyte	CAS Number	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs/Guidance Values	**Location**	EP19	EP19	EP20	EP20	EP21	EP22	EP22	EP23	EP24	EP25
			Sample Name	EP19_1	EP19_-5.8	EP20_4.75	EP20_-5.7	EP21_3	EP22_5	EP22_3	EP23_3	EP24_4	EP25_4.25
			Sample Date	01/04/2023	01/05/2023	11/22/2022	12/30/2022	10/28/2022	11/09/2022	11/21/2022	11/14/2022	01/24/2023	12/14/2022
			Sample Elevation	1		4.75		3	5	3	3	4	4.25
			Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Pesticides													
4,4'-DDD	72-54-8	13	mg/kg	NA	NA	<0.00164 U	NA	<0.00163 U	<0.00164 U	<0.00164 U	<0.00164 U	<0.00161 U	<0.00162 U
4,4'-DDE	72-55-9	8.9	mg/kg	NA	NA	<0.00164 U	NA	<0.00163 U	<0.00164 U	<0.00164 U	<0.00164 U	<0.00161 U	<0.00162 U
4,4'-DDT	50-29-3	7.9	mg/kg	NA	NA	<0.00164 U	NA	<0.00163 U	<0.00164 U	<0.00164 U	<0.00164 U	<0.00161 U	<0.00162 U
Aldrin	309-00-2	0.097	mg/kg	NA	NA	<0.00164 U	NA	<0.00163 U	<0.00164 U	<0.00164 U	<0.00164 U	<0.00161 U	<0.00162 U
Alpha BHC (Alpha Hexachlorocyclohexane)	319-84-6	0.48	mg/kg	NA	NA	<0.00164 U	NA	<0.00163 U	<0.00164 U	<0.00164 U	<0.00164 U	<0.00161 U	<0.00162 U
Alpha Chlordane	5103-71-9	4.2	mg/kg	NA	NA	<0.00164 U	NA	<0.00163 U	<0.00164 U	<0.00164 U	<0.00164 U	<0.00161 U	<0.00162 U
Alpha Endosulfan	959-98-8	24	mg/kg	NA	NA	<0.00164 U	NA	<0.00163 U	<0.00164 U	<0.00164 U	<0.00164 U	<0.00161 U	<0.00162 U
Beta Bhc (Beta Hexachlorocyclohexane)	319-85-7	0.36	mg/kg	NA	NA	<0.00164 U	NA	<0.00163 U	<0.00164 U	<0.00164 U	<0.00164 U	<0.00161 U	<0.00162 U
Beta Endosulfan	33213-65-9	24	mg/kg	NA	NA	<0.00164 U	NA	<0.00163 U	<0.00164 U	<0.00164 U	<0.00164 U	<0.00161 U	<0.00162 U
Delta Bhc (Delta Hexachlorocyclohexane)	319-86-8	100	mg/kg	NA	NA	<0.00164 U	NA	<0.00163 U	<0.00164 U	<0.00164 U	<0.00164 U	<0.00161 U	<0.00162 U
Dieldrin	60-57-1	0.2	mg/kg	NA	NA	<0.00164 U	NA	<0.00163 U	<0.00164 U	<0.00164 U	<0.00164 U	<0.00161 U	<0.00162 U
Endosulfan Sulfate	1031-07-8	24	mg/kg	NA	NA	<0.00164 U	NA	<0.00163 U	<0.00164 U	<0.00164 U	<0.00164 U	<0.00161 U	<0.00162 U
Endrin	72-20-8	11	mg/kg	NA	NA	<0.00164 U	NA	<0.00163 U	<0.00164 U	<0.00164 U	<0.00164 U	<0.00161 U	<0.00162 U
Gamma Bhc (Lindane)	58-89-9	1.3	mg/kg	NA	NA	<0.00164 U	NA	<0.00163 U	<0.00164 U	<0.00164 U	<0.00164 U	<0.00161 U	<0.00162 U
Heptachlor	76-44-8	2.1	mg/kg	NA	NA	<0.00164 U	NA	<0.00163 U	<0.00164 U	<0.00164 U	<0.00164 U	<0.00161 U	<0.00162 U
Herbicides													
Silvex (2,4,5-Tp)	93-72-1	100	mg/kg	NA	NA	<0.0222 U	NA	<0.0224 U	<0.0243 U	<0.024 U	<0.0218 U	<0.0214 U	<0.0223 U
Polychlorinated Biphenyl													
PCB-1016 (Aroclor 1016)	12674-11-2	NS	mg/kg	NA	NA	<0.0185 U	NA	<0.0185 U	<0.0202 U	<0.02 U	<0.0181 U	<0.0178 U	<0.0182 U
PCB-1221 (Aroclor 1221)	11104-28-2	NS	mg/kg	NA	NA	<0.0185 U	NA	<0.0185 U	<0.0202 U	<0.02 U	<0.0181 U	<0.0178 U	<0.0182 U
PCB-1232 (Aroclor 1232)	11141-16-5	NS	mg/kg	NA	NA	<0.0185 U	NA	<0.0185 U	<0.0202 U	<0.02 U	<0.0181 U	<0.0178 U	<0.0182 U
PCB-1242 (Aroclor 1242)	53469-21-9	NS	mg/kg	NA	NA	<0.0185 U	NA	<0.0185 U	<0.0202 U	<0.02 U	<0.0181 U	<0.0178 U	<0.0182 U
PCB-1248 (Aroclor 1248)	12672-29-6	NS	mg/kg	NA	NA	<0.0185 U	NA	<0.0185 U	<0.0202 U	<0.02 U	<0.0181 U	<0.0178 U	<0.0182 U
PCB-1254 (Aroclor 1254)	11097-69-1	NS	mg/kg	NA	NA	<0.0185 U	NA	<0.0185 U	<0.0202 U	<0.02 U	<0.0181 U	<0.0178 U	<0.0182 U
PCB-1260 (Aroclor 1260)	11096-82-5	NS	mg/kg	NA	NA	<0.0185 U	NA	<0.0185 U	<0.0202 U	<0.02 U	<0.0181 U	<0.0178 U	<0.0182 U
Total PCBs	1336-36-3	1	mg/kg	NA	NA	<0.0185 U	NA	<0.0185 U	<0.0202 U	<0.02 U	<0.0181 U	<0.0178 U	<0.0182 U
Metals													
Arsenic	7440-38-2	16	mg/kg	NA	NA	3.48	NA	<1.42 U	1.92	6.34	<1.37 U	1.56	1.95
Barium	7440-39-3	400	mg/kg	NA	NA	103	NA	54	133	142	46	49.6	32.2 J
Beryllium	7440-41-7	72	mg/kg	NA	NA	0.824	NA	<0.048 U	<0.051 U	0.463	<0.046 U	0.434	0.62
Cadmium	7440-43-9	**4.3**	mg/kg	NA	NA	1.62	NA	<0.284 U	**77.9**	**23.6**	<0.274 U	<0.269 U	<0.279 U
Chromium, Hexavalent	18540-29-9	110	mg/kg	NA	NA	<0.557 U	NA	<0.567 U	<0.611 U	<0.603 U	<0.548 U	<0.538 U	<0.558 U
Chromium, Total	7440-47-3	NS	mg/kg	NA	NA	17	NA	11.5	5.06 J	26.4	14.8	11 J	15.5 J
Chromium, Trivalent	16065-83-1	180	mg/kg	NA	NA	17	NA	11.5	5.06	26.4	14.8	11	15.5
Copper	7440-50-8	**270**	mg/kg	NA	NA	214	NA	29.3	**10,400 D**	**17,600 D**	20	17.4	26.7 J
Cyanide	57-12-5	27	mg/kg	NA	NA	<0.557 U	NA	<0.567 U	<0.611 U	<0.603 U	<0.548 U	NA	<0.558 UJ
Lead	7439-92-1	**400**	mg/kg	NA	NA	138 B	NA	58.6	**1,630**	**2,000**	6.82	7.4	32.2 J
Manganese	7439-96-5	2000	mg/kg	NA	NA	323	NA	231	104	515	408	299	175 J
Mercury	7439-97-6	**0.81**	mg/kg	0.0519	NA	0.0731	NA	<0.034 U	<0.0366 U	0.13	<0.0329 U	<0.0323 U	<0.0335 U
Nickel	7440-02-0	310	mg/kg	NA	NA	18.5	NA	11.3	53.8 J	113	12.6	12.7	13.9 J
Selenium	7782-49-2	180	mg/kg	NA	NA	<2.32 UJ	NA	<2.36 U	<2.54 U	<2.51 UJ	3.51	<2.24 UJ	<2.32 UJ
Silver	7440-22-4	180	mg/kg	NA	NA	<0.468 U	NA	<0.476 U	<0.513 UJ	<0.506 U	<0.46 U	<0.452 UJ	<0.469 UJ
Zinc	7440-66-6	**10000**	mg/kg	NA	NA	526 B	NA	52.1	**14,100 D**	6,850 D	25.9	63.5	135 J
General Chemistry													
Cyanide	57-12-5	27	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	<0.538 U	NA
Solids, Percent	SOLID	NS	Percent	88.4	89.7	89.8	59	88.2	81.9	82.9	91.3	92.9	89.4

Table 3
Site Management Plan
Remaining Soil Analytical Results

43-30 24th Street
Long Island City, Queens, New York
NYSDEC BCP Site No.: C241189
Langan Project No.: 170362702

Analyte	CAS Number	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs/Guidance Values	Location	EP19	EP19	EP20	EP20	EP21	EP22	EP22	EP23	EP24	EP25
			Sample Name	EP19_1	EP19_-5.8	EP20_4.75	EP20_-5.7	EP21_3	EP22_5	EP22_3	EP23_3	EP24_4	EP25_4.25
			Sample Date	01/04/2023	01/05/2023	11/22/2022	12/30/2022	10/28/2022	11/09/2022	11/21/2022	11/14/2022	01/24/2023	12/14/2022
			Sample Elevation	1		4.75		3	5	3	3	4	4.25
			Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Perfluorooctanoic acids													
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid	763051-92-9	NS	mg/kg	NA	<0.000882 U	NA	<0.00133 UJ	NA	<0.000979 U	<0.000973 U	<0.000868 U	<0.000849 U	<0.000881 U
1h,1h,2h,2h-Perfluorohexanesulfonic Acid (4:2)	757124-72-4	NS	mg/kg	NA	<0.000882 U	NA	<0.00133 UJ	NA	<0.000979 U	<0.000973 U	<0.000868 U	<0.000849 U	<0.000881 U
3:3 FTCA	356-02-5	NS	mg/kg	NA	<0.0011 UJ	NA	<0.00166 UJ	NA	<0.00122 U	<0.00122 U	<0.00109 U	<0.00106 U	<0.0011 U
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	919005-14-4	NS	mg/kg	NA	<0.000882 U	NA	<0.00133 UJ	NA	<0.000979 U	<0.000973 U	<0.000868 U	<0.000849 U	<0.000881 U
5:3 FTCA	914637-49-3	NS	mg/kg	NA	<0.00551 UJ	NA	<0.00832 UJ	NA	<0.00612 U	<0.00608 U	<0.00543 U	<0.00531 U	<0.0055 U
7:3 FTCA	812-70-4	NS	mg/kg	NA	<0.00551 UJ	NA	<0.00832 UJ	NA	<0.00612 U	<0.00608 U	<0.00543 U	<0.00531 U	<0.0055 U
9-Chlorohexadecafluoro-3-Oxanonane-1-Sulfonic Acid	756426-58-1	NS	mg/kg	NA	<0.000882 U	NA	<0.00133 UJ	NA	<0.000979 U	<0.000973 U	<0.000868 U	<0.000849 U	<0.000881 U
N-ethyl perfluorooctane- sulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	NS	mg/kg	NA	<0.00022 U	NA	<0.000333 UJ	<0.000258 U	<0.000245 U	<0.000243 U	<0.000217 U	<0.000212 U	<0.00022 U
N-ethylperfluorooctane sulfonamide	4151-50-2	NS	mg/kg	NA	<0.00022 UJ	NA	<0.000333 UJ	NA	<0.000245 U	<0.000243 U	<0.000217 U	<0.000212 UJ	<0.00022 U
N-ethylperfluorooctane sulfonamidoe	1691-99-2	NS	mg/kg	NA	<0.0022 U	NA	<0.00333 UJ	NA	<0.00245 U	<0.00243 U	<0.00217 U	<0.00212 UJ	<0.0022 U
N-methyl perfluorooctane- sulfonamidoacetic Acid (NMeFOSAA)	2355-31-9	NS	mg/kg	NA	<0.00022 U	NA	<0.000333 UJ	<0.000258 U	<0.000245 U	<0.000243 U	<0.000217 U	<0.000212 U	<0.00022 U
N-methylperfluorooctane sulfonamide	31506-32-8	NS	mg/kg	NA	<0.00022 U	NA	<0.000372 U	NA	<0.000245 U	<0.000243 U	<0.000217 U	<0.000212 UJ	<0.00022 U
N-methylperfluorooctanesulfonamidol	24448-09-7	NS	mg/kg	NA	<0.0022 U	NA	<0.00333 UJ	NA	<0.00245 U	<0.00243 U	<0.00217 U	<0.00212 UJ	<0.0022 U
Nonafluoro-3,6-dioxaheptanoic acid	151772-58-6	NS	mg/kg	NA	<0.000441 U	NA	<0.000666 UJ	NA	<0.00049 U	<0.000486 U	<0.000434 U	<0.000425 U	<0.00044 U
Perfluoro(2-ethoxyethane)sulfonic acid	113507-82-7	NS	mg/kg	NA	<0.000441 U	NA	<0.000666 UJ	NA	<0.00049 U	<0.000486 U	<0.000434 U	<0.000425 U	<0.00044 U
Perfluoro-3-methoxypropanoic acid	377-73-1	NS	mg/kg	NA	<0.000441 U	NA	<0.000666 UJ	NA	<0.00049 U	<0.000486 U	<0.000434 U	<0.000425 U	<0.00044 U
Perfluoro-4-methoxybutanoic acid	863090-89-5	NS	mg/kg	NA	<0.000441 U	NA	<0.000666 UJ	NA	<0.00049 U	<0.000486 U	<0.000434 U	<0.000425 U	<0.00044 U
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	NS	mg/kg	NA	<0.00022 U	NA	<0.000333 UJ	<0.000258 U	<0.000245 U	<0.000243 U	<0.000217 U	<0.000212 U	<0.00022 U
Perfluorobutanoic acid (PFBA)	375-22-4	NS	mg/kg	NA	<0.000882 U	NA	<0.00133 UJ	<0.000258 U	<0.000979 U	<0.000973 U	<0.000868 U	<0.000849 U	<0.000881 U
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	NS	mg/kg	NA	<0.00022 U	NA	<0.000333 UJ	<0.000258 U	<0.000245 U	<0.000243 U	<0.000217 U	<0.000212 U	<0.00022 U
Perfluorodecanoic Acid (PFDA)	335-76-2	NS	mg/kg	NA	<0.00022 U	NA	<0.000333 UJ	<0.000258 U	<0.000245 U	<0.000243 U	<0.000217 U	<0.000212 U	<0.00022 U
Perfluorododecanesulfonic Acid (PFDOS)	79780-39-5	NS	mg/kg	NA	<0.00022 U	NA	<0.000333 UJ	NA	<0.000245 U	<0.000243 UJ	<0.000217 U	<0.000212 U	<0.00022 U
Perfluorododecanoic Acid (PFDoA)	307-55-1	NS	mg/kg	NA	<0.00022 U	NA	<0.000333 UJ	<0.000258 U	<0.000245 U	<0.000243 U	<0.000217 U	<0.000212 U	<0.00022 U
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	NS	mg/kg	NA	<0.00022 U	NA	<0.000333 UJ	<0.000258 U	<0.000245 U	<0.000243 U	<0.000217 U	<0.000212 U	<0.00022 U
Perfluoroheptanoic acid (PFHpA)	375-85-9	NS	mg/kg	NA	<0.00022 U	NA	<0.000333 UJ	<0.000258 U	<0.000245 U	<0.000243 U	<0.000217 U	<0.000212 U	<0.00022 U
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	NS	mg/kg	NA	<0.00022 U	NA	<0.000333 UJ	<0.000258 U	<0.000245 U	<0.000243 U	<0.000217 U	<0.000212 U	<0.00022 U
Perfluorohexanoic Acid (PFHxA)	307-24-4	NS	mg/kg	NA	<0.00022 U	NA	<0.000333 UJ	<0.000258 U	<0.000245 U	<0.000243 U	<0.000217 U	<0.000212 U	<0.00022 U
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	NS	mg/kg	NA	<0.00022 U	NA	<0.000333 UJ	NA	<0.000245 U	<0.000243 U	<0.000217 U	<0.000212 U	<0.00022 U
Perfluorononanoic Acid (PFNA)	375-95-1	NS	mg/kg	NA	<0.00022 U	NA	<0.000333 UJ	<0.000258 U	<0.000245 U	<0.000243 U	<0.000217 U	<0.000212 U	<0.00022 U
Perfluorooctanesulfonamide (FOSA)	754-91-6	NS	mg/kg	NA	<0.00022 U	NA	<0.000333 UJ	<0.000258 U	<0.000245 U	<0.000243 U	<0.000217 U	<0.000212 UJ	<0.00022 U
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	0.044	mg/kg	NA	<0.00022 U	NA	<0.000333 UJ	<0.000258 U	0.000265	<0.000243 U	<0.000217 U	0.000248 J	<0.00022 U
Perfluorooctanoic Acid (PFOA)	335-67-1	0.033	mg/kg	NA	<0.00022 U	NA	<0.000333 UJ	<0.000258 U	0.000354	<0.000243 U	<0.000217 U	<0.000212 U	<0.00022 U
Perfluoropentanesulfonic Acid	2706-91-4	NS	mg/kg	NA	<0.00022 U	NA	<0.000333 UJ	NA	<0.000245 U	<0.000243 U	<0.000217 U	<0.000212 U	<0.00022 U
Perfluoropentanoic Acid (PFPeA)	2706-90-3	NS	mg/kg	NA	<0.000441 U	NA	<0.000666 UJ	<0.000258 U	<0.00049 U	<0.000486 U	<0.000434 U	<0.000425 U	<0.00044 U
Perfluorotetradecanoic Acid (PFTA)	376-06-7	NS	mg/kg	NA	<0.00022 U	NA	<0.000333 UJ	<0.000258 U	<0.000245 U	<0.000243 U	<0.000217 U	<0.000212 U	<0.00022 U
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	NS	mg/kg	NA	<0.00022 U	NA	<0.000333 UJ	<0.000258 U	<0.000245 U	<0.000243 U	<0.000217 U	<0.000212 U	<0.00022 U
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	NS	mg/kg	NA	<0.00022 U	NA	<0.000333 UJ	<0.000258 U	<0.000245 U	<0.000243 U	<0.000217 U	<0.000212 U	<0.00022 U
Sodium 1H,1H,2H,2H-Perfluorodecane Sulfonate (8:2) (8:2FTS)	39108-34-4	NS	mg/kg	NA	<0.000882 U	NA	<0.00133 UJ	<0.000258 U	<0.000979 U	<0.000973 U	<0.000868 U	<0.000849 U	<0.000881 U
Sodium 1H,1H,2H,2H-Perfluorooctane Sulfonate (6:2) (6:2FTS)	27619-97-2	NS	mg/kg	NA	<0.000882 U	NA	<0.00133 UJ	<0.000258 U	<0.000979 U	<0.000973 U	<0.000868 U	<0.000849 U	<0.000881 U
Tetrafluoro-2- (heptafluoropropoxy) propanoic Acid	13252-13-6	NS	mg/kg	NA	<0.000882 U	NA	<0.00133 UJ	NA	<0.000979 U	<0.000973 U	<0.000868 U	<0.000849 U	<0.000881 U

Table 3
Site Management Plan
Remaining Soil Analytical Results

43-30 24th Street
Long Island City, Queens, New York
NYSDEC BCP Site No.: C241189
Langan Project No.: 170362702

Analyte	CAS Number	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs/Guidance Values	Location	EP26	EP27	EP28	EP29	EP29	EP30	EP30	EP31	EP32	EP33
			Sample Name	EP26_4.25	EP27_4.25	EP28_2.5	EP29_11.5	EP29_5	EP30_11.5	EP30_6	EP31_2.5	EP32_2.5	EP33_2.5
			Sample Date	11/30/2022	11/30/2022	12/08/2022	08/03/2022	02/28/2023	08/03/2022	02/16/2023	12/08/2022	12/08/2022	12/08/2022
			Sample Elevation	4.25	4.25	2.5	11.5	5	11.5	6	2.5	2.5	2.5
			Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Volatile Organic Compounds													
1,1,1-Trichloroethane	71-55-6	100	mg/kg	<0.0039 U	<0.0038 U	<0.004 U	NA	<0.0052 U	NA	NA	<0.0038 U	<0.0026 U	<0.0034 U
1,1-Dichloroethane	75-34-3	26	mg/kg	<0.0039 U	<0.0038 U	<0.004 U	NA	<0.0052 U	NA	NA	<0.0038 U	<0.0026 U	<0.0034 U
1,1-Dichloroethene	75-35-4	100	mg/kg	<0.0039 U	<0.0038 U	<0.004 U	NA	<0.0052 U	NA	NA	<0.0038 U	<0.0026 U	<0.0034 U
1,2,4-Trimethylbenzene	95-63-6	52	mg/kg	<0.0039 U	<0.0038 U	<0.004 U	NA	<0.0052 U	NA	NA	<0.0038 U	<0.0026 U	<0.0034 U
1,2-Dichlorobenzene	95-50-1	100	mg/kg	<0.0039 U	<0.0038 U	<0.004 U	NA	<0.0052 U	NA	NA	<0.0038 U	<0.0026 U	<0.0034 U
1,2-Dichloroethane	107-06-2	3.1	mg/kg	<0.0039 U	<0.0038 U	<0.004 U	NA	<0.0052 U	NA	NA	<0.0038 U	<0.0026 U	<0.0034 U
1,3,5-Trimethylbenzene (Mesitylene)	108-67-8	52	mg/kg	<0.0039 U	<0.0038 U	<0.004 U	NA	<0.0052 U	NA	NA	<0.0038 U	<0.0026 U	<0.0034 U
1,3-Dichlorobenzene	541-73-1	49	mg/kg	<0.0039 U	<0.0038 U	<0.004 U	NA	<0.0052 U	NA	NA	<0.0038 U	<0.0026 U	<0.0034 U
1,4-Dichlorobenzene	106-46-7	13	mg/kg	<0.0039 U	<0.0038 U	<0.004 U	NA	<0.0052 U	NA	NA	<0.0038 U	<0.0026 U	<0.0034 U
1,4-Dioxane (P-Dioxane)	123-91-1	13	mg/kg	<0.078 U	<0.076 U	<0.08 U	NA	<0.1 U	NA	NA	<0.076 U	<0.052 U	<0.068 U
Acetone	67-64-1	100	mg/kg	0.011	0.004 J	<0.008 U	NA	0.013	NA	NA	<0.0076 U	<0.0052 U	<0.0068 U
Benzene	71-43-2	4.8	mg/kg	<0.0039 U	<0.0038 U	<0.004 U	NA	<0.0052 U	NA	NA	<0.0038 U	<0.0026 U	<0.0034 U
Carbon Tetrachloride	56-23-5	2.4	mg/kg	<0.0039 U	<0.0038 U	<0.004 U	NA	<0.0052 U	NA	NA	<0.0038 U	<0.0026 U	<0.0034 U
Chlorobenzene	108-90-7	100	mg/kg	<0.0039 U	<0.0038 U	<0.004 U	NA	<0.0052 U	NA	NA	<0.0038 U	<0.0026 U	<0.0034 U
Chloroform	67-66-3	49	mg/kg	<0.0039 U	<0.0038 U	<0.004 U	NA	<0.0052 U	NA	NA	<0.0038 U	<0.0026 U	<0.0034 U
Cis-1,2-Dichloroethene	156-59-2	100	mg/kg	<0.0039 U	<0.0038 U	<0.004 U	NA	<0.0052 U	NA	NA	<0.0038 U	<0.0026 U	<0.0034 U
Ethylbenzene	100-41-4	41	mg/kg	<0.0039 U	<0.0038 U	<0.004 U	NA	<0.0052 U	NA	NA	<0.0038 U	<0.0026 U	<0.0034 U
M,P-Xylene	179601-23-1	NS	mg/kg	<0.0078 U	<0.0076 U	<0.008 U	NA	<0.01 U	NA	NA	<0.0076 U	<0.0052 U	<0.0068 U
Methyl Ethyl Ketone (2-Butanone)	78-93-3	100	mg/kg	<0.0039 U	<0.0038 U	<0.004 U	NA	<0.0052 U	NA	NA	<0.0038 U	<0.0026 U	<0.0034 U
Methylene Chloride	75-09-2	100	mg/kg	<0.0078 U	0.0039 J	<0.008 U	NA	<0.01 U	NA	NA	<0.0076 U	<0.0052 U	<0.0068 U
Naphthalene	91-20-3	100	mg/kg	0.011	<0.0076 U	<0.008 U	NA	<0.01 U	NA	NA	<0.0076 U	<0.0052 U	<0.0068 U
n-Butylbenzene	104-51-8	100	mg/kg	<0.0039 U	<0.0038 U	<0.004 U	NA	<0.0052 U	NA	NA	<0.0038 U	<0.0026 U	<0.0034 U
n-Propylbenzene	103-65-1	100	mg/kg	<0.0039 U	<0.0038 U	<0.004 U	NA	<0.0052 U	NA	NA	<0.0038 U	<0.0026 U	<0.0034 U
o-Xylene (1,2-Dimethylbenzene)	95-47-6	NS	mg/kg	<0.0039 U	<0.0038 U	<0.004 U	NA	<0.0052 U	NA	NA	<0.0038 U	<0.0026 U	<0.0034 U
Sec-Butylbenzene	135-98-8	100	mg/kg	<0.0039 U	<0.0038 U	<0.004 U	NA	<0.0052 U	NA	NA	<0.0038 U	<0.0026 U	<0.0034 U
T-Butylbenzene	98-06-6	100	mg/kg	<0.0039 U	<0.0038 U	<0.004 U	NA	<0.0052 U	NA	NA	<0.0038 U	<0.0026 U	<0.0034 U
Tert-Butyl Methyl Ether	1634-04-4	100	mg/kg	<0.0039 U	<0.0038 U	<0.004 U	NA	<0.0052 U	NA	NA	<0.0038 U	<0.0026 U	<0.0034 U
Tetrachloroethene (PCE)	127-18-4	19	mg/kg	<0.0039 U	<0.0038 U	<0.004 U	NA	<0.0052 U	NA	NA	<0.0038 U	<0.0026 U	<0.0034 U
Toluene	108-88-3	100	mg/kg	<0.0039 U	<0.0038 U	<0.004 U	NA	<0.0052 U	NA	NA	<0.0038 U	<0.0026 U	<0.0034 U
Total Xylenes	1330-20-7	100	mg/kg	<0.012 U	<0.011 U	<0.012 U	NA	<0.016 U	NA	NA	<0.011 U	<0.0079 U	<0.01 U
Trans-1,2-Dichloroethene	156-60-5	100	mg/kg	<0.0039 U	<0.0038 U	<0.004 U	NA	<0.0052 U	NA	NA	<0.0038 U	<0.0026 U	<0.0034 U
Trichloroethene (TCE)	79-01-6	21	mg/kg	<0.0039 U	<0.0038 U	<0.004 U	NA	<0.0052 U	NA	NA	<0.0038 U	<0.0026 U	<0.0034 U
Vinyl Chloride	75-01-4	0.9	mg/kg	<0.0039 U	<0.0038 U	<0.004 U	NA	<0.0052 U	NA	NA	<0.0038 U	<0.0026 U	<0.0034 U
Semi-Volatile Organic Compounds													
1,4-Dioxane (P-Dioxane)	123-91-1	13	mg/kg	<0.0196 U	<0.0196 U	<0.02 U	NA	<0.0198 U	NA	NA	<0.02 U	<0.02 U	<0.0196 U
2-Methylphenol (o-Cresol)	95-48-7	100	mg/kg	<0.0967 U	<0.0926 U	<0.0953 U	<0.0474 U	<0.087 U	<0.0466 U	<0.0902 U	<0.0914 U	<0.092 U	<0.0982 U
3 & 4 Methylphenol (m&p Cresol)	65794-96-9	100	mg/kg	<0.0967 U	<0.0926 U	<0.0953 U	<0.0474 U	<0.087 U	<0.0466 U	<0.0902 U	<0.0914 U	<0.092 U	<0.0982 U
Acenaphthene	83-32-9	100	mg/kg	<0.0967 U	0.0548 JD	<0.0953 U	0.0544 JD	<0.087 U	0.102 D	<0.0902 U	<0.0914 U	<0.092 U	<0.0982 U
Acenaphthylene	208-96-8	100	mg/kg	<0.0967 U	<0.0926 U	<0.0953 U	0.0696 JD	<0.087 U	0.177 D	<0.0902 U	<0.0914 U	<0.092 U	<0.0982 U
Anthracene	120-12-7	100	mg/kg	<0.0967 U	<0.0926 U	0.155 D	0.249 D	<0.087 U	0.423 D	<0.0902 U	<0.0914 U	<0.092 U	<0.0982 U
Benzo(a)anthracene	56-55-3	**1**	mg/kg	0.204 D	<0.0926 U	0.303 D	0.354 D	<0.087 U	0.867 D	0.0591 JD	<0.0914 U	<0.092 U	<0.0982 U
Benzo(a)pyrene	50-32-8	**1**	mg/kg	0.155 D	<0.0926 U	0.427 D	0.375 D	<0.087 U	0.882 D	<0.0902 U	<0.0914 U	<0.092 U	<0.0982 U
Benzo(b)fluoranthene	205-99-2	**1**	mg/kg	0.128 D	<0.0926 U	0.355 D	0.299 D	<0.087 U	0.678 D	<0.0902 U	<0.0914 U	<0.092 U	<0.0982 U
Benzo(g,h,i)Perylene	191-24-2	100	mg/kg	0.0951 JD	<0.0926 U	0.345 D	0.215 D	<0.087 U	0.416 D	<0.0902 U	<0.0914 U	<0.092 U	<0.0982 U
Benzo(k)fluoranthene	207-08-9	**3.9**	mg/kg	0.146 D	<0.0926 U	0.267 D	0.315 D	<0.087 U	0.748 D	<0.0902 U	<0.0914 U	<0.092 U	<0.0982 U
Chrysene	218-01-9	**3.9**	mg/kg	0.18 D	<0.0926 U	0.27 D	0.346 D	<0.087 U	0.808 D	0.0555 JD	<0.0914 U	<0.092 U	<0.0982 U
Dibenz(a,h)anthracene	53-70-3	**0.33**	mg/kg	<0.0967 U	<0.0926 U	0.104 D	0.0696 JD	<0.087 U	0.146 D	<0.0902 U	<0.0914 U	<0.092 U	<0.0982 U
Dibenzofuran	132-64-9	59	mg/kg	<0.0967 U	0.0526 JD	0.0503 JD	0.0522 JD	<0.087 U	0.072 JD	<0.0902 U	<0.0914 U	<0.092 U	<0.0982 U
Fluoranthene	206-44-0	100	mg/kg	0.234 D	0.177 D	0.58 D	0.744 D	<0.087 U	1.93 D	0.168 D	<0.0914 U	<0.092 U	<0.0982 U
Fluorene	86-73-7	100	mg/kg	<0.0967 U	0.0874 JD	0.0693 JD	0.0749 JD	<0.087 U	0.108 D	<0.0902 U	<0.0914 U	<0.092 U	<0.0982 U
Hexachlorobenzene	118-74-1	1.2	mg/kg	<0.0967 U	<0.0926 U	<0.0953 U	<0.0474 U	<0.087 U	<0.0466 U	<0.0902 U	<0.0914 U	<0.092 U	<0.0982 U
Indeno(1,2,3-cd)pyrene	193-39-5	**0.5**	mg/kg	0.105 D	<0.0926 U	0.391 D	0.163 D	<0.087 U	0.383 D	<0.0902 U	<0.0914 U	<0.092 U	<0.0982 U
Naphthalene	91-20-3	100	mg/kg	<0.0967 U	<0.0926 U	0.0701 JD	0.0635 JD	<0.087 U	<0.0466 U	<0.0902 U	<0.0914 U	<0.092 U	<0.0982 U
Pentachlorophenol	87-86-5	6.7	mg/kg	<0.0967 U	<0.0926 U	<0.0953 U	<0.0474 U	<0.087 U	<0.0466 U	<0.0902 U	<0.0914 U	<0.092 U	<0.0982 U
Phenanthrene	85-01-8	100	mg/kg	0.0696 JD	0.253 D	0.554 D	0.519 D	<0.087 U	1.34 D	0.117 D	<0.0914 U	<0.092 U	<0.0982 U
Phenol	108-95-2	100	mg/kg	<0.0967 U	<0.0926 U	<0.0953 U	<0.0474 U	<0.087 U	<0.0466 U	<0.0902 U	<0.0914 U	<0.092 U	<0.0982 U
Pyrene	129-00-0	100	mg/kg	0.21 D	0.123 D	0.495 D	0.59 D	<0.087 U	1.45 D	0.117 D	<0.0914 U	<0.092 U	<0.0982 U

Table 3
Site Management Plan
Remaining Soil Analytical Results

43-30 24th Street
Long Island City, Queens, New York
NYSDEC BCP Site No.: C241189
Langan Project No.: 170362702

Analyte	CAS Number	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs/Guidance Values	Location	EP26	EP27	EP28	EP29	EP29	EP30	EP30	EP31	EP32	EP33
			Sample Name	EP26_4.25	EP27_4.25	EP28_2.5	EP29_11.5	EP29_5	EP30_11.5	EP30_6	EP31_2.5	EP32_2.5	EP33_2.5
			Sample Date	11/30/2022	11/30/2022	12/08/2022	08/03/2022	02/28/2023	08/03/2022	02/16/2023	12/08/2022	12/08/2022	12/08/2022
			Sample Elevation	4.25	4.25	2.5	11.5	5	11.5	6	2.5	2.5	2.5
			Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Pesticides													
4,4'-DDD	72-54-8	13	mg/kg	<0.00164 U	<0.00164 U	<0.00163 U	NA	<0.00163 U	NA	NA	<0.00161 U	<0.00164 U	<0.00163 U
4,4'-DDE	72-55-9	8.9	mg/kg	<0.00164 U	<0.00164 U	<0.00163 U	NA	<0.00163 U	NA	NA	<0.00161 U	<0.00164 U	<0.00163 U
4,4'-DDT	50-29-3	7.9	mg/kg	<0.00164 U	<0.00164 U	<0.00163 U	NA	<0.00163 U	NA	NA	<0.00161 U	<0.00164 U	<0.00163 U
Aldrin	309-00-2	0.097	mg/kg	<0.00164 U	<0.00164 U	<0.00163 U	NA	<0.00163 U	NA	NA	<0.00161 U	<0.00164 U	<0.00163 U
Alpha BHC (Alpha Hexachlorocyclohexane)	319-84-6	0.48	mg/kg	<0.00164 U	<0.00164 U	<0.00163 U	NA	<0.00163 U	NA	NA	<0.00161 U	<0.00164 U	<0.00163 U
Alpha Chlordane	5103-71-9	4.2	mg/kg	<0.00164 U	<0.00164 U	<0.00163 U	NA	<0.00163 U	NA	NA	<0.00161 U	<0.00164 U	<0.00163 U
Alpha Endosulfan	959-98-8	24	mg/kg	<0.00164 U	<0.00164 U	<0.00163 U	NA	<0.00163 U	NA	NA	<0.00161 U	<0.00164 U	<0.00163 U
Beta Bhc (Beta Hexachlorocyclohexane)	319-85-7	0.36	mg/kg	<0.00164 U	<0.00164 U	<0.00163 U	NA	<0.00163 U	NA	NA	<0.00161 U	<0.00164 U	<0.00163 U
Beta Endosulfan	33213-65-9	24	mg/kg	<0.00164 U	<0.00164 U	<0.00163 U	NA	<0.00163 U	NA	NA	<0.00161 U	<0.00164 U	<0.00163 U
Delta Bhc (Delta Hexachlorocyclohexane)	319-86-8	100	mg/kg	<0.00164 U	<0.00164 U	<0.00163 U	NA	<0.00163 U	NA	NA	<0.00161 U	<0.00164 U	<0.00163 U
Dieldrin	60-57-1	0.2	mg/kg	<0.00164 U	<0.00164 U	<0.00163 U	NA	<0.00163 U	NA	NA	<0.00161 U	<0.00164 U	<0.00163 U
Endosulfan Sulfate	1031-07-8	24	mg/kg	<0.00164 U	<0.00164 U	<0.00163 U	NA	<0.00163 U	NA	NA	<0.00161 U	<0.00164 U	<0.00163 U
Endrin	72-20-8	11	mg/kg	<0.00164 U	<0.00164 U	<0.00163 U	NA	<0.00163 U	NA	NA	<0.00161 U	<0.00164 U	<0.00163 U
Gamma Bhc (Lindane)	58-89-9	1.3	mg/kg	<0.00164 U	<0.00164 U	<0.00163 U	NA	<0.00163 U	NA	NA	<0.00161 U	<0.00164 U	<0.00163 U
Heptachlor	76-44-8	2.1	mg/kg	<0.00164 U	<0.00164 U	<0.00163 U	NA	<0.00163 U	NA	NA	<0.00161 U	<0.00164 U	<0.00163 U
Herbicides													
Silvex (2,4,5-Tp)	93-72-1	100	mg/kg	<0.023 U	<0.0225 U	<0.0225 U	NA	<0.0207 U	NA	NA	<0.0221 U	<0.0219 U	<0.0234 U
Polychlorinated Biphenyl													
PCB-1016 (Aroclor 1016)	12674-11-2	NS	mg/kg	<0.0194 U	<0.0189 U	<0.0189 U	NA	<0.0172 U	NA	NA	<0.0183 U	<0.0186 U	<0.0194 U
PCB-1221 (Aroclor 1221)	11104-28-2	NS	mg/kg	<0.0194 U	<0.0189 U	<0.0189 U	NA	<0.0172 U	NA	NA	<0.0183 U	<0.0186 U	<0.0194 U
PCB-1232 (Aroclor 1232)	11141-16-5	NS	mg/kg	<0.0194 U	<0.0189 U	<0.0189 U	NA	<0.0172 U	NA	NA	<0.0183 U	<0.0186 U	<0.0194 U
PCB-1242 (Aroclor 1242)	53469-21-9	NS	mg/kg	<0.0194 U	<0.0189 U	<0.0189 U	NA	<0.0172 U	NA	NA	<0.0183 U	<0.0186 U	<0.0194 U
PCB-1248 (Aroclor 1248)	12672-29-6	NS	mg/kg	<0.0194 U	<0.0189 U	<0.0189 U	NA	<0.0172 U	NA	NA	<0.0183 U	<0.0186 U	<0.0194 U
PCB-1254 (Aroclor 1254)	11097-69-1	NS	mg/kg	<0.0194 U	<0.0189 U	<0.0189 U	NA	<0.0172 U	NA	NA	<0.0183 U	<0.0186 U	<0.0194 U
PCB-1260 (Aroclor 1260)	11096-82-5	NS	mg/kg	<0.0194 U	<0.0189 U	<0.0189 U	NA	<0.0172 U	NA	NA	<0.0183 U	<0.0186 U	<0.0194 U
Total PCBs	1336-36-3	1	mg/kg	<0.0194 U	<0.0189 U	<0.0189 U	NA	<0.0172 U	NA	NA	<0.0183 U	<0.0186 U	<0.0194 U
Metals													
Arsenic	7440-38-2	16	mg/kg	2.19	<1.43 U	5.28	6.2	<1.31 U	8.06	1.77	<1.41 U	1.65	1.69
Barium	7440-39-3	400	mg/kg	48.7	49.5	22.5	117	25.1	165	64.3	29.7	33.8	29.1
Beryllium	7440-41-7	72	mg/kg	0.241	0.535	0.357	<0.058 U	0.4	<0.057 U	0.395	0.353	0.441	0.368
Cadmium	7440-43-9	**4.3**	mg/kg	<0.293 U	<0.286 U	<0.287 U	1.47	<0.262 U	1.11	0.282	0.302	<0.28 U	<0.295 U
Chromium, Hexavalent	18540-29-9	110	mg/kg	<0.586 U	<0.572 U	<0.573 U	NA	<0.524 U	NA	<0.555 U	<0.563 U	<0.559 U	<0.591 U
Chromium, Total	7440-47-3	NS	mg/kg	11.3	12.5	9.5	18.5 B	9.24	25.7 B	14.9	8.24	10.7	8.67
Chromium, Trivalent	16065-83-1	180	mg/kg	11.3	12.5	9.5	NA	9.24	NA	14.9	8.24	10.7	8.67
Copper	7440-50-8	**270**	mg/kg	17.1	15.7 J	14.1	**421**	8.08	**461**	34.8	10.3	12.8	11.1
Cyanide	57-12-5	27	mg/kg	<0.586 U	<0.572 U	0.814	NA	NA	NA	NA	<0.563 U	<0.559 U	<0.591 U
Lead	7439-92-1	**400**	mg/kg	20.7	11	16.1	210	9.85 J	340	30.4	6.6	7.1	9.27 J
Manganese	7439-96-5	2000	mg/kg	579	129	83.5	349	263	368	590	53.1	99.5	108 J
Mercury	7439-97-6	**0.81**	mg/kg	<0.0351 U	<0.0343 U	<0.0344 U	**1.17**	<0.0314 U	0.4	<0.0333 U	<0.0338 U	<0.0336 U	<0.0355 U
Nickel	7440-02-0	310	mg/kg	8.64	14	8.68	24.7 J	7.57	28 J	14.4	8.65	8.71	8.04
Selenium	7782-49-2	180	mg/kg	<2.44 U	<2.38 U	<2.39 U	<2.91 U	<2.18 UJ	<2.84 U	<2.31 U	<2.34 U	<2.33 U	<2.46 UJ
Silver	7440-22-4	180	mg/kg	<0.492 U	<0.481 U	<0.482 U	<0.583 U	<0.44 UJ	<0.568 U	<0.466 U	<0.473 U	<0.47 U	<0.496 UJ
Zinc	7440-66-6	**10000**	mg/kg	49.9	35.6	29.9	630	22.1	614	61.3	86.7	61.7	40.9
General Chemistry													
Cyanide	57-12-5	27	mg/kg	NA	NA	NA	NA	<0.524 U	NA	<0.555 U	NA	NA	NA
Solids, Percent	SOLID	NS	Percent	85.4	87.4	87.2	87.3	95.5	89.5	90.1	88.9	89.4	84.6

Table 3
Site Management Plan
Remaining Soil Analytical Results

43-30 24th Street
Long Island City, Queens, New York
NYSDEC BCP Site No.: C241189
Langan Project No.: 170362702

Analyte	CAS Number	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs/Guidance Values	Location	EP26	EP27	EP28	EP29	EP29	EP30	EP30	EP31	EP32	EP33
			Sample Name	EP26_4.25	EP27_4.25	EP28_2.5	EP29_11.5	EP29_5	EP30_11.5	EP30_6	EP31_2.5	EP32_2.5	EP33_2.5
			Sample Date	11/30/2022	11/30/2022	12/08/2022	08/03/2022	02/28/2023	08/03/2022	02/16/2023	12/08/2022	12/08/2022	12/08/2022
			Sample Elevation	4.25	4.25	2.5	11.5	5	11.5	6	2.5	2.5	2.5
			Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Perfluorooctanoic acids													
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid	763051-92-9	NS	mg/kg	<0.000916 U	<0.000902 U	<0.000906 U	NA	<0.000837 U	NA	NA	<0.000914 U	<0.00088 U	<0.000876 U
1h,1h,2h,2h-Perfluorohexanesulfonic Acid (4:2)	757124-72-4	NS	mg/kg	<0.000916 U	<0.000902 U	<0.000906 U	NA	<0.00083 U	NA	NA	<0.000914 U	<0.00088 U	<0.000876 U
3:3 FTCA	356-02-5	NS	mg/kg	<0.00114 U	<0.00113 U	<0.00113 U	NA	<0.00111 U	NA	NA	<0.00114 U	<0.0011 U	<0.00109 U
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	919005-14-4	NS	mg/kg	<0.000916 U	<0.000902 U	<0.000906 U	NA	<0.000837 U	NA	NA	<0.000914 U	<0.00088 U	<0.000876 U
5:3 FTCA	914637-49-3	NS	mg/kg	<0.00572 U	<0.00563 U	<0.00566 U	NA	<0.00554 U	NA	NA	<0.00571 U	<0.0055 U	<0.00547 U
7:3 FTCA	812-70-4	NS	mg/kg	<0.00572 U	<0.00563 U	<0.00566 U	NA	<0.00554 U	NA	NA	<0.00571 U	<0.0055 U	<0.00547 U
9-Chlorohexadecafluoro-3-Oxanonane-1-Sulfonic Acid	756426-58-1	NS	mg/kg	<0.000916 U	<0.000902 U	<0.000906 U	NA	<0.000828 U	NA	NA	<0.000914 U	<0.00088 U	<0.000876 U
N-ethyl perfluorooctane- sulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	NS	mg/kg	<0.000229 U	<0.000225 U	<0.000226 U	NA	<0.000221 U	NA	NA	<0.000229 U	<0.00022 U	<0.000219 U
N-ethylperfluorooctane sulfonamide	4151-50-2	NS	mg/kg	<0.000229 U	<0.000225 U	<0.000226 U	NA	<0.000221 U	NA	NA	<0.000229 U	<0.00022 U	<0.000219 U
N-ethylperfluorooctane sulfonamidoe	1691-99-2	NS	mg/kg	<0.00229 U	<0.00225 U	<0.00226 U	NA	<0.00221 U	NA	NA	<0.00229 U	<0.0022 U	<0.00219 U
N-methyl perfluorooctane- sulfonamidoacetic Acid (NMeFOSAA)	2355-31-9	NS	mg/kg	<0.000229 U	<0.000225 U	<0.000226 U	NA	<0.000221 U	NA	NA	<0.000229 U	<0.00022 U	<0.000219 U
N-methylperfluorooctane sulfonamide	31506-32-8	NS	mg/kg	<0.000229 U	<0.000225 U	<0.000226 U	NA	<0.000221 U	NA	NA	<0.000229 U	<0.00022 U	<0.000219 U
N-methylperfluorooctanesulfonamidol	24448-09-7	NS	mg/kg	<0.00229 U	<0.00225 U	<0.00226 U	NA	<0.00221 U	NA	NA	<0.00229 U	<0.0022 U	<0.00219 U
Nonafluoro-3,6-dioxaheptanoic acid	151772-58-6	NS	mg/kg	<0.000458 U	<0.000451 U	<0.000453 U	NA	<0.000443 U	NA	NA	<0.000457 U	<0.00044 U	<0.000438 U
Perfluoro(2-ethoxyethane)sulfonic acid	113507-82-7	NS	mg/kg	<0.000458 U	<0.000451 U	<0.000453 U	NA	<0.000394 U	NA	NA	<0.000457 U	<0.00044 U	<0.000438 U
Perfluoro-3-methoxypropanoic acid	377-73-1	NS	mg/kg	<0.000458 U	<0.000451 U	<0.000453 U	NA	<0.000443 U	NA	NA	<0.000457 U	<0.00044 U	<0.000438 U
Perfluoro-4-methoxybutanoic acid	863090-89-5	NS	mg/kg	<0.000458 U	<0.000451 U	<0.000453 U	NA	<0.000443 U	NA	NA	<0.000457 U	<0.00044 U	<0.000438 U
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	NS	mg/kg	<0.000229 U	<0.000225 U	<0.000226 U	NA	<0.000196 U	NA	NA	<0.000229 U	<0.00022 U	<0.000219 U
Perfluorobutanoic acid (PFBA)	375-22-4	NS	mg/kg	<0.000916 U	<0.000902 U	<0.000906 U	NA	<0.000886 U	NA	NA	<0.000914 U	<0.00088 U	<0.000876 U
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	NS	mg/kg	<0.000229 U	<0.000225 U	<0.000226 U	NA	<0.000214 U	NA	NA	<0.000229 U	<0.00022 U	<0.000219 U
Perfluorodecanoic Acid (PFDA)	335-76-2	NS	mg/kg	<0.000229 U	<0.000225 U	<0.000226 U	NA	<0.000221 U	NA	NA	<0.000229 U	<0.00022 U	<0.000219 U
Perfluorododecanesulfonic Acid (PFDOS)	79780-39-5	NS	mg/kg	<0.000229 U	<0.000225 U	<0.000226 U	NA	<0.000215 U	NA	NA	<0.000229 U	<0.00022 U	<0.000219 U
Perfluorododecanoic Acid (PFDoA)	307-55-1	NS	mg/kg	<0.000229 U	<0.000225 U	<0.000226 U	NA	<0.000221 U	NA	NA	<0.000229 U	<0.00022 U	<0.000219 U
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	NS	mg/kg	<0.000229 U	<0.000225 U	<0.000226 U	NA	<0.000221 U	NA	NA	<0.000229 U	<0.00022 U	<0.000219 U
Perfluoroheptanoic acid (PFHpA)	375-85-9	NS	mg/kg	<0.000229 U	<0.000225 U	<0.000226 U	NA	<0.000221 U	NA	NA	<0.000229 U	<0.00022 U	<0.000219 U
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	NS	mg/kg	<0.000229 U	<0.000225 U	<0.000226 U	NA	<0.000203 U	NA	NA	<0.000229 U	<0.00022 U	<0.000219 U
Perfluorohexanoic Acid (PFHxA)	307-24-4	NS	mg/kg	<0.000229 U	<0.000225 U	<0.000226 U	NA	<0.000221 U	NA	NA	<0.000229 U	<0.00022 U	<0.000219 U
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	NS	mg/kg	<0.000229 U	<0.000225 U	<0.000226 U	NA	<0.000213 U	NA	NA	<0.000229 U	<0.00022 U	<0.000219 U
Perfluorononanoic Acid (PFNA)	375-95-1	NS	mg/kg	<0.000229 U	<0.000225 U	<0.000226 U	NA	<0.000221 U	NA	NA	<0.000229 U	<0.00022 U	<0.000219 U
Perfluorooctanesulfonamide (FOSA)	754-91-6	NS	mg/kg	<0.000229 U	<0.000225 U	<0.000226 U	NA	<0.000221 U	NA	NA	<0.000229 U	<0.00022 U	<0.000219 U
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	0.044	mg/kg	<0.000229 U	<0.000225 U	<0.000226 U	NA	<0.000206 U	NA	NA	<0.000229 U	<0.00022 U	<0.000219 U
Perfluorooctanoic Acid (PFOA)	335-67-1	0.033	mg/kg	<0.000229 U	<0.000225 U	<0.000226 U	NA	<0.000221 U	NA	NA	<0.000229 U	<0.00022 U	<0.000219 U
Perfluoropentanesulfonic Acid	2706-91-4	NS	mg/kg	<0.000229 U	<0.000225 U	<0.000226 U	NA	<0.000208 U	NA	NA	<0.000229 U	<0.00022 U	<0.000219 U
Perfluoropentanoic Acid (PFPeA)	2706-90-3	NS	mg/kg	<0.000458 U	<0.000451 U	<0.000453 U	NA	<0.000443 U	NA	NA	<0.000457 U	<0.00044 U	<0.000438 U
Perfluorotetradecanoic Acid (PFTA)	376-06-7	NS	mg/kg	<0.000229 U	<0.000225 U	<0.000226 U	NA	<0.000221 U	NA	NA	<0.000229 U	<0.00022 U	<0.000219 U
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	NS	mg/kg	<0.000229 U	<0.000225 U	<0.000226 U	NA	<0.000221 U	NA	NA	<0.000229 U	<0.00022 U	<0.000219 U
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	NS	mg/kg	<0.000229 U	<0.000225 U	<0.000226 U	NA	<0.000221 U	NA	NA	<0.000229 U	<0.00022 U	<0.000219 U
Sodium 1H,1H,2H,2H-Perfluorodecane Sulfonate (8:2) (8:2FTS)	39108-34-4	NS	mg/kg	<0.000916 U	<0.000902 U	<0.000906 U	NA	<0.00085 U	NA	NA	<0.000914 U	<0.00088 UJ	<0.000876 U
Sodium 1H,1H,2H,2H-Perfluorooctane Sulfonate (6:2) (6:2FTS)	27619-97-2	NS	mg/kg	<0.000916 U	<0.000902 U	<0.000906 U	NA	<0.000841 U	NA	NA	<0.000914 U	<0.00088 U	<0.000876 U
Tetrafluoro-2- (heptafluoropropoxy) propanoic Acid	13252-13-6	NS	mg/kg	<0.000916 U	<0.000902 U	<0.000906 U	NA	<0.000886 U	NA	NA	<0.000914 U	<0.00088 U	<0.000876 U

Table 3
Site Management Plan
Remaining Soil Analytical Results

43-30 24th Street
Long Island City, Queens, New York
NYSDEC BCP Site No.: C241189
Langan Project No.: 170362702

Analyte	CAS Number	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs/Guidance Values	Location	EP34	EP35	EP36	EP36	EP37	EP38
			Sample Name	EP34_3	EP35_3	EP36_3_102822	EP36_3_111822	EP37_1.4	EP38_1.4
			Sample Date	10/28/2022	10/28/2022	10/28/2022	11/18/2022	10/10/2022	10/10/2022
			Sample Elevation	3	3	3	3	1.4	1.4
			Unit	Result	Result	Result	Result	Result	Result
Volatile Organic Compounds									
1,1,1-Trichloroethane	71-55-6	100	mg/kg	<0.0052 U	<0.0039 U	<0.0036 U	<0.0043 U	<0.0052 U	<0.0046 U
1,1-Dichloroethane	75-34-3	26	mg/kg	<0.0052 U	<0.0039 U	<0.0036 U	<0.0043 U	<0.0052 U	<0.0046 U
1,1-Dichloroethene	75-35-4	100	mg/kg	<0.0052 U	<0.0039 U	<0.0036 U	<0.0043 U	<0.0052 U	<0.0046 U
1,2,4-Trimethylbenzene	95-63-6	52	mg/kg	<0.0052 U	<0.0039 U	<0.0036 U	<0.0043 U	<0.0052 U	<0.0046 U
1,2-Dichlorobenzene	95-50-1	100	mg/kg	<0.0052 U	<0.0039 U	<0.0036 U	<0.0043 U	<0.0052 U	<0.0046 U
1,2-Dichloroethane	107-06-2	3.1	mg/kg	<0.0052 U	<0.0039 U	<0.0036 U	<0.0043 U	<0.0052 U	<0.0046 U
1,3,5-Trimethylbenzene (Mesitylene)	108-67-8	52	mg/kg	<0.0052 U	<0.0039 U	<0.0036 U	<0.0043 U	<0.0052 U	<0.0046 U
1,3-Dichlorobenzene	541-73-1	49	mg/kg	<0.0052 U	<0.0039 U	<0.0036 U	<0.0043 U	<0.0052 U	<0.0046 U
1,4-Dichlorobenzene	106-46-7	13	mg/kg	<0.0052 U	<0.0039 U	<0.0036 U	<0.0043 U	<0.0052 U	<0.0046 U
1,4-Dioxane (P-Dioxane)	123-91-1	13	mg/kg	<0.1 U	<0.077 U	<0.072 U	<0.085 U	<0.1 U	<0.093 U
Acetone	67-64-1	100	mg/kg	<0.01 U	0.021 J	0.011 J	<0.0085 U	<0.01 U	0.0074 J
Benzene	71-43-2	4.8	mg/kg	<0.0052 U	<0.0039 U	<0.0036 U	<0.0043 U	<0.0052 U	<0.0046 U
Carbon Tetrachloride	56-23-5	2.4	mg/kg	<0.0052 U	<0.0039 U	<0.0036 U	<0.0043 U	<0.0052 U	<0.0046 U
Chlorobenzene	108-90-7	100	mg/kg	<0.0052 U	<0.0039 U	<0.0036 U	<0.0043 U	<0.0052 U	<0.0046 U
Chloroform	67-66-3	49	mg/kg	<0.0052 U	<0.0039 U	<0.0036 U	<0.0043 U	<0.0052 U	<0.0046 U
Cis-1,2-Dichloroethene	156-59-2	100	mg/kg	<0.0052 U	<0.0039 U	<0.0036 U	<0.0043 U	<0.0052 U	<0.0046 U
Ethylbenzene	100-41-4	41	mg/kg	<0.0052 U	<0.0039 U	<0.0036 U	<0.0043 U	<0.0052 U	<0.0046 U
M,P-Xylene	179601-23-1	NS	mg/kg	<0.01 U	<0.0077 U	<0.0072 U	<0.0085 U	<0.01 U	<0.0093 U
Methyl Ethyl Ketone (2-Butanone)	78-93-3	100	mg/kg	<0.0052 U	<0.0039 U	<0.0036 U	<0.0043 U	<0.0052 U	<0.0046 U
Methylene Chloride	75-09-2	100	mg/kg	<0.01 U	<0.0077 U	<0.0072 U	<0.0085 U	<0.01 U	0.014
Naphthalene	91-20-3	100	mg/kg	<0.01 U	<0.0077 U	<0.0072 U	<0.0085 U	<0.01 U	<0.0093 U
n-Butylbenzene	104-51-8	100	mg/kg	<0.0052 U	<0.0039 U	<0.0036 U	<0.0043 U	<0.0052 U	<0.0046 U
n-Propylbenzene	103-65-1	100	mg/kg	<0.0052 U	<0.0039 U	<0.0036 U	<0.0043 U	<0.0052 U	<0.0046 U
o-Xylene (1,2-Dimethylbenzene)	95-47-6	NS	mg/kg	<0.0052 U	<0.0039 U	<0.0036 U	<0.0043 U	<0.0052 U	<0.0046 U
Sec-Butylbenzene	135-98-8	100	mg/kg	<0.0052 U	<0.0039 U	<0.0036 U	<0.0043 U	<0.0052 U	<0.0046 U
T-Butylbenzene	98-06-6	100	mg/kg	<0.0052 U	<0.0039 U	<0.0036 U	<0.0043 U	<0.0052 U	<0.0046 U
Tert-Butyl Methyl Ether	1634-04-4	100	mg/kg	<0.0052 U	<0.0039 U	<0.0036 U	<0.0043 U	<0.0052 U	<0.0046 U
Tetrachloroethene (PCE)	127-18-4	19	mg/kg	<0.0052 U	<0.0039 U	<0.0036 U	<0.0043 U	<0.0052 U	<0.0046 U
Toluene	108-88-3	100	mg/kg	<0.0052 U	<0.0039 U	<0.0036 U	<0.0043 U	<0.0052 U	<0.0046 U
Total Xylenes	1330-20-7	100	mg/kg	<0.015 U	<0.012 U	<0.011 U	<0.013 U	<0.016 U	<0.014 U
Trans-1,2-Dichloroethene	156-60-5	100	mg/kg	<0.0052 U	<0.0039 U	<0.0036 U	<0.0043 U	<0.0052 U	<0.0046 U
Trichloroethene (TCE)	79-01-6	21	mg/kg	<0.0052 U	<0.0039 U	<0.0036 U	<0.0043 U	<0.0052 U	<0.0046 U
Vinyl Chloride	75-01-4	0.9	mg/kg	<0.0052 U	<0.0039 U	<0.0036 U	<0.0043 U	<0.0052 U	<0.0046 U
Semi-Volatile Organic Compounds									
1,4-Dioxane (P-Dioxane)	123-91-1	13	mg/kg	<0.0198 U	<0.0183 U	<0.019 U	<0.0185 U	NA	NA
2-Methylphenol (o-Cresol)	95-48-7	100	mg/kg	<0.0901 U	<0.0933 U	<0.0903 U	<0.103 U	<0.0934 U	<0.2 U
3 & 4 Methylphenol (m&p Cresol)	65794-96-9	100	mg/kg	<0.0901 U	<0.0933 U	<0.0903 U	<0.103 U	<0.0934 U	<0.2 U
Acenaphthene	83-32-9	100	mg/kg	<0.0901 U	<0.0933 U	0.0599 JD	<0.103 U	<0.0934 U	<0.2 U
Acenaphthylene	208-96-8	100	mg/kg	<0.0901 U	<0.0933 U	1.28 D	<0.103 U	<0.0934 U	<0.2 U
Anthracene	120-12-7	100	mg/kg	0.0497 JD	<0.0933 U	0.569 D	<0.103 U	<0.0934 U	<0.2 U
Benzo(a)anthracene	56-55-3	**1**	mg/kg	0.194 D	<0.0933 U	**5.37 D**	<0.103 U	<0.0934 U	<0.2 U
Benzo(a)pyrene	50-32-8	**1**	mg/kg	0.188 D	<0.0933 U	**6.23 D**	<0.103 U	<0.0934 U	<0.2 U
Benzo(b)fluoranthene	205-99-2	**1**	mg/kg	0.147 D	<0.0933 U	**5.8 D**	<0.103 U	<0.0934 U	<0.2 U
Benzo(g,h,i)Perylene	191-24-2	100	mg/kg	0.116 D	<0.0933 U	3.78 D	<0.103 U	<0.0934 U	<0.2 U
Benzo(k)fluoranthene	207-08-9	**3.9**	mg/kg	0.135 D	<0.0933 U	**4.41 D**	<0.103 U	<0.0934 U	<0.2 U
Chrysene	218-01-9	**3.9**	mg/kg	0.182 D	<0.0933 U	**4.89 D**	<0.103 U	<0.0934 U	<0.2 U
Dibenz(a,h)anthracene	53-70-3	**0.33**	mg/kg	<0.0901 U	<0.0933 U	**1.31 D**	<0.103 U	<0.0934 U	<0.2 U
Dibenzofuran	132-64-9	59	mg/kg	<0.0901 U	<0.0933 U	<0.0903 U	<0.103 U	<0.0934 U	<0.2 U
Fluoranthene	206-44-0	100	mg/kg	0.286 D	<0.0933 U	10.4 D	<0.103 U	<0.0934 U	<0.2 U
Fluorene	86-73-7	100	mg/kg	<0.0901 U	<0.0933 U	<0.0903 U	<0.103 U	<0.0934 U	<0.2 U
Hexachlorobenzene	118-74-1	1.2	mg/kg	<0.0901 U	<0.0933 U	<0.0903 U	<0.103 U	<0.0934 U	<0.2 U
Indeno(1,2,3-cd)pyrene	193-39-5	**0.5**	mg/kg	0.138 D	<0.0933 U	**3.61 D**	<0.103 U	<0.0934 U	<0.2 U
Naphthalene	91-20-3	100	mg/kg	<0.0901 U	<0.0933 U	0.116 D	<0.103 U	<0.0934 U	<0.2 U
Pentachlorophenol	87-86-5	6.7	mg/kg	<0.0901 U	<0.0933 U	<0.0903 U	<0.103 U	<0.0934 U	<0.2 U
Phenanthrene	85-01-8	100	mg/kg	0.206 D	<0.0933 U	0.451 D	<0.103 U	<0.0934 U	<0.2 U
Phenol	108-95-2	100	mg/kg	<0.0901 U	<0.0933 U	<0.0903 U	<0.103 U	<0.0934 U	<0.2 U
Pyrene	129-00-0	100	mg/kg	0.375 D	<0.0933 U	9.37 D	<0.103 U	<0.0934 U	<0.2 U

Table 3
Site Management Plan
Remaining Soil Analytical Results

43-30 24th Street
Long Island City, Queens, New York
NYSDEC BCP Site No.: C241189
Langan Project No.: 170362702

Analyte	CAS Number	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs/Guidance Values	Location	EP34	EP35	EP36	EP36	EP37	EP38
			Sample Name	EP34_3	EP35_3	EP36_3_102822	EP36_3_111822	EP37_1.4	EP38_1.4
			Sample Date	10/28/2022	10/28/2022	10/28/2022	11/18/2022	10/10/2022	10/10/2022
			Sample Elevation	3	3	3	3	1.4	1.4
			Unit	Result	Result	Result	Result	Result	Result
Pesticides									
4,4'-DDD	72-54-8	13	mg/kg	<0.00163 U	<0.00163 U	<0.00163 U	<0.00165 U	NA	NA
4,4'-DDE	72-55-9	8.9	mg/kg	<0.00163 U	<0.00163 U	<0.00163 U	<0.00165 U	NA	NA
4,4'-DDT	50-29-3	7.9	mg/kg	<0.00163 U	<0.00163 U	<0.00163 U	<0.00165 U	NA	NA
Aldrin	309-00-2	0.097	mg/kg	<0.00163 U	<0.00163 U	<0.00163 U	<0.00165 U	NA	NA
Alpha BHC (Alpha Hexachlorocyclohexane)	319-84-6	0.48	mg/kg	<0.00163 U	<0.00163 U	<0.00163 U	<0.00165 U	NA	NA
Alpha Chlordane	5103-71-9	4.2	mg/kg	<0.00163 U	<0.00163 U	<0.00163 U	<0.00165 U	NA	NA
Alpha Endosulfan	959-98-8	24	mg/kg	<0.00163 U	<0.00163 U	<0.00163 U	<0.00165 U	NA	NA
Beta Bhc (Beta Hexachlorocyclohexane)	319-85-7	0.36	mg/kg	<0.00163 U	<0.00163 U	<0.00163 U	<0.00165 U	NA	NA
Beta Endosulfan	33213-65-9	24	mg/kg	<0.00163 U	<0.00163 U	<0.00163 U	<0.00165 U	NA	NA
Delta Bhc (Delta Hexachlorocyclohexane)	319-86-8	100	mg/kg	<0.00163 U	<0.00163 U	<0.00163 U	<0.00165 U	NA	NA
Dieldrin	60-57-1	0.2	mg/kg	<0.00163 U	<0.00163 U	<0.00163 U	<0.00165 U	NA	NA
Endosulfan Sulfate	1031-07-8	24	mg/kg	<0.00163 U	<0.00163 U	<0.00163 U	<0.00165 U	NA	NA
Endrin	72-20-8	11	mg/kg	<0.00163 U	<0.00163 U	<0.00163 U	<0.00165 U	NA	NA
Gamma Bhc (Lindane)	58-89-9	1.3	mg/kg	<0.00163 U	<0.00163 U	<0.00163 U	<0.00165 U	NA	NA
Heptachlor	76-44-8	2.1	mg/kg	<0.00163 U	<0.00163 U	<0.00163 U	<0.00165 U	NA	NA
Herbicides									
Silvex (2,4,5-Tp)	93-72-1	100	mg/kg	<0.0217 U	<0.022 U	<0.0218 U	<0.025 U	NA	NA
Polychlorinated Biphenyl									
PCB-1016 (Aroclor 1016)	12674-11-2	NS	mg/kg	<0.018 U	<0.0185 U	<0.0181 U	<0.0212 U	<0.0186 U	<0.0188 U
PCB-1221 (Aroclor 1221)	11104-28-2	NS	mg/kg	<0.018 U	<0.0185 U	<0.0181 U	<0.0212 U	<0.0186 U	<0.0188 U
PCB-1232 (Aroclor 1232)	11141-16-5	NS	mg/kg	<0.018 U	<0.0185 U	<0.0181 U	<0.0212 U	<0.0186 U	<0.0188 U
PCB-1242 (Aroclor 1242)	53469-21-9	NS	mg/kg	<0.018 U	<0.0185 U	<0.0181 U	<0.0212 U	<0.0186 U	<0.0188 U
PCB-1248 (Aroclor 1248)	12672-29-6	NS	mg/kg	<0.018 U	<0.0185 U	<0.0181 U	<0.0212 U	<0.0186 U	<0.0188 U
PCB-1254 (Aroclor 1254)	11097-69-1	NS	mg/kg	<0.018 U	<0.0185 U	<0.0181 U	<0.0212 U	<0.0186 U	<0.0188 U
PCB-1260 (Aroclor 1260)	11096-82-5	NS	mg/kg	<0.018 U	<0.0185 U	<0.0181 U	<0.0212 U	<0.0186 U	<0.0188 U
Total PCBs	1336-36-3	1	mg/kg	<0.018 U	<0.0185 U	<0.0181 U	<0.0212 U	<0.0186 U	<0.0188 U
Metals									
Arsenic	7440-38-2	16	mg/kg	<1.36 U	<1.4 U	<1.39 U	<1.59 U	2.05	3.19
Barium	7440-39-3	400	mg/kg	89.2	59.4	63.8	31.3	47.4	48.2
Beryllium	7440-41-7	72	mg/kg	<0.046 U	<0.047 U	<0.047 U	<0.054 U	<0.056 U	<0.057 U
Cadmium	7440-43-9	**4.3**	mg/kg	<0.273 U	<0.281 U	<0.278 U	<0.319 U	<0.336 U	<0.34 U
Chromium, Hexavalent	18540-29-9	110	mg/kg	1.14	2.51	<0.556 U	<0.637 U	<0.56 U	<0.567 U
Chromium, Total	7440-47-3	NS	mg/kg	16.1	14.2	11.2	9.35	14.3	12.7
Chromium, Trivalent	16065-83-1	180	mg/kg	15	11.7	11.2	9.35	14.3	12.7
Copper	7440-50-8	**270**	mg/kg	57.7	40.4	73.5	16.6	16.6	21.4
Cyanide	57-12-5	27	mg/kg	<0.546 U	<0.561 U	<0.556 U	1.47	<0.56 U	<0.567 U
Lead	7439-92-1	**400**	mg/kg	171	65.6	208	9.43	15	36.7
Manganese	7439-96-5	2000	mg/kg	300	316	224	257	240	275
Mercury	7439-97-6	**0.81**	mg/kg	0.322	<0.0337 U	0.176	<0.0382 U	<0.0336 U	<0.034 U
Nickel	7440-02-0	310	mg/kg	14.2	13.6	12.2	9.19	14	13.5
Selenium	7782-49-2	180	mg/kg	<2.27 U	<2.34 U	<2.31 U	5.87	<2.8 U	<2.83 U
Silver	7440-22-4	180	mg/kg	<0.458 U	<0.471 U	<0.467 U	<0.535 U	<0.56 U	<0.567 U
Zinc	7440-66-6	**10000**	mg/kg	89.6	66.5	193	25.7	48.8	50.4
General Chemistry									
Cyanide	57-12-5	27	mg/kg	NA	NA	NA	NA	NA	NA
Solids, Percent	SOLID	NS	Percent	91.6	89.1	90	78.5	89.3	88.2

Table 3
Site Management Plan
Remaining Soil Analytical Results

43-30 24th Street
Long Island City, Queens, New York
NYSDEC BCP Site No.: C241189
Langan Project No.: 170362702

Analyte	CAS Number	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs/Guidance Values	**Location**	EP34	EP35	EP36	EP36	EP37	EP38
			Sample Name	EP34_3	EP35_3	EP36_3_102822	EP36_3_111822	EP37_1.4	EP38_1.4
			Sample Date	10/28/2022	10/28/2022	10/28/2022	11/18/2022	10/10/2022	10/10/2022
			Sample Elevation	3	3	3	3	1.4	1.4
			Unit	Result	Result	Result	Result	Result	Result
Perfluorooctanoic acids									
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid	763051-92-9	NS	mg/kg	NA	NA	NA	<0.000874 U	NA	NA
1h,1h,2h,2h-Perfluorohexanesulfonic Acid (4:2)	757124-72-4	NS	mg/kg	NA	NA	NA	<0.000874 U	NA	NA
3:3 FTCA	356-02-5	NS	mg/kg	NA	NA	NA	<0.00109 U	NA	NA
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	919005-14-4	NS	mg/kg	NA	NA	NA	<0.000874 U	NA	NA
5:3 FTCA	914637-49-3	NS	mg/kg	NA	NA	NA	<0.00546 U	NA	NA
7:3 FTCA	812-70-4	NS	mg/kg	NA	NA	NA	<0.00546 U	NA	NA
9-Chlorohexadecafluoro-3-Oxanonane-1-Sulfonic Acid	756426-58-1	NS	mg/kg	NA	NA	NA	<0.000874 U	NA	NA
N-ethyl perfluorooctane- sulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	NS	mg/kg	<0.000263 U	<0.000273 U	<0.000271 U	<0.000218 U	NA	NA
N-ethylperfluorooctane sulfonamide	4151-50-2	NS	mg/kg	NA	NA	NA	<0.000218 U	NA	NA
N-ethylperfluorooctane sulfonamidoe	1691-99-2	NS	mg/kg	NA	NA	NA	<0.00218 U	NA	NA
N-methyl perfluorooctane- sulfonamidoacetic Acid (NMeFOSAA)	2355-31-9	NS	mg/kg	<0.000263 U	<0.000273 U	<0.000271 U	<0.000218 U	NA	NA
N-methylperfluorooctane sulfonamide	31506-32-8	NS	mg/kg	NA	NA	NA	<0.000218 U	NA	NA
N-methylperfluorooctanesulfonamidol	24448-09-7	NS	mg/kg	NA	NA	NA	<0.00218 U	NA	NA
Nonafluoro-3,6-dioxaheptanoic acid	151772-58-6	NS	mg/kg	NA	NA	NA	<0.000437 U	NA	NA
Perfluoro(2-ethoxyethane)sulfonic acid	113507-82-7	NS	mg/kg	NA	NA	NA	<0.000437 U	NA	NA
Perfluoro-3-methoxypropanoic acid	377-73-1	NS	mg/kg	NA	NA	NA	<0.000437 U	NA	NA
Perfluoro-4-methoxybutanoic acid	863090-89-5	NS	mg/kg	NA	NA	NA	<0.000437 U	NA	NA
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	NS	mg/kg	<0.000263 U	<0.000273 U	<0.000271 U	<0.000218 U	NA	NA
Perfluorobutanoic acid (PFBA)	375-22-4	NS	mg/kg	<0.000263 U	<0.000273 U	<0.000271 U	<0.000874 U	NA	NA
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	NS	mg/kg	<0.000263 U	<0.000273 U	<0.000271 U	<0.000218 U	NA	NA
Perfluorodecanoic Acid (PFDA)	335-76-2	NS	mg/kg	<0.000263 U	<0.000273 U	<0.000271 U	<0.000218 U	NA	NA
Perfluorododecanesulfonic Acid (PFDOS)	79780-39-5	NS	mg/kg	NA	NA	NA	<0.000218 UJ	NA	NA
Perfluorododecanoic Acid (PFDoA)	307-55-1	NS	mg/kg	<0.000263 U	<0.000273 U	<0.000271 U	<0.000218 U	NA	NA
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	NS	mg/kg	<0.000263 U	<0.000273 U	<0.000271 U	<0.000218 U	NA	NA
Perfluoroheptanoic acid (PFHpA)	375-85-9	NS	mg/kg	<0.000263 U	<0.000273 U	<0.000271 U	<0.000218 U	NA	NA
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	NS	mg/kg	<0.000263 U	<0.000273 U	<0.000271 U	<0.000218 U	NA	NA
Perfluorohexanoic Acid (PFHxA)	307-24-4	NS	mg/kg	<0.000263 U	<0.000273 U	<0.000271 U	<0.000218 U	NA	NA
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	NS	mg/kg	NA	NA	NA	<0.000218 U	NA	NA
Perfluorononanoic Acid (PFNA)	375-95-1	NS	mg/kg	<0.000263 U	<0.000273 U	<0.000271 U	<0.000218 U	NA	NA
Perfluorooctanesulfonamide (FOSA)	754-91-6	NS	mg/kg	<0.000263 U	<0.000273 U	<0.000271 U	<0.000218 U	NA	NA
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	0.044	mg/kg	<0.000263 U	<0.000273 U	<0.000271 U	<0.000218 U	NA	NA
Perfluorooctanoic Acid (PFOA)	335-67-1	0.033	mg/kg	<0.000263 U	<0.000273 U	<0.000271 U	<0.000218 U	NA	NA
Perfluoropentanesulfonic Acid	2706-91-4	NS	mg/kg	NA	NA	NA	<0.000218 U	NA	NA
Perfluoropentanoic Acid (PFPeA)	2706-90-3	NS	mg/kg	<0.000263 U	<0.000273 U	<0.000271 U	<0.000437 U	NA	NA
Perfluorotetradecanoic Acid (PFTA)	376-06-7	NS	mg/kg	<0.000263 U	<0.000273 U	<0.000271 U	<0.000218 U	NA	NA
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	NS	mg/kg	<0.000263 U	<0.000273 U	<0.000271 U	<0.000218 U	NA	NA
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	NS	mg/kg	<0.000263 U	<0.000273 U	<0.000271 U	<0.000218 U	NA	NA
Sodium 1H,1H,2H,2H-Perfluorodecane Sulfonate (8:2) (8:2FTS)	39108-34-4	NS	mg/kg	<0.000263 U	<0.000273 U	<0.000271 U	<0.000874 U	NA	NA
Sodium 1H,1H,2H,2H-Perfluorooctane Sulfonate (6:2) (6:2FTS)	27619-97-2	NS	mg/kg	<0.000263 U	<0.000273 UJ	<0.000271 UJ	<0.000874 U	NA	NA
Tetrafluoro-2- (heptafluoropropoxy) propanoic Acid	13252-13-6	NS	mg/kg	NA	NA	NA	<0.000874 U	NA	NA

Table 3
Site Management Plan
Remaining Soil Analytical Results

43-30 24th Street
Long Island City, Queens, New York
NYSDEC BCP Site No.: C241189
Langan Project No.: 170362702

Notes:

CAS - Chemical Abstract Service
NS - No standard
mg/kg - milligram per kilogram
NA - Not analyzed
RL - Reporting limit
<RL - Not detected
Soil sample analytical results are compared to the New York State Department of Environmental Conservation (NYSDEC) Title 6 of the Official Compilation of New York Codes, Rules, and Regulations (NYCRR) Part 375 Restricted Use Restricted-Residential Soil Cleanup Objectives (SCO) and the NYSDEC Part 375 Remedial Programs Guidelines for Sampling and Analysis of Per- and Polyfluoroalkyl Substances (PFAS) Restricted Use Restricted-Residential Guidance Values (referred to as "Guidance Values") (April 2023).

Criterion comparisons for 3- & 4-methylphenol (m&p cresol) are provided for reference. Promulgated SCOs are for 3-methylphenol (m-cresol) and 4-methylphenol (p-cresol).

Qualifiers:

D - The concentration reported is a result of a diluted sample.
B - The analyte was found in the associated analysis batch blank.
J - The analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample.
UJ - The analyte was not detected at a level greater than or equal to the RL; however, the reported RL is approximate and may be inaccurate or imprecise.
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.

Exceedance Summary:

10 - Result exceeds Restricted Use Restricted-Residential SCOs

Table 4
Site Management Plan
Lead Delineation Analytical Results

43-30 24th Street
Long Island City, Queens, New York
NYSDEC BCP Site No.: C241189
Langan Project No.: 170362702

Analyte	CAS Number	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	RCRA Characteristics of Hazardous Waste	**Location**	EB16	EB16	GRABK2_1	GRABK2_2	GRABK2_3	GRABK2_4	HS-5_EP-1	HS-5_EP-10	HS-5_EP-12
				Sample Name	EB16_7-8_2022	EB16_17-18_2022	GRABK2_1_5-6	GRABK2_2_9-10	GRABK2_3_7-8	GRABK2_4_8-9	HS-5_EP-1_062122	HS-5_EP-10_061722	HS-5_EP-12_062022
				Sample Date	04/21/2022	04/21/2022	04/20/2022	04/20/2022	04/20/2022	04/20/2022	06/21/2022	06/17/2022	06/20/2022
				Sample Depth	7-8	17-18	5-6	9-10	7-8	8-9	1.75-1.75	1.75-1.75	1.75-1.75
				Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result
Metals - Total													
Lead	7439-92-1	**400**	NS	mg/kg	24.8	NA	**514**	8.08	62.1	**2,210**	112 J	5.24 J	6.91 B
Metals - TCLP													
Lead	7439-92-1	NS	5	mg/l	<0.125 U	<0.125 U	0.945	<0.125 U	0.146	0.41	<0.125 U	<0.125 U	<0.125 U
General Chemistry													
Solids, Percent	SOLID	NS	NS	Percent	87.2	60	87.9	90.1	80.7	68	83.4	92.5	88.5

Table 4
Site Management Plan
Lead Delineation Analytical Results

43-30 24th Street
Long Island City, Queens, New York
NYSDEC BCP Site No.: C241189
Langan Project No.: 170362702

Analyte	CAS Number	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	RCRA Characteristics of Hazardous Waste	Location	HS-5_EP-16	HS-5_EP-19	HS-5_EP-3	HS-5_EP-6	HS-5_EP-7	SB01_E3N3	SB01_E3N3	SB01_E3N3	SB01_E4
				Sample Name	HS-5_EP-16_061722	HS-5_EP-19_061722	HS-5_EP-3_062022	HS-5_EP-6_062122	HS-5_EP-7_062122	DUP02_052422	SB01_E3N3_0-2	SB01_E3N3_2-3.5	SB01_E4_0-2
				Sample Date	06/17/2022	06/17/2022	06/20/2022	06/21/2022	06/21/2022	05/24/2022	05/25/2022	05/25/2022	05/25/2022
				Sample Depth	3.5-3.5	3.5-3.5	1.75-1.75	1.75-1.75	1.75-1.75	0-2	0-2	2-3.5	0-2
				Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result
Metals - Total													
Lead	7439-92-1	**400**	NS	mg/kg	7.92 J	7.29 J	25.3 B	20.1 J	7.26 B	7.64 J	**1,720 J**	**551**	**1,090**
Metals - TCLP													
Lead	7439-92-1	NS	5	mg/l	<0.125 U	<0.125 U	<0.125 U	<0.125 U	<0.125 U	<0.125 UJ	3.1 J	1.62	23.4
General Chemistry													
Solids, Percent	SOLID	NS	NS	Percent	87.9	85.9	87.7	88.9	90.2	83.3	90.6	86.8	86

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Site Management Plan
Lead Delineation Analytical Results

43-30 24th Street
Long Island City, Queens, New York
NYSDEC BCP Site No.: C241189
Langan Project No.: 170362702

Analyte	CAS Number	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	RCRA Characteristics of Hazardous Waste	Location	SB01_E4	SB01_E4N1	SB01_E4N1	SB01_E4N2	SB01_E4N2	SB01_E4S1	SB01_E4S1	SB01_E5	SB01_E5
				Sample Name	SB01_E4_2-3.5	SB01_E4N1_0-2	SB01_E4N1_2-3.5	SB01_E4N2_0-2	SB01_E4N2_2-3.5	SB01_E4S1_0-2	SB01_E4S1_2-3.5	SB01_E5_0-2	SB01_E5_2-3.5
				Sample Date	05/25/2022	05/25/2022	05/25/2022	05/25/2022	05/25/2022	05/25/2022	05/25/2022	05/25/2022	05/25/2022
				Sample Depth	2-3.5	0-2	2-3.5	0-2	2-3.5	0-2	2-3.5	0-2	2-3.5
				Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result
Metals - Total													
Lead	7439-92-1	**400**	NS	mg/kg	222	**3,530**	208	**439**	65.4	**1,060**	394	**612**	**2,560**
Metals - TCLP													
Lead	7439-92-1	NS	5	mg/l	0.323 J	5.18	0.681	0.536 J	0.367 J	10.8	1.79 J	1.72 J	21.4
General Chemistry													
Solids, Percent	SOLID	NS	NS	Percent	89.3	89	88.2	92.7	87.7	91.5	89.7	94.7	91.5

Table 4
Site Management Plan
Lead Delineation Analytical Results

43-30 24th Street
Long Island City, Queens, New York
NYSDEC BCP Site No.: C241189
Langan Project No.: 170362702

Analyte	CAS Number	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	RCRA Characteristics of Hazardous Waste	Location	SB01_E5N1	SB01_E5N1	SB01_E5N2	SB01_E5N2	SB01_E5S1	SB01_E5S1	SB01E1N1	SB01E1N2	SB01E1N2
				Sample Name	SB01_E5N1_0-2	SB01_E5N1_2-3.5	SB01_E5N2_0-2	SB01_E5N2_2-3.5	SB01_E5S1_0-2	SB01_E5S1_2-3.5	SB01E1N1_0-2	SB01E1N2_0-2	SB01E1N2_2-3.5
				Sample Date	05/25/2022	05/25/2022	05/25/2022	05/25/2022	05/25/2022	05/25/2022	04/21/2022	04/21/2022	04/21/2022
				Sample Depth	0-2	2-3.5	0-2	2-3.5	0-2	2-3.5	0-2	0-2	2-3.5
				Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result
Metals - Total													
Lead	7439-92-1	**400**	NS	mg/kg	**1,220**	54.6	**647**	342	**2,920**	**1,010**	**4,200 J**	**1,740**	7.48
Metals - TCLP													
Lead	7439-92-1	NS	5	mg/l	2.33 J	0.269 J	1.15 J	0.401	18.4	0.858 J	0.625	11.4	0.78
General Chemistry													
Solids, Percent	SOLID	NS	NS	Percent	88.2	87.5	89.3	86.9	89	89	86.6	86	88.5

Table 4
Site Management Plan
Lead Delineation Analytical Results

43-30 24th Street
Long Island City, Queens, New York
NYSDEC BCP Site No.: C241189
Langan Project No.: 170362702

Analyte	CAS Number	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	RCRA Characteristics of Hazardous Waste	Location	SB01E1S1	SB01E2	SB01E2	SB01E2N1	SB01E2N1	SB01E2N2	SB01E2N2	SB01E2S1	SB01E3
				Sample Name	SB01E1S1_0-2	SB01E2_2-3.5	SODUP05_042122	SB01E2N1_0-2	SODUP01_042122	SB01E2N2_0-2	SB01E2N2_2-3.5	SB01E2S1_0-2	SB01E3_0-2
				Sample Date	04/21/2022	04/21/2022	04/21/2022	04/21/2022	04/21/2022	04/21/2022	04/21/2022	04/21/2022	04/21/2022
				Sample Depth	0-2	2-3.5	2-3.5	0-2	0-2	0-2	2-3.5	0-2	0-2
				Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result
Metals - Total													
Lead	7439-92-1	**400**	NS	mg/kg	233 J	30.2 J	21.3 J	**2,490 J**	**2,300 J**	**1,330**	14.6	**568 J**	**3,390 J**
Metals - TCLP													
Lead	7439-92-1	NS	5	mg/l	2.79	<0.125 UJ	2.15 J	0.704	1.17	6.39	0.197	1.66	35.1
General Chemistry													
Solids, Percent	SOLID	NS	NS	Percent	86.4	87.6	87.7	79.7	85.3	81	88	78.3	88.2

Table 4
Site Management Plan
Lead Delineation Analytical Results

43-30 24th Street
Long Island City, Queens, New York
NYSDEC BCP Site No.: C241189
Langan Project No.: 170362702

Analyte	CAS Number	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	RCRA Characteristics of Hazardous Waste	Location	SB01E3	SB01E3	SB01E3N1	SB01E3N1	SB01E3N2	SB01E3N2	SB01E3S1	SB02	SB02
				Sample Name	SODUP04_042122	SB01E3_2-3.5	SB01E3N1_0-2	SB01E3N1_2-3.5	SB01E3N2_0-2	SB01E3N2_2-3.5	SB01E3S1_0-2	SB02_0-2	SB02_10-11
				Sample Date	04/21/2022	04/21/2022	04/21/2022	04/21/2022	04/21/2022	04/21/2022	04/21/2022	04/21/2022	04/21/2022
				Sample Depth	0-2	2-3.5	0-2	2-3.5	0-2	2-3.5	0-2	0-2	10-11
				Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result
Metals - Total													
Lead	7439-92-1	**400**	NS	mg/kg	**2,770 J**	**590**	**2,700**	111	**1,460**	**1,470**	**1,790 B**	209	15.5
Metals - TCLP													
Lead	7439-92-1	NS	5	mg/l	36	2.36	21.2	<0.125 U	9.41	11.6	3.38	0.131	<0.125 U
General Chemistry													
Solids, Percent	SOLID	NS	NS	Percent	87.5	85.6	89.7	87.7	88.9	91.9	87.7	87.6	91.2

Table 4
Site Management Plan
Lead Delineation Analytical Results

43-30 24th Street
Long Island City, Queens, New York
NYSDEC BCP Site No.: C241189
Langan Project No.: 170362702

Analyte	CAS Number	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	RCRA Characteristics of Hazardous Waste	Location	SB03	SB04	SB04	SB05	SB07	SB09	SB10	SB10	SB10-13
				Sample Name	SB03_0-2	SB04_0-2	SB04_10-11.5	SB05_9-10	SB07_0-2	SB09_0-2	SB10_14-16	SB10_0-2	SB10-13_11-12
				Sample Date	04/20/2022	04/20/2022	04/20/2022	04/20/2022	04/21/2022	04/19/2022	04/18/2022	05/24/2022	05/24/2022
				Sample Depth	0-2	0-2	10-11.5	9-10	0-2	0-2	14-16	0-2	11-12
				Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result
Metals - Total													
Lead	7439-92-1	**400**	NS	mg/kg	370	82.2	7.62	**676**	391	103	34	323	**670**
Metals - TCLP													
Lead	7439-92-1	NS	5	mg/l	0.368	0.484	<0.125 U	0.851	<0.125 U	0.53	<0.125 U	0.483	1.52
General Chemistry													
Solids, Percent	SOLID	NS	NS	Percent	85.5	91.8	90.9	87.5	73.8	92.3	87	86.9	86.1

Table 4
Site Management Plan
Lead Delineation Analytical Results

43-30 24th Street
Long Island City, Queens, New York
NYSDEC BCP Site No.: C241189
Langan Project No.: 170362702

Analyte	CAS Number	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	RCRA Characteristics of Hazardous Waste	Location	SB10-13	SB10-13	SB10-13	SB10-13	SB10-14	SB10-14	SB10-14	SB10-14	SB10-14
				Sample Name	SB10-13_12-14	SB10-13_14-15	SB10-13_15-16	SB10-13_16-18	SB10-14_11-12	SB10-14_12-14	SB10-14_14-15	SB10-14_15-16	SB10-14_16-18
				Sample Date	05/24/2022	05/24/2022	05/24/2022	05/24/2022	05/24/2022	05/24/2022	05/24/2022	05/24/2022	05/24/2022
				Sample Depth	12-14	14-15	15-16	16-18	11-12	12-14	14-15	15-16	16-18
				Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result
Metals - Total													
Lead	7439-92-1	**400**	NS	mg/kg	**559**	**1,520**	**664**	221	**708**	**696**	**8,330**	29.5	**5,180 J**
Metals - TCLP													
Lead	7439-92-1	NS	5	mg/l	0.215	1.45	0.643	1.32	0.476	22.2	49.9	7.53	9.85 J
General Chemistry													
Solids, Percent	SOLID	NS	NS	Percent	86.9	84.1	83.5	87.7	88.6	84.5	82.6	90.7	71

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Site Management Plan
Lead Delineation Analytical Results

43-30 24th Street
Long Island City, Queens, New York
NYSDEC BCP Site No.: C241189
Langan Project No.: 170362702

Analyte	CAS Number	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	RCRA Characteristics of Hazardous Waste	Location	SB10-14	SB10-14NW1	SB10-14NW1	SB10-14NW1	SB10-14NW1	SB10-14NW1	SB10-14NW2	SB10-14NW2	SB10-14NW2
				Sample Name	DUP01_052422	SB10-14NW1_7-9	SB10-14NW1_9-12	SB10-14NW1_12-14	SB10-14NW1_14-16	SB10-14NW1_16-18	SB10-14NW2_7-9	SB10-14NW2_9-12	SB10-14NW2_12-14
				Sample Date	05/24/2022	06/15/2022	06/15/2022	06/15/2022	06/15/2022	06/15/2022	06/15/2022	06/15/2022	06/15/2022
				Sample Depth	16-18	7-9	9-12	12-14	14-16	16-18	7-9	9-12	12-14
				Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result
Metals - Total													
Lead	7439-92-1	**400**	NS	mg/kg	8.08 J	137	356	**1,040**	**6,940**	**755**	350	**411**	**557**
Metals - TCLP													
Lead	7439-92-1	NS	5	mg/l	<0.125 UJ	1.72	24.4	193	0.253	0.562	0.84 J	0.248 J	<0.125 U
General Chemistry													
Solids, Percent	SOLID	NS	NS	Percent	85.4	86.3	90.2	87.5	87.1	79.8	89.9	88.4	81

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Site Management Plan
Lead Delineation Analytical Results

43-30 24th Street
Long Island City, Queens, New York
NYSDEC BCP Site No.: C241189
Langan Project No.: 170362702

Analyte	CAS Number	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	RCRA Characteristics of Hazardous Waste	Location	SB10-14NW2	SB10-14NW2	SB10-14NW3	SB10-14NW3	SB10-14NW3	SB10-14NW3	SB10-14NW3	SB10-15	SB10-15
				Sample Name	SB10-14NW2_14-16	SB10-14NW2_16-18	SB10-14NW3_7-9	SB10-14NW3_9-12	SB10-14NW3_12-14	SB10-14NW3_14-16	SB10-14NW3_16-18	SB10-15_11-12	SB10-15_12-14
				Sample Date	06/15/2022	06/15/2022	06/15/2022	06/15/2022	06/15/2022	06/15/2022	06/15/2022	05/24/2022	05/24/2022
				Sample Depth	14-16	16-18	7-9	9-12	12-14	14-16	16-18	11-12	12-14
				Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result
Metals - Total													
Lead	7439-92-1	**400**	NS	mg/kg	12.4 J	8.9	**513**	276	186	205	24.1	192	**850**
Metals - TCLP													
Lead	7439-92-1	NS	5	mg/l	<0.125 U	<0.125 U	1.07 J	<0.125 U	<0.125 U	<0.125 U	<0.125 U	1.12	5.32
General Chemistry													
Solids, Percent	SOLID	NS	NS	Percent	88.7	86.8	90.4	89.8	83.2	83.4	87.6	95.4	85.7

Table 4
Site Management Plan
Lead Delineation Analytical Results

43-30 24th Street
Long Island City, Queens, New York
NYSDEC BCP Site No.: C241189
Langan Project No.: 170362702

Analyte	CAS Number	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	RCRA Characteristics of Hazardous Waste	Location	SB10-15	SB10-15	SB10-15	SB10-15NE1	SB10-15NE1	SB10-15NE1	SB10-15NE1	SB10-15NE1	SB10-15NW1
				Sample Name	SB10-15_14-15	SB10-15_15-16	SB10-15_16-18	SB10-15NE1_7-9	SB10-15NE1_9-12	SB10-15NE1_12-14	SB10-15NE1_14-16	SB10-15NE1_16-18	SB10-15NW1_7-9
				Sample Date	05/24/2022	05/24/2022	05/24/2022	06/15/2022	06/15/2022	06/15/2022	06/15/2022	06/15/2022	06/15/2022
				Sample Depth	14-15	15-16	16-18	7-9	9-12	12-14	14-16	16-18	7-9
				Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result
Metals - Total													
Lead	7439-92-1	**400**	NS	mg/kg	**3,220**	**2,000**	**1,400**	33.5	**1,970**	390	243	46	339
Metals - TCLP													
Lead	7439-92-1	NS	5	mg/l	21.5	8.25	8.28	<0.125 U	<0.125 U	0.137	0.191 J	0.11 J	0.313
General Chemistry													
Solids, Percent	SOLID	NS	NS	Percent	79.1	83	84.5	85	88.6	73	83.3	89.5	88

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Site Management Plan
Lead Delineation Analytical Results

43-30 24th Street
Long Island City, Queens, New York
NYSDEC BCP Site No.: C241189
Langan Project No.: 170362702

Analyte	CAS Number	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	RCRA Characteristics of Hazardous Waste	Location	SB10-15NW1	SB10-15NW1	SB10-15NW1	SB10-15NW1	SB10-3	SB10-3	SB10-3	SB10-3	SB10-3
				Sample Name	SB10-15NW1_9-12	SB10-15NW1_12-14	SB10-15NW1_14-16	SB10-15NW1_16-18	SB10-3_9-10	SB10-3_10-12	SB10-3_12-13	SB10-3_13-14	SB10-3_14-16
				Sample Date	06/15/2022	06/15/2022	06/15/2022	06/15/2022	04/19/2022	04/19/2022	04/19/2022	04/19/2022	04/19/2022
				Sample Depth	9-12	12-14	14-16	16-18	9-10	10-12	12-13	13-14	14-16
				Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result
Metals - Total													
Lead	7439-92-1	**400**	NS	mg/kg	**627**	**1,070**	83.3	118	23.9	**1,200**	**3,140**	227	12.2
Metals - TCLP													
Lead	7439-92-1	NS	5	mg/l	0.717	0.178	<0.125 U	<0.125 U	<0.125 U	<0.125 U	8.95	2.17	0.192
General Chemistry													
Solids, Percent	SOLID	NS	NS	Percent	89.6	62.8	86.1	74.8	87.6	79.2	79.3	90	86.5

Table 4
Site Management Plan
Lead Delineation Analytical Results

43-30 24th Street
Long Island City, Queens, New York
NYSDEC BCP Site No.: C241189
Langan Project No.: 170362702

Analyte	CAS Number	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	RCRA Characteristics of Hazardous Waste	Location	SB10-3NW1	SB10-3NW1	SB10-3NW1	SB10-3NW1	SB10-3NW1	SB10-3NW2	SB10-3NW2	SB10-3NW2	SB10-3NW2
				Sample Name	SB10-3NW1_7-9	SB10-3NW1_9-12	SB10-3NW1_12-14	SB10-3NW1_14-16	SB10-3NW1_16-18	SB10-3NW2_7-9	SB10-3NW2_9-12	SB10-3NW2_12-14	SB10-3NW2_14-16
				Sample Date	06/15/2022	06/15/2022	06/15/2022	06/15/2022	06/15/2022	06/15/2022	06/15/2022	06/15/2022	06/15/2022
				Sample Depth	7-9	9-12	12-14	14-16	16-18	7-9	9-12	12-14	14-16
				Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result
Metals - Total													
Lead	7439-92-1	**400**	NS	mg/kg	178	194	**2,360**	**866**	100	148	280	**1,300**	24.8
Metals - TCLP													
Lead	7439-92-1	NS	5	mg/l	<0.125 U	<0.125 U	15.7	1.38	1.32	<0.125 U	0.299 J	4.13	0.579 J
General Chemistry													
Solids, Percent	SOLID	NS	NS	Percent	90.7	86.1	84.9	83.4	82.6	90.2	87.6	82.1	87.4

Table 4
Site Management Plan
Lead Delineation Analytical Results

43-30 24th Street
Long Island City, Queens, New York
NYSDEC BCP Site No.: C241189
Langan Project No.: 170362702

Analyte	CAS Number	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	RCRA Characteristics of Hazardous Waste	Location	SB10-3NW2	SB10-3NW3	SB10-3NW3	SB10-3NW3	SB10-3NW3	SB10-3NW3	SB10-4	SB10-4	SB10-4
				Sample Name	SB10-3NW2_16-18	SB10-3NW3_7-9	SB10-3NW3_9-12	SB10-3NW3_12-14	SB10-3NW3_14-16	SB10-3NW3_16-18	SB10-4_9-10	SB10-4_10-12	SB10-4_12-13
				Sample Date	06/15/2022	06/15/2022	06/15/2022	06/15/2022	06/15/2022	06/15/2022	04/19/2022	04/19/2022	04/19/2022
				Sample Depth	16-18	7-9	9-12	12-14	14-16	16-18	9-10	10-12	12-13
				Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result
Metals - Total													
Lead	7439-92-1	**400**	NS	mg/kg	97.7	91.7	**428**	165	17.8	10.9	239	**1,270**	**7,870**
Metals - TCLP													
Lead	7439-92-1	NS	5	mg/l	0.163 J	<0.125 U	0.273 J	0.132 J	0.127 J	<0.125 U	0.163	0.417	21.4
General Chemistry													
Solids, Percent	SOLID	NS	NS	Percent	81	93	85.1	81.2	87.4	87.4	81.9	83.2	84.6

Table 4
Site Management Plan
Lead Delineation Analytical Results

43-30 24th Street
Long Island City, Queens, New York
NYSDEC BCP Site No.: C241189
Langan Project No.: 170362702

Analyte	CAS Number	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	RCRA Characteristics of Hazardous Waste	Location	SB10-4	SB10-4	SB10-5	SB10-5	SB10-5	SB10-6	SB10-6	SB10-6	SB10-6
				Sample Name	SB10-4_13-14	SB10-4_14-16	SB10-5_9-10	SB10-5_10-12	SB10-5_14-16	SB10-6_8-9	SB10-6_9-10	SB10-6_10-12	SB10-6_12-13
				Sample Date	04/19/2022	04/19/2022	04/19/2022	04/19/2022	04/19/2022	04/19/2022	04/19/2022	04/19/2022	04/19/2022
				Sample Depth	13-14	14-16	9-10	10-12	14-16	8-9	9-10	10-12	12-13
				Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result
Metals - Total													
Lead	7439-92-1	**400**	NS	mg/kg	**3,630**	17.2	67.4	**1,190**	16.4	221	**1,300**	**1,880**	**1,290**
Metals - TCLP													
Lead	7439-92-1	NS	5	mg/l	14.4	0.133	<0.125 U	21.8	0.137	<0.125 U	6.28	8.6	13
General Chemistry													
Solids, Percent	SOLID	NS	NS	Percent	82.3	82.4	91.6	84.9	87.4	87.4	87.7	84.9	83.2

Table 4
Site Management Plan
Lead Delineation Analytical Results

43-30 24th Street
Long Island City, Queens, New York
NYSDEC BCP Site No.: C241189
Langan Project No.: 170362702

Analyte	CAS Number	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	RCRA Characteristics of Hazardous Waste	Location	SB10-6	SB10-7	SB10-7	SB10-7	SB10-7_SW1	SB10-7_SW1	SB10-7_SW1	SB10-7_SW1	SB10-7_SW1
				Sample Name	SB10-6_14-16	SB10-7_9-10	SB10-7_10-12	SB10-7_14-16	SB10-7_SW1_9-10	SB10-7_SW1_10-12	SB10-7_SW1_12-13	SB10-7_SW1_13-14	SB10-7_SW1_14-16
				Sample Date	04/19/2022	04/19/2022	04/19/2022	04/19/2022	05/24/2022	05/24/2022	05/24/2022	05/24/2022	05/24/2022
				Sample Depth	14-16	9-10	10-12	14-16	9-10	10-12	12-13	13-14	14-16
				Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result
Metals - Total													
Lead	7439-92-1	**400**	NS	mg/kg	10.1	**5,020**	**2,560**	8.21	45.1	6.22	**1,030**	**3,940**	**467**
Metals - TCLP													
Lead	7439-92-1	NS	5	mg/l	<0.125 U	1.92	21.9	<0.125 U	<0.125 U	<0.125 U	6.16	17	3.83
General Chemistry													
Solids, Percent	SOLID	NS	NS	Percent	87.6	66.9	81.8	85.9	94.9	87.6	85.6	86.3	89.4

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Site Management Plan
Lead Delineation Analytical Results

43-30 24th Street
Long Island City, Queens, New York
NYSDEC BCP Site No.: C241189
Langan Project No.: 170362702

Analyte	CAS Number	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	RCRA Characteristics of Hazardous Waste	Location	SB10-7_SW2	SB10-7_SW2	SB10-7_SW2	SB10-7_SW2	SB10-7_SW2	SB10-8	SB10-8	SB10-8	SB10-8
				Sample Name	SB10-7_SW2_9-10	SB10-7_SW2_10-12	SB10-7_SW2_12-13	SB10-7_SW2_13-14	SB10-7_SW2_14-16	SB10-8_9-10	SB10-8_10-12	SB10-8_12-13	SB10-8_13-14
				Sample Date	05/24/2022	05/24/2022	05/24/2022	05/24/2022	05/24/2022	04/19/2022	04/19/2022	04/19/2022	04/19/2022
				Sample Depth	9-10	10-12	12-13	13-14	14-16	9-10	10-12	12-13	13-14
				Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result
Metals - Total													
Lead	7439-92-1	**400**	NS	mg/kg	17.1	9.53	177	6.81	8.11	**487**	**879**	40.4	18.6
Metals - TCLP													
Lead	7439-92-1	NS	5	mg/l	<0.125 U	<0.125 U	<0.125 U	<0.125 U	<0.125 U	0.662	<0.125 U	0.454	<0.125 U
General Chemistry													
Solids, Percent	SOLID	NS	NS	Percent	88.7	90.2	90.5	87.2	85.1	89	87.7	90.6	88.9

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Site Management Plan
Lead Delineation Analytical Results

43-30 24th Street
Long Island City, Queens, New York
NYSDEC BCP Site No.: C241189
Langan Project No.: 170362702

Analyte	CAS Number	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	RCRA Characteristics of Hazardous Waste	Location	SB10-8	SB10E1	SB10E1	SB10E2	SB10N	SB10N	SB10N	SB10S1	SB10S2
				Sample Name	SB10-8_14-16	SB10E1_8-9	SB10E1_13-14	SB10E2_13-14	SB10N_9-10	SB10N_10-12	SB10N_12-13	SB10S1_13-14	SB10S2_9-10
				Sample Date	04/19/2022	04/18/2022	04/18/2022	04/18/2022	04/19/2022	04/19/2022	04/19/2022	04/18/2022	04/18/2022
				Sample Depth	14-16	8-9	13-14	13-14	9-10	10-12	12-13	13-14	9-10
				Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result
Metals - Total													
Lead	7439-92-1	**400**	NS	mg/kg	110	**2,120**	11.3	8.34	**1,240**	137	**551**	7.73	**2,500**
Metals - TCLP													
Lead	7439-92-1	NS	5	mg/l	<0.125 U	0.519	<0.125 U	<0.125 U	2.23	0.161	0.203	<0.125 U	<0.125 U
General Chemistry													
Solids, Percent	SOLID	NS	NS	Percent	84.2	85	91.5	86.1	85.3	67.3	76.2	85.1	74.4

Table 4
Site Management Plan
Lead Delineation Analytical Results

43-30 24th Street
Long Island City, Queens, New York
NYSDEC BCP Site No.: C241189
Langan Project No.: 170362702

Analyte	CAS Number	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	RCRA Characteristics of Hazardous Waste	Location	SB10S2	SB10SE	SB10SE	SB10SE	SB10SE	SB10SW	SB10SW	SB10SW	SB10W1
				Sample Name	SB10S2_13-14	SB10SE_8-9	SB10SE_9-10	SB10SE_10-12	SB10SE_12-13	SB10SW_9-10	SB10SW_10-12	SB10SW_12-13	SB10W1_8-9
				Sample Date	04/18/2022	04/19/2022	04/19/2022	04/19/2022	04/19/2022	04/19/2022	04/19/2022	04/19/2022	04/18/2022
				Sample Depth	13-14	8-9	9-10	10-12	12-13	9-10	10-12	12-13	8-9
				Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result
Metals - Total													
Lead	7439-92-1	**400**	NS	mg/kg	27.4	65.6	**6,020**	**490**	27.4 J	198	23.8	17.1	**3,890**
Metals - TCLP													
Lead	7439-92-1	NS	5	mg/l	<0.125 U	<0.125 U	8.51	0.17	0.645	<0.125 U	0.138	<0.125 U	1.79
General Chemistry													
Solids, Percent	SOLID	NS	NS	Percent	88.3	91.2	89.2	89.5	85.7	89.2	88.5	83.7	79.4

Table 4
Site Management Plan
Lead Delineation Analytical Results

43-30 24th Street
Long Island City, Queens, New York
NYSDEC BCP Site No.: C241189
Langan Project No.: 170362702

Analyte	CAS Number	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	RCRA Characteristics of Hazardous Waste	Location	SB10W1	SB10W2	SB10W2	SB10W2	SB11	SB11	SB12	SB13	SB16S1
				Sample Name	SB10W1_13-14	SB10W2_9-10	SB10W2_12-13	SB10W2_13-14	SB11_0-2	SB11_11-13	SB12_0-2	SB13_7-8	SB16S1_3-5
				Sample Date	04/18/2022	04/18/2022	04/18/2022	04/18/2022	04/20/2022	04/20/2022	04/21/2022	04/26/2022	04/22/2022
				Sample Depth	13-14	9-10	12-13	13-14	0-2	11-13	0-2	7-8	3-5
				Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result
Metals - Total													
Lead	7439-92-1	**400**	NS	mg/kg	**2,130**	**2,200**	75.2	58.4	**917**	78.7	**640**	**547**	**456**
Metals - TCLP													
Lead	7439-92-1	NS	5	mg/l	1.19	0.477	0.301	<0.125 U	1.22	1.7	0.211	1.59	0.458 J
General Chemistry													
Solids, Percent	SOLID	NS	NS	Percent	84.8	79.5	88.1	84	83.7	84.5	84	85.1	89.9

Table 4
Site Management Plan
Lead Delineation Analytical Results

43-30 24th Street
Long Island City, Queens, New York
NYSDEC BCP Site No.: C241189
Langan Project No.: 170362702

Analyte	CAS Number	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	RCRA Characteristics of Hazardous Waste	Location	SB16S1	SB16S1E1	SB16S1E1	SB16S1W1	SB16S1W1	SB18
				Sample Name	SB16S1_10-12	SB16S1E1_5-8	SB16S1E1_8-10	SB16S1W1_5-8	SB16S1W1_8-10	SB18_5-8
				Sample Date	04/22/2022	04/22/2022	04/22/2022	04/22/2022	04/22/2022	04/18/2022
				Sample Depth	10-12	5-8	8-10	5-8	8-10	5-8
				Unit	Result	Result	Result	Result	Result	Result
Metals - Total										
Lead	7439-92-1	**400**	NS	mg/kg	254	**436**	330	317	**448**	11.1
Metals - TCLP										
Lead	7439-92-1	NS	5	mg/l	0.217 J	<0.125 U	0.335 J	0.281 J	0.155 J	<0.125 U
General Chemistry										
Solids, Percent	SOLID	NS	NS	Percent	86.8	88	85.9	86.9	83.5	82.1

Table 4
Site Management Plan
Lead Delineation Analytical Results

43-30 24th Street
Long Island City, Queens, New York
NYSDEC BCP Site No.: C241189
Langan Project No.: 170362702

Notes:

TCLP - Toxicity Characteristic Leaching Procedure
CAS - Chemical Abstract Service
NS - No standard
mg/l - milligram per liter
NA - Not analyzed
RL - Reporting limit
<RL - Not detected
Soil sample analytical results are compared to the New York State Department of Environmental Conservation (NYSDEC) Title 6 of the Official Compilation of New York Codes, Rules, and Regulations (NYCRR) Part 375 Restricted Use Restricted-Residential Soil Cleanup Objectives (SCO).
Soil sample analytical results are compared to the 6 New York Codes, Rules and Regulations (NYCRR) Part 371.3 and 40 CFR 261 Subpart C and Table 1 of 40 CFR 261.24 - Environmental Protection Agency (EPA) Resource Conservation and Recovery Act (RCRA) Characteristics of Hazardous Waste.

Qualifiers:

B - The analyte was found in the associated analysis batch blank.
J - The analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample.
UJ - The analyte was not detected at a level greater than or equal to the RL; however, the reported RL is approximate and may be inaccurate or imprecise.
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.

Exceedance Summary:

10 - Result exceeds NYSDEC Part 375 Restricted Use Restricted-Residential SCOs
10 - Result exceeds the RCRA Maximum Concentration of Contaminants for the Toxicity Characteristic

Table 5
Site Management Plan
Remaining Groundwater Analytical Results

43-30 24th Street
Long Island City, Queens, New York
NYSDEC BCP Site No.: C241189
Langan Project No.: 170362702

Sample ID Lab Sample ID Sample Date	NYSDEC TOGS SGV - Class GA	MW03_071217 460-136990-1 7/12/2017		MW06_071317 460-137167-2 7/13/2017		MW07_071017 460-136984-1 7/10/2017		MW08_071217 460-136990-2 7/12/2017		MW08_071317 460-137167-3 7/13/2017		MW09_071017 460-136984-2 7/10/2017		MW13_071317 460-137167-1 7/13/2017		DUP01_071317 460-137167-4 7/13/2017	
Volatile Organic Compounds (µg/L)																	
1,4-Dioxane	~	0.16	U	0.15	U	NT		NT		NT		NT		0.15	U	NT	
2-Butanone (MEK)	50	2.2	U	2.2	U	2.2	U	4.2	J	NT		2.2	U	2.2	U	2.2	U
Acetone	50	4.3	J	1.1	U	5.9	U	21		NT		5.5	U	1.1	U	1.1	U
Benzene	1	0.42	J	0.09	U	0.09	U	0.83	J	NT		0.09	U	0.09	U	0.09	U
Chloroform	7	0.22	U	0.39	J	0.3	J	0.22	U	NT		0.22	U	0.22	U	0.22	U
cis-1,2-Dichloroethene	5	3.2		0.26	U	0.26	U	1.4		NT		0.26	U	0.26	U	0.26	U
Methyl tert-butyl ether	~	0.13	U	0.13	U	0.13	U	2.3		NT		0.13	U	0.13	U F1	0.13	U
Tetrachloroethene	5	1.9		0.95	J	0.85	J	1.9		NT		0.12	U	0.12	U	0.12	U
Toluene	5	0.25	U	0.25	U	0.25	U	0.55	J	NT		0.25	U	0.25	U	0.25	U
Trichloroethene	5	1.9		0.34	J	1.9		0.32	J	NT		0.22	U	0.22	U	0.22	U
Vinyl chloride	2	0.68	J	0.06	U	0.06	U	0.06	U	NT		0.06	U	0.06	U	0.06	U
Semivolatile Organic Compounds (µg/L)																	
Bis(2-ethylhexyl) phthalate	5	0.76	U	0.76	U	0.72	U	NT		**7**		0.86	J	3		**7**	
Di-n-butyl phthalate	50	0.87	U	0.86	U	0.82	U	NT		0.94	J	0.82	U	0.86	U	0.86	U
Pesticides (µg/L)																	
Total Pesticides	~	ND		ND		ND		NT		ND		ND		ND		ND	
Polychlorinated Biphenyls (µg/L)																	
Total PCBs	0.09	0.1	U	0.1	U	0.1	U	NT		0.1	U	0.1	U	0.1	U	0.1	U
Total Metals (µg/L)																	
Aluminum	2000	**8300**		93.8		18.2	U	NT		1210		**3880**		1940		1470	
Antimony	6	0.97	J	0.62	U	0.62	U	NT		1	J	0.62	U	0.62	U	0.62	U
Arsenic	50	5		0.64	U	0.64	U	NT		1.6	J	2.8		0.92	J	0.77	J
Barium	2000	155		79.7		62.9		NT		62.3		90.6		228		229	
Beryllium	3	0.34	J	0.24	U	0.24	U	NT		0.24	U	0.24	U	0.24	U	0.24	U
Cadmium	10	0.71	U	0.71	U	1.6	J	NT		0.71	U	0.71	U	0.71	U	0.71	U
Calcium	~	110000		93100		102000		NT		274000		292000		316000		321000	
Chromium	100	24		1.3	U	1.3	U	NT		5.6		7.1		4.7		4	
Cobalt	~	11.1		1.3	U	2.7	J	NT		1.6	J	5.9		2.1	J	1.9	J
Copper	1000	44.4		1.4	U	5.4		NT		9.9		9.9		15.2		13.2	
Iron	300	**18100**		152		42.4	U	NT		**2320**		**6060**		**3050**		**2420**	
Lead	50	**57.8**		0.38	U	0.38	U	NT		7.9		14.7		17.2		15.4	
Magnesium	35000	**47500**		13600		16400		NT		34100		**221000**		**64500**		**65600**	
Manganese	300	**4200**		160		**1010**		NT		**665**		**1390**		209		194	
Nickel	200	27.7		2.1	J	9.2		NT		6.6		12.2		6.1		5.5	
Potassium	~	11200		4930		5760		NT		12900		39000		17600		17900	
Selenium	20	**27.5**		4.9	J	7.4	J	NT		0.73	U	**121**		**51.9**		**55.1**	
Silver	100	1.3	U	1.3	U	1.3	U	NT		1.3	U	1.3	U	1.3	U	1.3	U
Sodium	20000	**71400**		**190000**		**188000**		NT		**187000**		**114000**		**68600**		**69900**	
Thallium	0.5	0.26	U	0.26	U	0.26	U	NT		0.26	U	0.26	U	0.26	U	0.26	U
Vanadium	~	23.5		1.9	U	1.9	U	NT		3.5	J	8.6		5.2		4.2	
Zinc	5000	111		7	U	147		NT		20		38.6		34.1		30	
Cyanide	400	3.2	J	8.1	J	2	J	NT		2	U	3.7	J	18		15	
Mercury	1.4	0.17	U	0.17	U	0.17	U	NT		0.17	U	0.17	U	0.17	U	0.17	U
Dissolved Metals (µg/L)																	
Aluminum	2000	18.2	U	18.2	U	18.2	U	NT		33.3	J	18.2	U	18.2	U	18.2	U
Antimony	6	0.72	J	0.62	U	0.62	U	NT		0.62	U	0.62	U	0.62	U	0.62	U
Arsenic	50	1.9	J	0.64	U	0.64	U	NT		1.4	J	1.6	J	0.64	U	0.64	U
Barium	2000	91.3		82.1		60.4		NT		52.1		67.1		223		219	
Beryllium	3	0.24	U	0.24	U	0.24	U	NT		0.24	U	0.24	U	0.24	U	0.24	U
Cadmium	10	0.71	U	0.71	U	1.5	J	NT		0.71	U	0.71	U	0.71	U	0.71	U
Calcium	~	120000		96000		101000		NT		282000		323000		355000		357000	
Chromium	100	1.3	U	1.3	U	1.3	U	NT		1.3	U	1.3	U	1.3	U	1.3	U
Cobalt	~	3.6	J	1.3	U	2.3	J	NT		1.3	U	4.1		1.3	U	1.3	U
Copper	1000	2.5	J	1.4	U	4.4		NT		1.8	J	1.4	U	2.6	J	2.3	J
Iron	300	94.3	J	42.4	U	42.4	U	NT		42.4	U	**1430**		42.4	U	42.4	U
Lead	50	0.43	J	0.38	U	0.38	U	NT		0.38	U	0.38	U	0.5	J	0.48	J
Magnesium	35000	**51200**		13400		15900		NT		33200		**200000**		**64100**		**64500**	
Manganese	300	**4340**		150		**943**		NT		**579**		**1260**		65.9		62.5	
Nickel	200	7.6		1.8	J	8		NT		3.1	J	8		1.9	J	1.6	J
Potassium	~	11000		4920		5440		NT		12300		39400		18700		18600	
Selenium	20	**30.9**		4.6	J	7.8	J	NT		0.73	U	**137**		**56.9**		**57.7**	
Silver	100	1.3	U	1.3	U	1.3	U	NT		1.3	U	1.3	U	1.3	U	1.3	U
Sodium	20000	**82000**		**184000**		**161000**		NT		**179000**		**102000**		**72200**		**71800**	
Thallium	0.5	0.26	U	0.26	U	0.26	U	NT		0.26	U	0.26	U	0.26	U	0.26	U
Vanadium	~	1.9	U	1.9	U	1.9	U	NT		1.9	U	1.9	U	1.9	U	1.9	U
Zinc	5000	11.1	J	7	U	136		NT		7	U	18.4		9.9	J	7.3	J
Water Chemistry (mg/L, unless otherwise noted)																	
Dehalococcoides (cells/ml)	~	NT		NT		NT		0.5		NT		NT		NT		NT	
Sulfate	~	NT		NT		NT		910		NT		NT		NT		NT	
Alkalinity	~	NT		NT		NT		64.4		NT		NT		NT		NT	
Ammonia	~	NT		NT		NT		0.21		NT		NT		NT		NT	
Nitrate as N	~	NT		NT		NT		0.01	U	NT		NT		NT		NT	
Nitrite as N	~	NT		NT		NT		0.053	J	NT		NT		NT		NT	
Phosphorus as P	~	NT		NT		NT		0.12		NT		NT		NT		NT	
Phosphorus as PO4	~	NT		NT		NT		0.37		NT		NT		NT		NT	
Biochemical Oxygen Demand	~	NT		NT		NT		15.9		NT		NT		NT		NT	
Chemical Oxygen Demand	~	NT		NT		NT		50.3		NT		NT		NT		NT	
Total Organic Carbon	~	NT		NT		NT		16.5		NT		NT		NT		NT	

Notes
1. Groundwater results are compared to the New York State Department of Environmental Conservation (NYSDEC) Technical and Operational Guidance Series (TOGS) 1.1.1 Ambient Water Quality Standards and Guidance Values (SGV) for Class GA groundwater.
2. Only analytes with detections are shown in the table.
3. Concentrations exceeding their NYSDEC TOGS SGV are shaded and bolded.
4. µg/L = Micrograms per Liter
5. mg/L = Milligrams per Liter
6 ~ = Criterion does not exist
7. ND = Not Detected
8. NT = Not Tested
9. cells/ml = Cells per Milliliter
10. Sample "DUP01_071317" is a field duplicate of Sample "MW13_071317".

Qualifiers
J = Result is less than the Reporting Limit (RL) but greater than or equal to the Method Detection Limit (MDL) and the concentration is an approximate value.
U = Indicates the analyte was analyzed for but not detected.
F1 = Matrix Spike (MS) and/or Matrix Spike Duplicate (MSD) Recovery is outside acceptance limits.

Table 5
Site Management Plan
Remaining Groundwater Analytical Results

43-30 24th Street
Long Island City, Queens, New York
NYSDEC BCP Site No.: C241189
Langan Project No.: 170362702

Sample ID **Sampling Date** **Lab Sample ID**	**MW03_071217** **460-136990-1** **7/12/2017**		**FB02_071217** **460-136990-3** **7/12/2017**		**MW06_071317** **320-29887-2** **7/13/2017**		**FB04_071317** **320-29887-4** **7/13/2017**		**MW13_071317** **320-29887-1** **7/13/2017**		**FB03_071317** **320-29887-3** **7/13/2017**	
Perflourinated Chemical (17-compound list) (ng/L)												
Perfluorobutanesulfonic acid (PFBS)	3.39		0.88	U	18.1		0.9	U	11.8		0.89	U
Perfluorobutanoic acid (PFBA)	30.90	B	1.92	U	16.4	B	1.95	U	16.2	J	1.93	U
Perfluorodecanesulfonic acid (PFDS)	1.20	U	1.16	U	1.2	U	1.18	U	1.14	U	1.17	U
Perfluorodecanoic acid (PFDA)	2.85		0.59	J	0.44	U	0.43	U	0.42	U	0.42	U
Perfluorododecanoic acid (PFDoA)	0.58	U	0.60	J	0.58	U	0.57	U	0.55	U	0.56	U
Perfluoroheptanesulfonic Acid (PFHpS)	0.71	U	0.68	U	0.71	U	0.7	U	0.67	U	0.69	U
Perfluoroheptanoic acid (PFHpA)	3.41		0.77	U	17.8		0.78	U	13.2		0.77	U
Perfluorohexanesulfonic acid (PFHxS)	1.30	J	0.84	U	2.71		0.85	U	5.22		0.84	U
Perfluorohexanoic acid (PFHxA)	7.36		0.75	U	25.1		0.77	U	13.4		0.76	U
Perfluorononanoic acid (PFNA)	1.04	J	0.63	U	3.91		0.64	U	0.62	U	0.63	U
Perfluorooctane Sulfonamide (FOSA)	0.84	J	0.77	J	0.63	UJ	0.62	U	1.96	J	38.6	U
Perfluorooctanesulfonic acid (PFOS)	7.36		1.23	U	17.2		1.25	U	1.9		1.23	U
Perfluorooctanoic acid (PFOA)	15.10		0.72	U	56.5		0.73	U	37.9		0.72	U
Perfluoropentanoic acid (PFPeA)	18.80		0.95	U	25.7		0.97	U	17		0.96	U
Perfluorotetradecanoic acid (PFTeA)	0.20	U	1.92	U	0.2	U	0.19	U	1.89	U	0.19	U
Perfluorotridecanoic Acid (PFTriA)	0.55	U	0.66	J	0.55	U	0.54	U	0.52	U	0.53	U
Perfluoroundecanoic acid (PFUnA)	0.74	U	0.72	U	0.74	U	0.73	U	0.71	U	0.72	U
Total PFOS and PFOA	22.5		ND		73.7		ND		39.8		ND	

Notes

1. Regulatory comparison criteria for perfluorinated chemicals are not currently established.
2. All analytes are shown in the table.
3. ng/L = Nanograms per Liter
4. ND = Not Detected
5. The following field blanks and primary samples were collected simultaniously: MW03_071217 and FB02_071217; MW06_071317 and FB04_071317; and MW13_071317 and FB03_71317

Qualifiers

J = Result is less than the Reporting Limit (RL) but greater than or equal to the Method Detection Limit (MDL) and the concentration is an approximate value.
U = Indicates the analyte was analyzed for but not detected.
UJ = The analyte was not detected at a level greater than or equal to the RL; however, the reported RL is approximate and may be inaccurate or imprecise.
B = Compound was found in the blank and sample.

Table 6
Site Management Plan
Remaining Soil Vapor Analytical Results

43-30 24th Street
Long Island City, Queens, New York
NYSDEC BCP Site No.: C241189
Langan Project No.: 170362702

Sample ID Lab Sample ID Sampling Date	NYSDOH Decision Matrix Values	AA01_063017 200-39191-4 6/30/2017		SV01_063017 200-39191-2 6/30/2017		DUP01_063017 200-39191-3 6/30/2017		SV02_063017 200-39191-1 6/30/2017	
Volatile Organic Compounds (µg/m^3)									
1,2,4-Trimethylbenzene	~	0.98	U	**13**	J	**14**	J	**12**	J
1,3-Butadiene	~	0.44	U	**19**		**22**		**9.6**	J
1,3-Dichlorobenzene	~	1.2	U	**12**	J	**11**	J	40	U
Acetone	~	9.5	J	**1900**		**1900**		**1900**	
Benzene	~	0.43	J	**5.2**	J	**5.3**	J	**6.5**	J
Carbon disulfide	~	1.6	U	56	U	53	U	**29**	J
Carbon tetrachloride	6	0.31		9.1	U	8.5	U	8.4	U
Chloroform	~	0.13	J	35	U	33	U	32	U
Chloromethane	~	0.89	J	37	U	35	U	34	U
Cyclohexane	~	0.26	J	**9.4**	J	**8.5**	J	23	U
Dichlorodifluoromethane	~	1.7	J	89	U	84	U	82	U
Ethylbenzene	~	0.28	J	**8.5**	J	**9**	J	**7.5**	J
Freon 22	~	1.2	J	**340**		**320**		**23**	J
Freon TF	~	0.36	J	55	U	52	U	51	U
Isopropyl alcohol	~	12	U	**250**	J	**250**	J	**110**	J
m,p-Xylene	~	0.86	J	**28**	J	**31**	J	**24**	J
Methyl Butyl Ketone (2-Hexanone)	~	2	U	74	U	69	U	**40**	J
Methyl Ethyl Ketone	~	1.3	J	**250**		**480**		**420**	
methyl isobutyl ketone	~	0.36	J	74	U	69	U	68	U
Methylene Chloride	100	1	J	**13**	J	**13**	J	**13**	J
n-Butane	~	2.4		**150**		**160**		**45**	
n-Heptane	~	0.39	J	**13**	J	**13**	J	**16**	J
n-Hexane	~	0.78		**28**		**27**		**17**	J
Styrene	~	0.85	U	31	U	29	U	**5.4**	J
Tetrachloroethene	100	0.24	J	*49*	U	*46*	U	**4.7**	J
Toluene	~	1.8		**39**		**39**		**26**	
Trichloroethene	6	0.21	U	7.8	U	7.3	U	**31**	
Trichlorofluoromethane	~	0.89	J	41	U	38	U	**87**	
Xylene (total)	~	1.2	J	**39**	J	**42**	J	**34**	J
o-Xylene	~	0.29	J	**11**	J	**11**	J	**10**	J
Total VOCs	~	46.3		3263.1		3481.8		4119.1	

Notes:

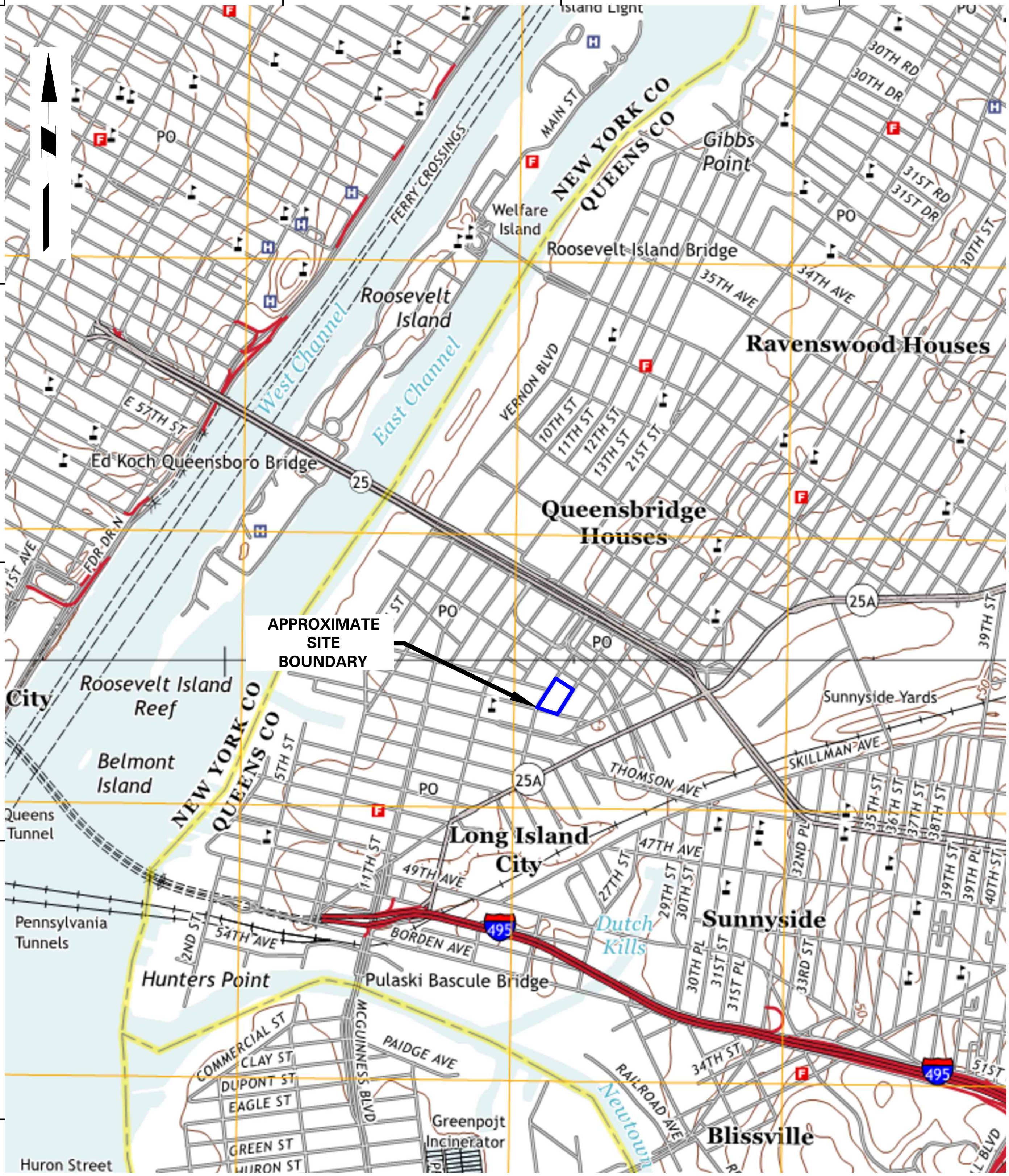
1. Soil vapor sample results were compared to the ambient air sample results, and the New York State Department of Health (NYSDOH) Air Guidance Values (AGVs) - Table 3.1; and the lowest concentration (absent indoor air) that trigger a mitigation recomendation as shown in the NYSDOH Soil Vapor/Indoor Air Matrices A, B &C (revised May 2017)
2. Only detected analytes are shown in the table.
3. Soil vapor results that are greater than the respective ambient air results are bolded.
4. Soil vapor results that are greater than the minimum NYSDOH matrix value recomending monitoring or mitigation are shaded and bolded.
5. µg/m^3 = Micrograms per Cubic Meter
6. AA01_063017 is an ambient air sample.
7. DUP01_063017 is a duplicate sample of SV01_063017.

Qualifiers:

J = Result is less than the Reporting Limit (RL) but greater than or equal to the Method Detection Limit (MDL) and the concentration is an approximate value.

U = Indicates the analyte was analyzed for but not detected.

FIGURES



MAP REFERENCE: USGS 7.5-MINUTE TOPOGRAPHIC QUADRANGLE of BROOKLYN AND QUEENS, DATED 2016

LANGAN	Project	Figure Title	Project No.	Figure
300 Kimball Drive Parsippany, NJ 07054 T: 973.560.4900 F: 973.560.4901 www.langan.com	43-30 24TH STREET	SITE LOCATION MAP	170362702	1
Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C. Langan Engineering and Environmental Services, Inc. Langan CT, Inc. Langan International LLC Collectively known as Langan	BLOCK No. 436, LOT No. 1 LONG ISLAND CITY NEW YORK		Date: 11/17/2023 Scale: NTS Drawn By: KAG Checked By: JF Submission Date	Sheet 1 of 11

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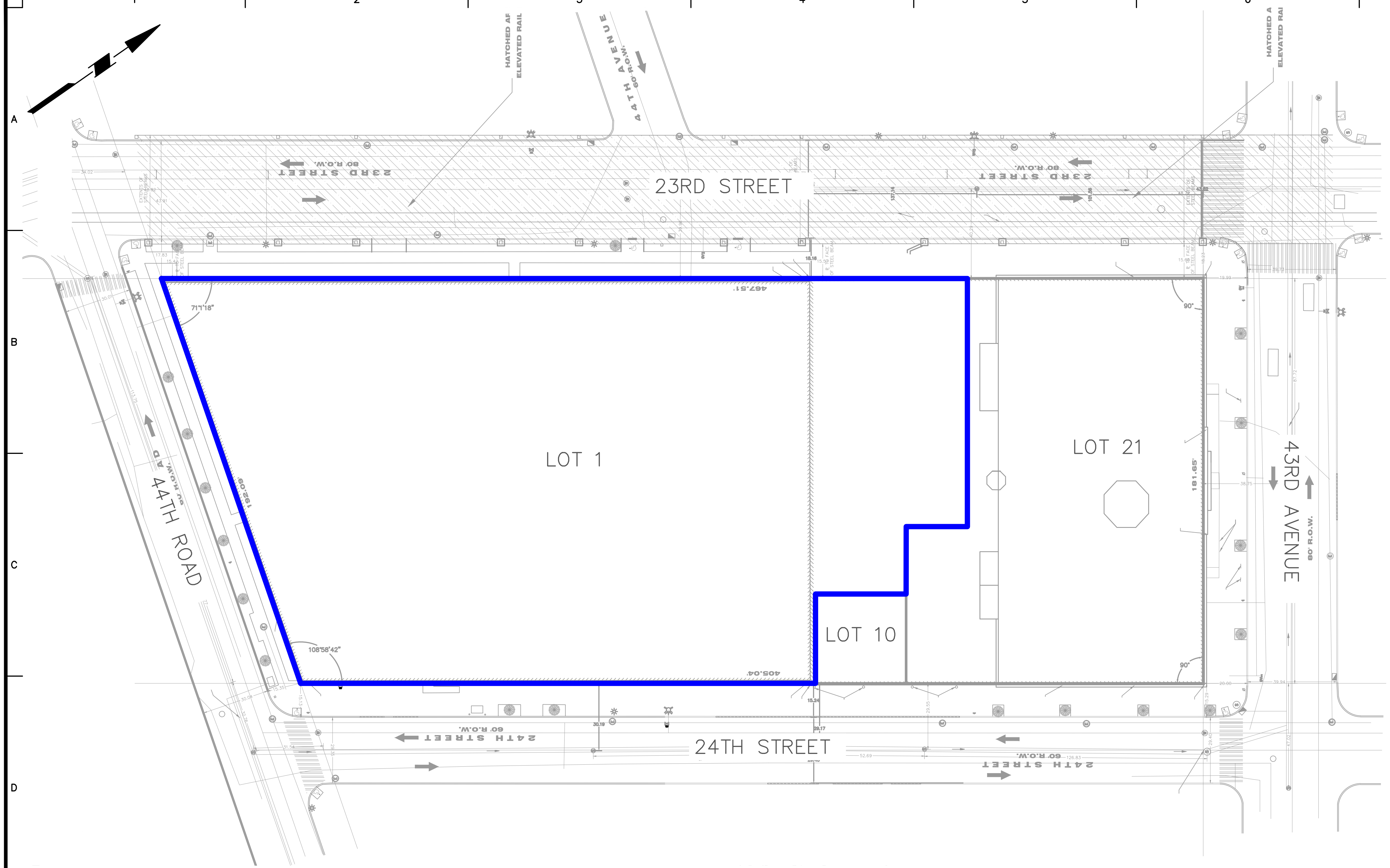
Filename: \\langan.com\data\NYC\data7\170362701\Cadd Data - 170362701\SheetFiles\Environmental\BCP FER\SMP\Figure 1 - Site Location Map USGS_PAR.dwg Date: 12/18/2023 Time: 14:15 User: kgioia Style Table: Langan.stb Layout: ANSIA-BP



LEGEND:

SITE/INSTITUTIONAL CONTROL BOUNDARY

NOTE:

BASE MAP TAKEN FROM ARCHITECTURAL SURVEY OF 23-10 43RD AVENUE ISSUED BY TRUE NORTH SURVEYORS ON MAY 5, 2016.

50 0 25 50

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Project	Figure Title	Project No.	Figure No.
43-30 24TH STREET BLOCK No. 436, LOT No. 1 LONG ISLAND CITY NEW YORK	SITE LAYOUT PLAN AND INSTITUTIONAL CONTROL BOUNDARY	170362702 Date: 11/16/2023 Scale: 1"=50' Drawn By: KAG Checked By: JF Submission Date	2 Sheet 2 of 11

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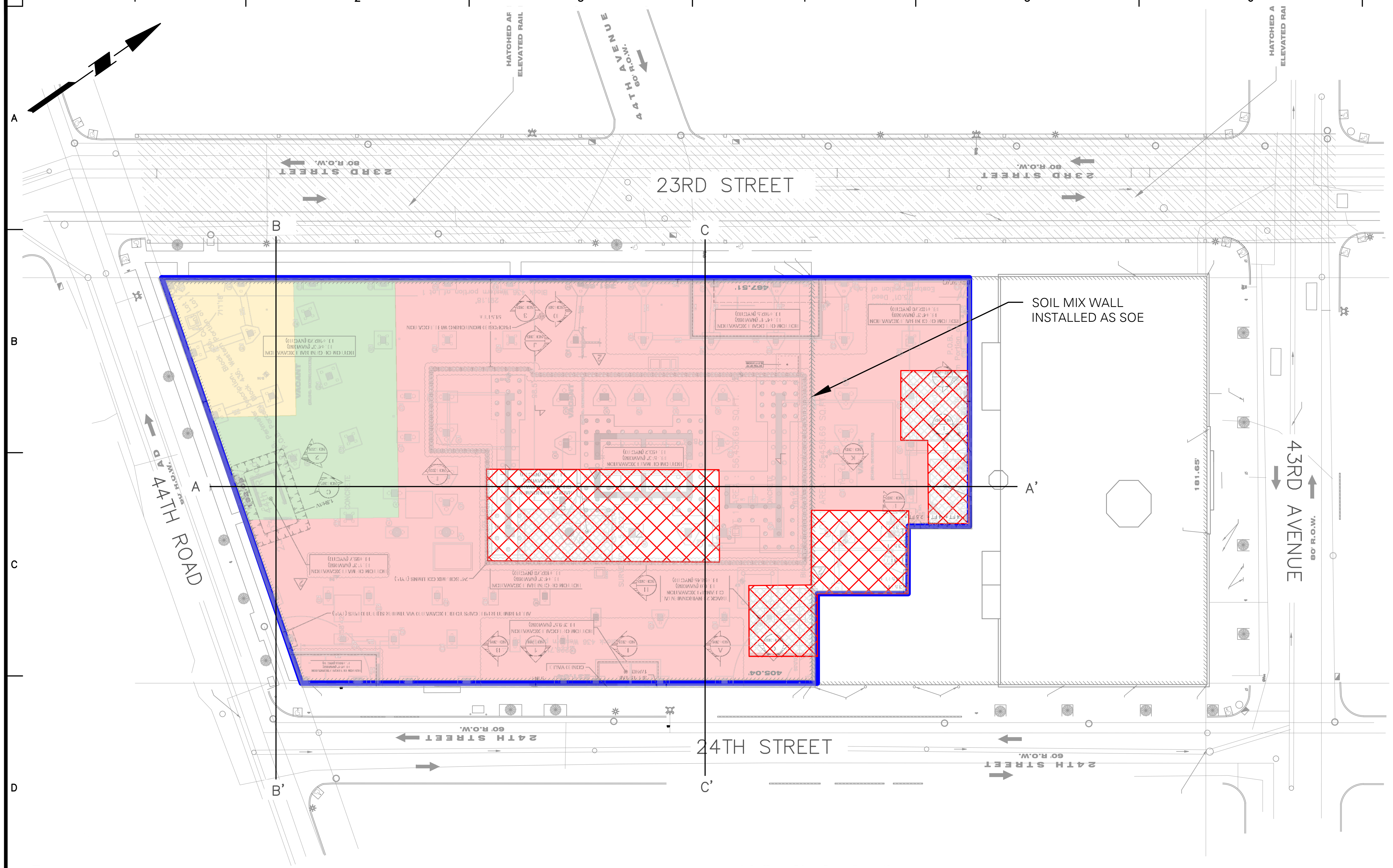

LEGEND:

SITE BOUNDARY

EXTENT OF REMEDIAL EXCAVATION OF SOIL EXCEEDING RR SCOs TO ABOUT 4 FEET BGS.

EXTENT OF REMEDIAL EXCAVATION OF SOIL EXCEEDING RR SCOs TO ABOUT 11 FEET BGS.

EXTENT OF REMEDIAL EXCAVATION OF SOIL EXCEEDING RR SCOs TO ABOUT 12 TO 13 FEET BGS.

EXTENT OF REMEDIAL EXCAVATION OF SOIL EXCEEDING RR SCOs TO ABOUT 15 FEET BGS.

NOTES:

1. BASE MAPS TAKEN FROM ARCHITECTURAL SURVEY OF 23-10 43RD AVENUE ISSUED BY TRUE NORTH SURVEYORS ON MAY 5, 2016 AND SUPPORT OF EXCAVATION PLAN ISSUED BY HILL WEST ON NOVEMBER 7, 2022.
2. ALL LOCATIONS APPROXIMATE
3. RR SCOs = RESTRICTED USE RESTRICTED-RESIDENTIAL SOIL CLEANUP OBJECTIVES
4. BGS = BELOW GROUND SURFACE
5. SOE = SUPPORT OF EXCAVATION

50 0 25 50

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Project	Figure Title	Project No.	Figure No.
43-30 24TH STREET BLOCK No. 436, LOT No. 1 LONG ISLAND CITY NEW YORK	REMEDIAL EXCAVATION EXTENTS MAP	Date: 12/07/2023 Scale: 1"=50' Drawn by: KAG Checked by: JF Submission Date	3 Sheet 3 of 11

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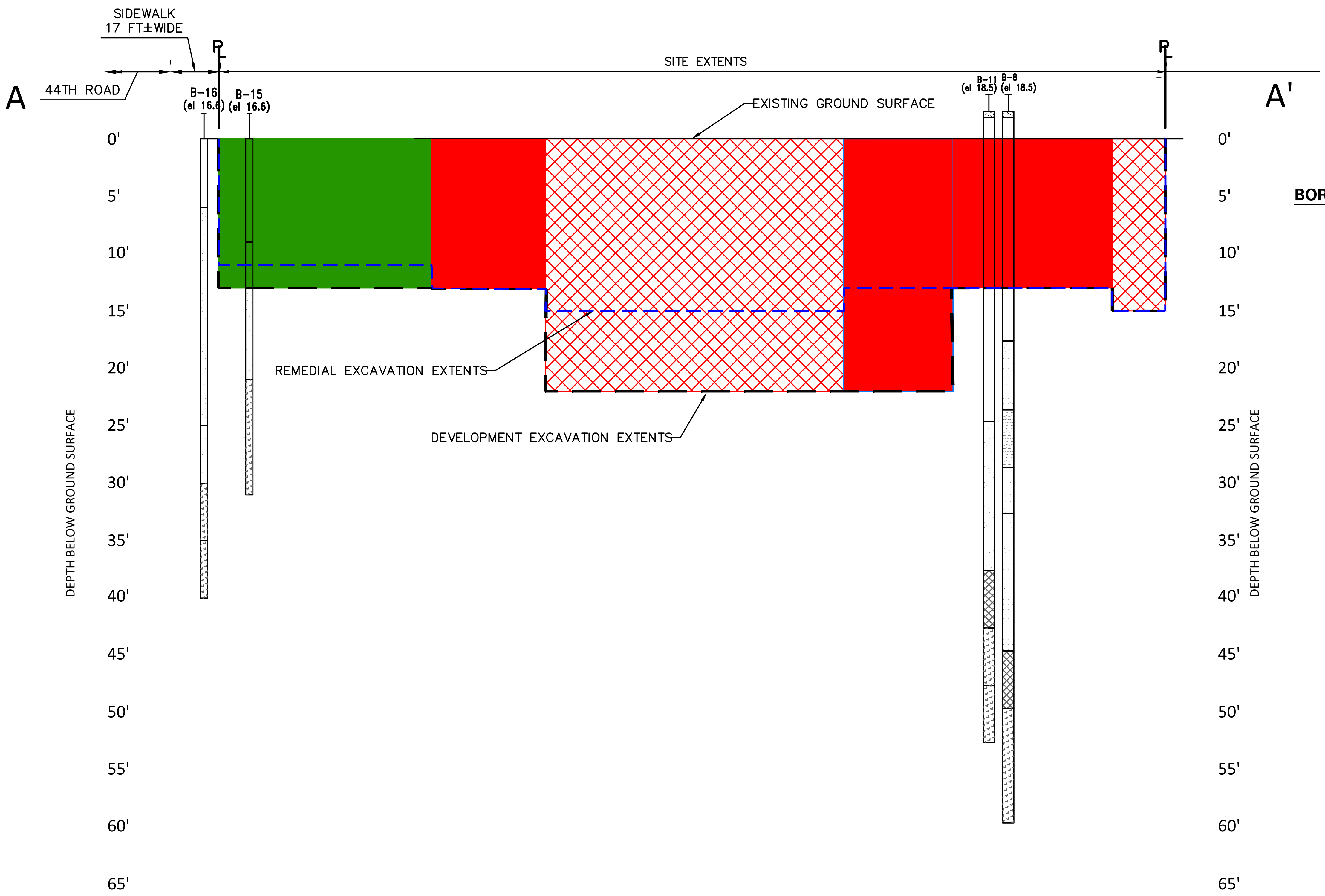
Filename: \\langan.com\data\NYC\data7\170362701\Cadd Data - 170362701\SheetFiles\Environmental\BCP FER\SMP\Figure 3 - Remedial Excavation Extents Map_PAR.dwg Date: 12/18/2023 Time: 14:14 User: kgioia Style Table: Langan.stb Layout: FIG 12 - TRACK 2



BORING KEY

B — BORING IDENTIFICATION

EL — GROUND SURFACE ELEVATION AT TIME OF BORING

MATERIAL SYMBOLS

- BEDROCK
- WEATHERED ROCK
- SAND
- PEAT
- UNCONTROLLED FILL

LEGEND:

- EXTENT OF REMEDIAL EXCAVATION OF SOIL EXCEEDING RURR SCOs TO ABOUT 11 FEET BGS. CONSTRUCTION EXCAVATION IN THIS AREA EXTENDED TO ABOUT 12 TO 13 FEET BGS
- EXTENT OF REMEDIAL EXCAVATION OF SOIL EXCEEDING RURR SCOs TO ABOUT 12 TO 13 FEET BGS. CONSTRUCTION EXCAVATION IN THIS AREA EXTENDED TO ABOUT 12 TO 13 FEET BGS OUTSIDE OF THE SOIL MIX WALL AND TO ABOUT 22 FEET WITHIN THE SOIL MIX WALL
- REMEDIAL EXCAVATION TO A MAXIMUM DEPTH OF 15 FEET BGS. CONSTRUCTION EXCAVATION IN THIS AREA EXTENDED TO A MAXIMUM OF 15 FEET BGS OUTSIDE OF THE SOIL MIX WALL AND TO ABOUT 22 FEET WITHIN THE SOIL MIX WALL
- REMEDIAL EXCAVATION EXTENTS
- DEVELOPMENT EXCAVATION EXTENTS

NOTES:

1. ALL LOCATIONS APPROXIMATE
2. RURR SCOs = RESTRICTED USE RESTRICTED-RESIDENTIAL SITE CLEANUP OBJECTIVES
3. BGS = BELOW GROUND SURFACE
4. SOE = SUPPORT OF EXCAVATION
5. BORING LOGS TAKEN FROM GEOTECHNICAL ENGINEERING REPORT FOR 43-16 24TH STREET & 23-03 44TH ROAD, DATED JUNE 3, 2016, PREPARED BY LANGAN

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Project	Figure Title	Project No. 170362701	Figure No.
43-30 24TH STREET BLOCK No. 436, LOT No. 1 LONG ISLAND CITY NEW YORK	SUBSURFACE PROFILE A-A'	Date 12/14/2023 Scale AS SHOWN Drawn By AR / Checked By KG Submission Date 12/14/2023	3A Sheet 4 of 11

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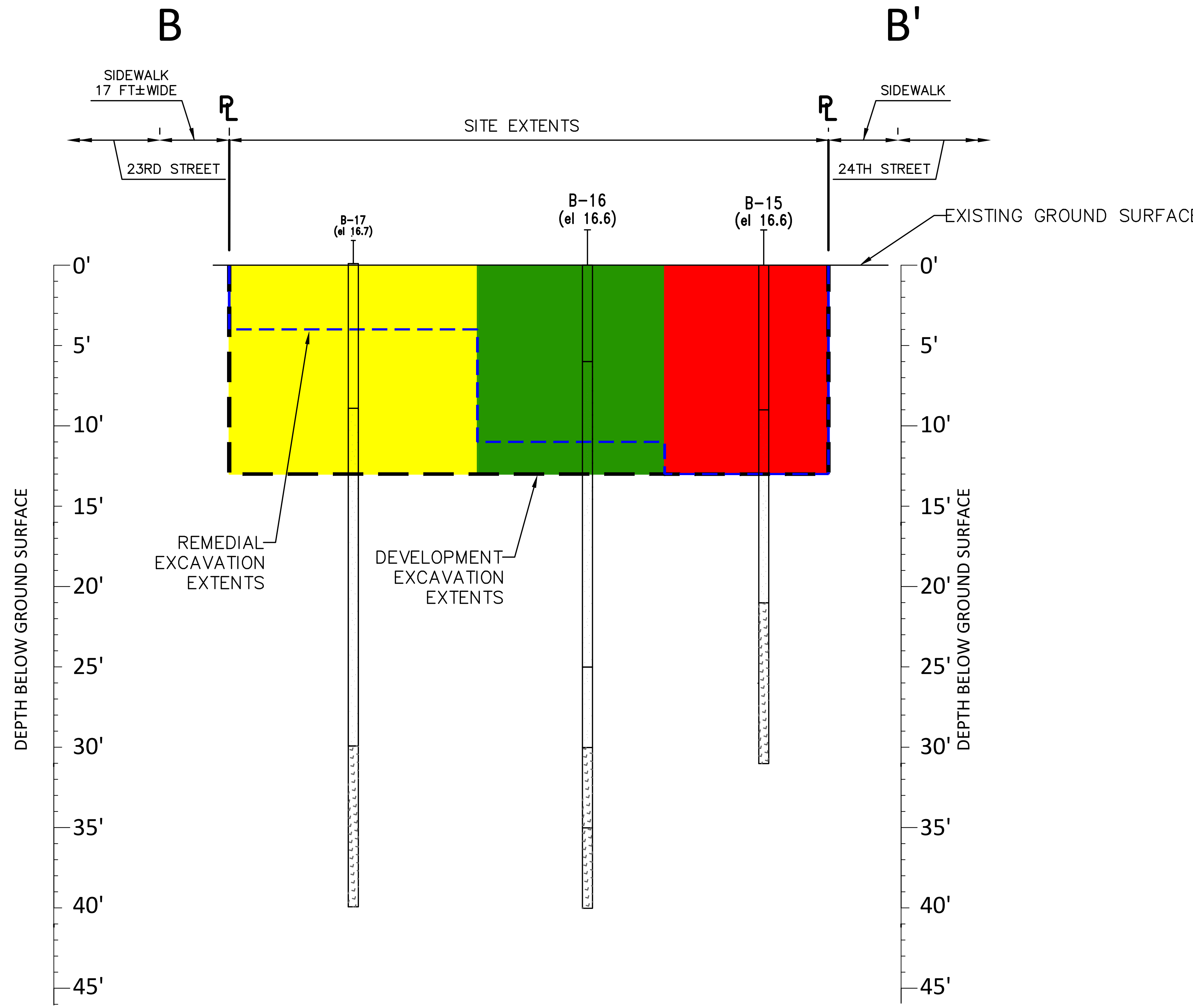
BORING KEY

B — BORING IDENTIFICATION

EL — GROUND SURFACE ELEVATION AT TIME OF BORING

MATERIAL SYMBOLS

- BEDROCK
- WEATHERED ROCK
- SAND
- PEAT
- UNCONTROLLED FILL



LEGEND:

(yellow)	EXTENT OF REMEDIAL EXCAVATION OF SOIL EXCEEDING RURR SCOs TO ABOUT 4 FEET BGS. CONSTRUCTION EXCAVATION IN THIS AREA EXTENDED TO ABOUT 12 TO 13 FEET BGS
(green)	EXTENT OF REMEDIAL EXCAVATION OF SOIL EXCEEDING RURR SCOs TO ABOUT 11 FEET BGS. CONSTRUCTION EXCAVATION IN THIS AREA EXTENDED TO ABOUT 12 TO 13 FEET BGS
(red)	EXTENT OF REMEDIAL EXCAVATION OF SOIL EXCEEDING RURR SCOs TO ABOUT 12 TO 13 FEET BGS. CONSTRUCTION EXCAVATION IN THIS AREA EXTENDED TO ABOUT 12 TO 13 FEET BGS OUTSIDE OF THE SOIL MIX WALL AND TO ABOUT 22 FEET WITHIN THE SOIL MIX WALL
(red hatch)	REMEDIAL EXCAVATION TO A MAXIMUM DEPTH OF 15 FEET BGS. CONSTRUCTION EXCAVATION IN THIS AREA EXTENDED TO A MAXIMUM OF 15 FEET BGS OUTSIDE OF THE SOIL MIX WALL AND TO ABOUT 22 FEET WITHIN THE SOIL MIX WALL
(blue dashed line)	REMEDIAL EXCAVATION EXTENTS
(black dashed line)	DEVELOPMENT EXCAVATION EXTENTS

NOTES:

1. ALL LOCATIONS APPROXIMATE
2. RURR SCOs = RESTRICTED USE RESTRICTED-RESIDENTIAL SITE CLEANUP OBJECTIVES
3. BGS = BELOW GROUND SURFACE
4. SOE = SUPPORT OF EXCAVATION
5. BORING LOGS TAKEN FROM GEOTECHNICAL ENGINEERING REPORT FOR 43-16 24TH STREET & 23-03 44TH ROAD, DATED JUNE 3, 2016, PREPARED BY LANGAN

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Project	Figure Title	Project No. / Date / Scale	Figure No.
43-30 24TH STREET BLOCK No. 436, LOT No. 1 LONG ISLAND CITY NEW YORK	SUBSURFACE PROFILE B-B′	Project No. 170362701 Date 12/14/2023 Scale AS SHOWN Drawn By AR / Checked By KG Submission Date 12/14/2023	3B Sheet 5 of 11

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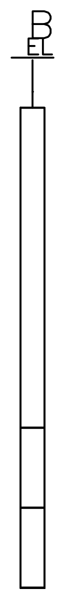
BORING KEY



B BORING IDENTIFICATION

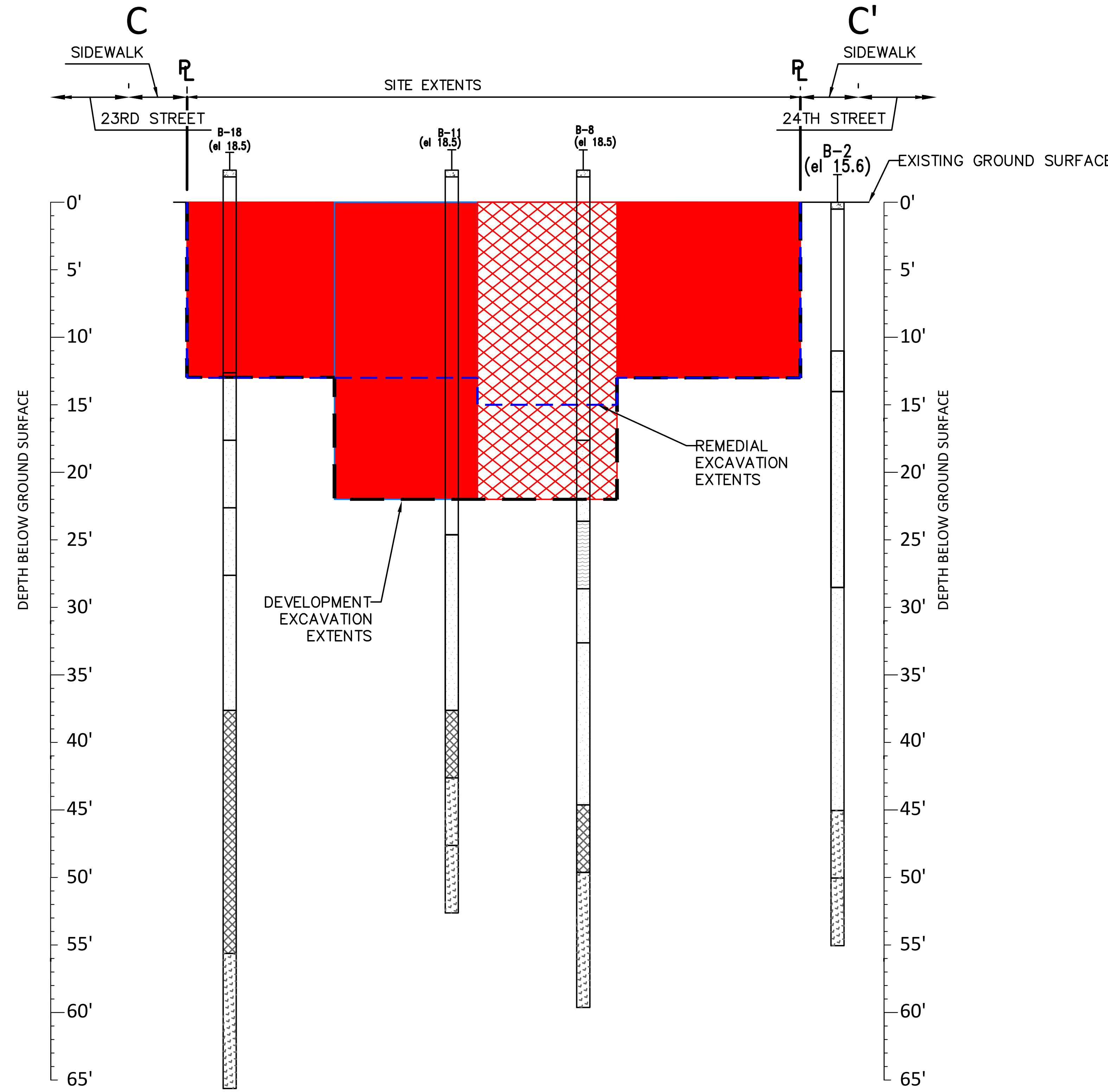
EL GROUND SURFACE ELEVATION AT TIME OF BORING

MATERIAL SYMBOLS

- BEDROCK
- WEATHERED ROCK
- SAND
- PEAT
- UNCONTROLLED FILL

LEGEND:

- EXTENT OF REMEDIAL EXCAVATION OF SOIL EXCEEDING RURR SCOs TO ABOUT 12 TO 13 FEET BGS. CONSTRUCTION EXCAVATION IN THIS AREA EXTENDED TO ABOUT 12 TO 13 FEET BGS OUTSIDE OF THE SOIL MIX WALL AND TO ABOUT 22 FEET WITHIN THE SOIL MIX WALL
- REMEDIAL EXCAVATION TO A MAXIMIUM DEPTH OF 15 FEET BGS. CONSTRUCTION EXCAVATION IN THIS AREA EXTENDED TO A MAXIMUM OF 15 FEET BGS OUTSIDE OF THE SOIL MIX WALL AND TO ABOUT 22 FEET WITHIN THE SOIL MIX WALL
- REMEDIAL EXCAVATION EXTENTS
- DEVELOPMENT EXCAVATION EXTENTS



NOTES:

1. ALL LOCATIONS APPROXIMATE
2. RURR SCOs = RESTRICTED USE RESTRICTED-RESIDENTIAL SITE CLEANUP OBJECTIVES
3. BGS = BELOW GROUND SURFACE
4. SOE = SUPPORT OF EXCAVATION
5. BORING LOGS TAKEN FROM GEOTECHNICAL ENGINEERING REPORT FOR 43-16 24TH STREET & 23-03 44TH ROAD, DATED JUNE 3, 2016, PREPARED BY LANGAN

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Project	Figure Title	Project No. 170362701	Figure No.
43-30 24TH STREET BLOCK No. 436, LOT No. 1 LONG ISLAND CITY NEW YORK	SUBSURFACE PROFILE C-C'	Date 12/06/2023 Scale AS SHOWN Drawn By AR / Checked By KG Submission Date 12/06/2023	3C Sheet 6 of 11

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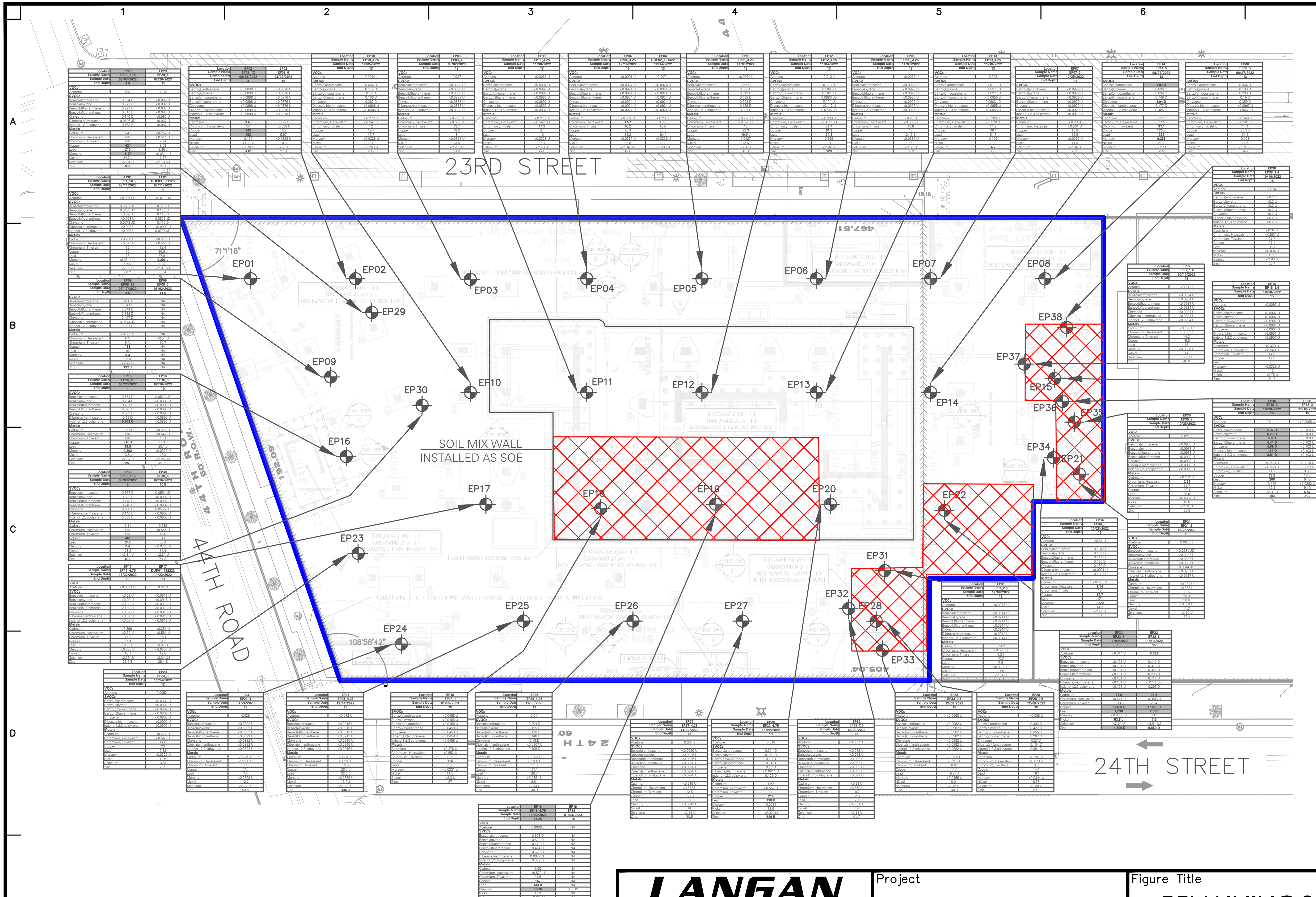

LEGEND:

APPROXIMATE SITE BOUNDARY

EP01 APPROXIMATE DOCUMENTATION/ CONFIRMATION BASE SOIL SAMPLE LOCATION

APPROXIMATE HOT SPOT EXCAVATION TO 15 FEET BELOW GRADE SURFACE

NOTES:

1. ALL LOCATIONS ARE APPROXIMATE.
2. BASE MAP TAKEN FROM ARCHITECTURAL SURVEY OF 23-10 43RD AVENUE ISSUED BY TRUE NORTH SURVEYORS ON MAY 5, 2016 AND SUPPORT OF EXCAVATION PLAN ISSUED BY HILL WEST ON NOVEMBER 7, 2022.
3. SOIL SAMPLE ANALYTICAL RESULTS ARE COMPARED TO TITLE 6 OF THE NEW YORK CODES, RULES AND REGULATIONS (NYCRR) PART 375 UNRESTRICTED USE AND RESTRICTED USE RESTRICTED-RESIDENTIAL SOIL CLEANUP OBJECTIVES (SCOs).
4. ALL ANALYTICAL RESULTS ARE SHOWN IN MILLIGRAMS PER KILOGRAM (MG/KG).
5. SOE = SUPPORT OF EXCAVATION
6. BGS = BELOW GRADE SURFACE
7. MATERIAL REPRESENTED BY GRAYED DOCUMENTATION/ENDPOINT SOIL SAMPLE LOCATION HEADINGS WAS OVER-EXCAVATED BASED ON THE ANALYTICAL RESULTS AND IS NO LONGER PRESENT.

Analyte	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs
VOCs		
Acetone	0.05	100
SVOCs		
Benzo(a)anthracene	1	1
Benzo(a)pyrene	1	1
Benzo(b)fluoranthene	1	1
Benzo(k)fluoranthene	0.8	3.9
Chrysene	1	3.9
Dibenz(a,h)anthracene	0.33	0.33
Indeno(1,2,3-cd)pyrene	0.5	0.5
Metals		
Cadmium	2.5	4.3
Chromium, Hexavalent	1	110
Chromium, Trivalent	30	180
Copper	50	270
Lead	63	400
Mercury	0.18	0.81
Nickel	30	310
Selenium	3.9	180
Zinc	109	10000

Exceedance Summary:

10 - Result exceeds Unrestricted Use SCOs

10 - Result exceeds Restricted Use Restricted-Residential SCOs

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Project

43-30 24TH STREET

BLOCK No. 436, LOT No. 1

LONG ISLAND CITY NEW YORK

Figure Title

REMAINING SOIL SAMPLE ANALYTICAL RESULTS SUMMARY

Project No. 170362702

Date 11/16/2023

Scale 1"=40'

Drawn By KAG

Checked By JF

Submission Date

Figure No. 4

Sheet 7 of 11

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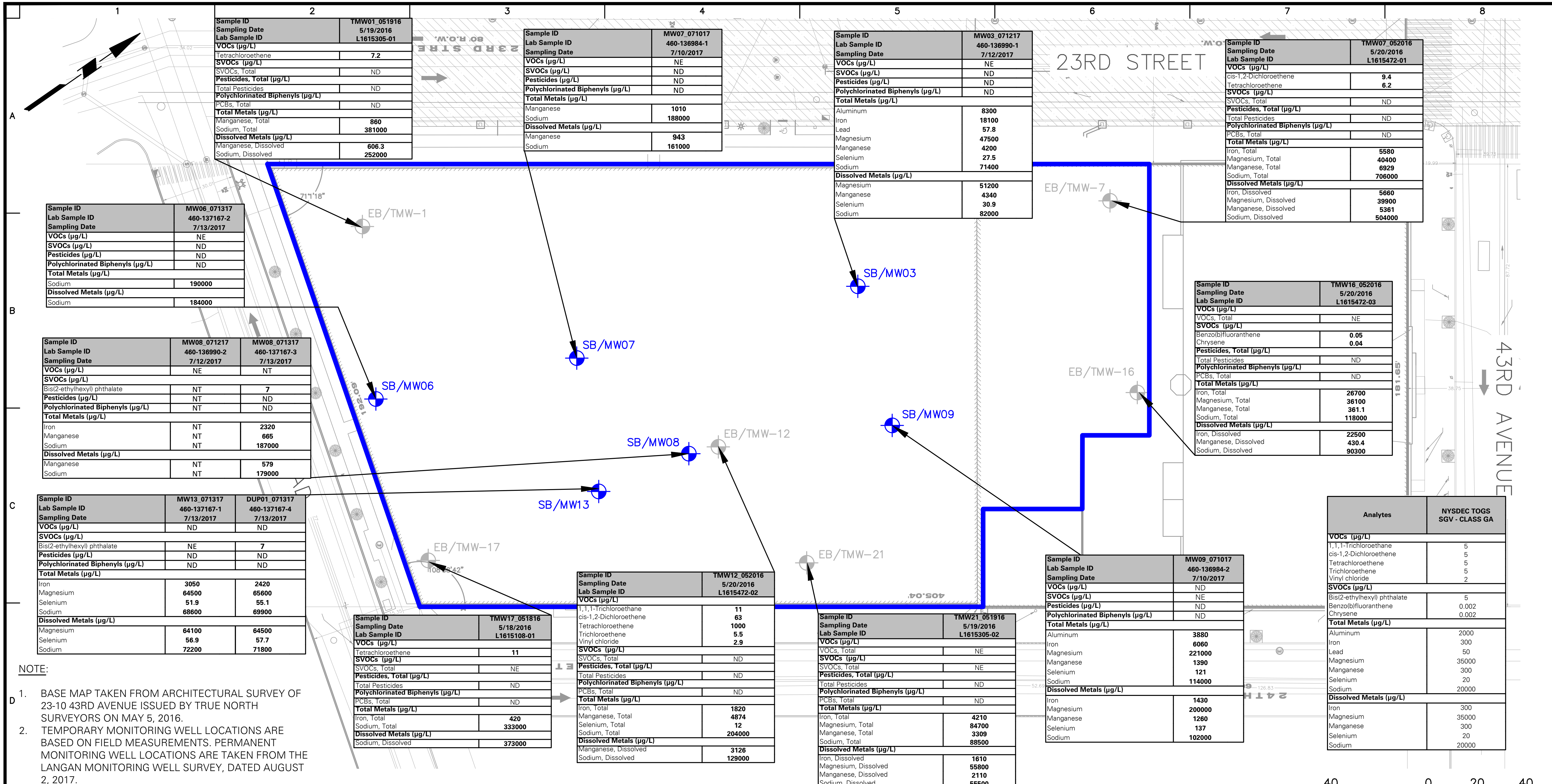
Filename: \\langan.com\data\NYC\data7\170362701\Cadd Data - 170362701\SheetFiles\Environmental\BCP FER\SMP\Figure 4 - Remaining Soil Sample Analytical Results Summary_PAR.dwg Date: 12/18/2023 Time: 16:36 User: kgioia Style Table: Langan.stb Layout: ANSIB-BL



Sample ID	TMW01_051916
Sampling Date	5/19/2016
Lab Sample ID	L1615305-01
VOCs (µg/L)	
Tetrachloroethene	**7.2**
SVOCs (µg/L)	
SVOCs, Total	ND
Pesticides, Total (µg/L)	
Total Pesticides	ND
Polychlorinated Biphenyls (µg/L)	
PCBs, Total	ND
Total Metals (µg/L)	
Manganese, Total	**860**
Sodium, Total	**381000**
Dissolved Metals (µg/L)	
Manganese, Dissolved	**606.3**
Sodium, Dissolved	**252000**

Sample ID	MW07_071017
Lab Sample ID	460-136984-1
Sampling Date	7/10/2017
VOCs (µg/L)	NE
SVOCs (µg/L)	ND
Pesticides (µg/L)	ND
Polychlorinated Biphenyls (µg/L)	ND
Total Metals (µg/L)	
Manganese	**1010**
Sodium	**188000**
Dissolved Metals (µg/L)	
Manganese	**943**
Sodium	**161000**

Sample ID	MW03_071217
Lab Sample ID	460-136990-1
Sampling Date	7/12/2017
VOCs (µg/L)	NE
SVOCs (µg/L)	ND
Pesticides (µg/L)	ND
Polychlorinated Biphenyls (µg/L)	ND
Total Metals (µg/L)	
Aluminum	**8300**
Iron	**18100**
Lead	**57.8**
Magnesium	**47500**
Manganese	**4200**
Selenium	**27.5**
Sodium	**71400**
Dissolved Metals (µg/L)	
Magnesium	**51200**
Manganese	**4340**
Selenium	**30.9**
Sodium	**82000**

Sample ID	TMW07_052016
Sampling Date	5/20/2016
Lab Sample ID	L1615472-01
VOCs (µg/L)	
cis-1,2-Dichloroethene	**9.4**
Tetrachloroethene	**6.2**
SVOCs (µg/L)	
SVOCs, Total	ND
Pesticides, Total (µg/L)	
Total Pesticides	ND
Polychlorinated Biphenyls (µg/L)	
PCBs, Total	ND
Total Metals (µg/L)	
Iron, Total	**5580**
Magnesium, Total	**40400**
Manganese, Total	**6929**
Sodium, Total	**706000**
Dissolved Metals (µg/L)	
Iron, Dissolved	**5660**
Magnesium, Dissolved	**39900**
Manganese, Dissolved	**5361**
Sodium, Dissolved	**504000**

Sample ID	MW06_071317
Lab Sample ID	460-137167-2
Sampling Date	7/13/2017
VOCs (µg/L)	NE
SVOCs (µg/L)	ND
Pesticides (µg/L)	ND
Polychlorinated Biphenyls (µg/L)	ND
Total Metals (µg/L)	
Sodium	**190000**
Dissolved Metals (µg/L)	
Sodium	**184000**

Sample ID	TMW16_052016
Sampling Date	5/20/2016
Lab Sample ID	L1615472-03
VOCs (µg/L)	
VOCs, Total	NE
SVOCs (µg/L)	
Benzo(b)fluoranthene	**0.05**
Chrysene	**0.04**
Pesticides, Total (µg/L)	
Total Pesticides	ND
Polychlorinated Biphenyls (µg/L)	
PCBs, Total	ND
Total Metals (µg/L)	
Iron, Total	**26700**
Magnesium, Total	**36100**
Manganese, Total	**361.1**
Sodium, Total	**118000**
Dissolved Metals (µg/L)	
Iron, Dissolved	**22500**
Manganese, Dissolved	**430.4**
Sodium, Dissolved	**90300**

Sample ID	MW08_071217	MW08_071317
Lab Sample ID	460-136990-2	460-137167-3
Sampling Date	7/12/2017	7/13/2017
VOCs (µg/L)	NE	NT
SVOCs (µg/L)		
Bis(2-ethylhexyl) phthalate	NT	**7**
Pesticides (µg/L)	NT	ND
Polychlorinated Biphenyls (µg/L)	NT	ND
Total Metals (µg/L)		
Iron	NT	**2320**
Manganese	NT	**665**
Sodium	NT	**187000**
Dissolved Metals (µg/L)		
Manganese	NT	**579**
Sodium	NT	**179000**

Sample ID	MW13_071317	DUP01_071317
Lab Sample ID	460-137167-1	460-137167-4
Sampling Date	7/13/2017	7/13/2017
VOCs (µg/L)	ND	ND
SVOCs (µg/L)		
Bis(2-ethylhexyl) phthalate	NE	**7**
Pesticides (µg/L)	ND	ND
Polychlorinated Biphenyls (µg/L)	ND	ND
Total Metals (µg/L)		
Iron	**3050**	**2420**
Magnesium	**64500**	**65600**
Selenium	**51.9**	**55.1**
Sodium	**68600**	**69900**
Dissolved Metals (µg/L)		
Magnesium	**64100**	**64500**
Selenium	**56.9**	**57.7**
Sodium	**72200**	**71800**

Sample ID	TMW17_051816
Sampling Date	5/18/2016
Lab Sample ID	L1615108-01
VOCs (µg/L)	
Tetrachloroethene	**11**
SVOCs (µg/L)	
SVOCs, Total	NE
Pesticides, Total (µg/L)	
Total Pesticides	ND
Polychlorinated Biphenyls (µg/L)	
PCBs, Total	ND
Total Metals (µg/L)	
Iron, Total	**420**
Sodium, Total	**333000**
Dissolved Metals (µg/L)	
Sodium, Dissolved	**373000**

Sample ID	TMW12_052016
Sampling Date	5/20/2016
Lab Sample ID	L1615472-02
VOCs (µg/L)	
1,1,1-Trichloroethane	**11**
cis-1,2-Dichloroethene	**63**
Tetrachloroethene	**1000**
Trichloroethene	**5.5**
Vinyl chloride	**2.9**
SVOCs (µg/L)	
SVOCs, Total	ND
Pesticides, Total (µg/L)	
Total Pesticides	ND
Polychlorinated Biphenyls (µg/L)	
PCBs, Total	ND
Total Metals (µg/L)	
Iron, Total	**1820**
Manganese, Total	**4874**
Selenium, Total	**12**
Sodium, Total	**204000**
Dissolved Metals (µg/L)	
Manganese, Dissolved	**3126**
Sodium, Dissolved	**129000**

Sample ID	TMW21_051916
Sampling Date	5/19/2016
Lab Sample ID	L1615305-02
VOCs (µg/L)	
VOCs, Total	NE
SVOCs (µg/L)	
SVOCs, Total	NE
Pesticides, Total (µg/L)	
Total Pesticides	ND
Polychlorinated Biphenyls (µg/L)	
PCBs, Total	ND
Total Metals (µg/L)	
Iron, Total	**4210**
Magnesium, Total	**84700**
Manganese, Total	**3309**
Sodium, Total	**88500**
Dissolved Metals (µg/L)	
Iron, Dissolved	**1610**
Magnesium, Dissolved	**55800**
Manganese, Dissolved	**2110**
Sodium, Dissolved	**55500**

Sample ID	MW09_071017
Lab Sample ID	460-136984-2
Sampling Date	7/10/2017
VOCs (µg/L)	ND
SVOCs (µg/L)	NE
Pesticides (µg/L)	ND
Polychlorinated Biphenyls (µg/L)	ND
Total Metals (µg/L)	
Aluminum	**3880**
Iron	**6060**
Magnesium	**221000**
Manganese	**1390**
Selenium	**121**
Sodium	**114000**
Dissolved Metals (µg/L)	
Iron	**1430**
Magnesium	**200000**
Manganese	**1260**
Selenium	**137**
Sodium	**102000**

Analytes	NYSDEC TOGS SGV - CLASS GA
VOCs (µg/L)	
1,1,1-Trichloroethane	5
cis-1,2-Dichloroethene	5
Tetrachloroethene	5
Trichloroethene	5
Vinyl chloride	2
SVOCs (µg/L)	
Bis(2-ethylhexyl) phthalate	5
Benzo(b)fluoranthene	0.002
Chrysene	0.002
Total Metals (µg/L)	
Aluminum	2000
Iron	300
Lead	50
Magnesium	35000
Manganese	300
Selenium	20
Sodium	20000
Dissolved Metals (µg/L)	
Iron	300
Magnesium	35000
Manganese	300
Selenium	20
Sodium	20000

NOTE:

1. BASE MAP TAKEN FROM ARCHITECTURAL SURVEY OF 23-10 43RD AVENUE ISSUED BY TRUE NORTH SURVEYORS ON MAY 5, 2016.
2. TEMPORARY MONITORING WELL LOCATIONS ARE BASED ON FIELD MEASUREMENTS. PERMANENT MONITORING WELL LOCATIONS ARE TAKEN FROM THE LANGAN MONITORING WELL SURVEY, DATED AUGUST 2, 2017.
3. RESULTS ARE COMPARED TO THE NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION (NYSDEC) TECHNICAL AND OPERATIONAL GUIDANCE SERIES (TOGS) 1.1.1 AMBIENT WATER QUALITY STANDARDS AND GUIDANCE VALUES (SGV) FOR CLASS GA GROUNDWATER
4. VALUES THAT EXCEED THEIR RESPECTIVE NYSDEC TOGS SGV ARE SHOWN IN BOLD
5. µg/L = MICROGRAMS PER LITER
6. VOCs = VOLATILE ORGANIC COMPOUND
7. SVOCs = SEMIVOLATILE ORGANIC COMPOUND
8. NE = RESULT DOES NOT EXCEED THE TOGS SGV
9. ND= NOT DETECTED
10. NT = NOT TESTED
11. RI = REMEDIAL INVESTIGATION

LEGEND:

SITE BOUNDARY

SB/MW02 — RI SOIL BORING AND PERMANENT MONITORING WELL LOCATION

EB/TMW-1 — PREVIOUS SOIL BORING AND TEMPORARY MONITORING WELL LOCATION (LANGAN, JUNE 2016)

LANGAN
300 Kimball Drive
Parsippany, NJ 07054
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Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C.
Langan Engineering and Environmental Services, Inc.
Langan CT, Inc.
Langan International LLC
Collectively known as Langan

Project
43-30 24TH STREET
BLOCK No. 436, LOT No. 1
LONG ISLAND CITY NEW YORK

Figure Title
REMAINING GROUNDWATER SAMPLE ANALYTICAL RESULTS SUMMARY

Project No. 170362701
Date 11/16/2023
Scale 1"=40'
Drawn By KAG
Checked By JF
Submission Date NOVEMBER 2023

Figure No. 5A

Sheet 8 of 11

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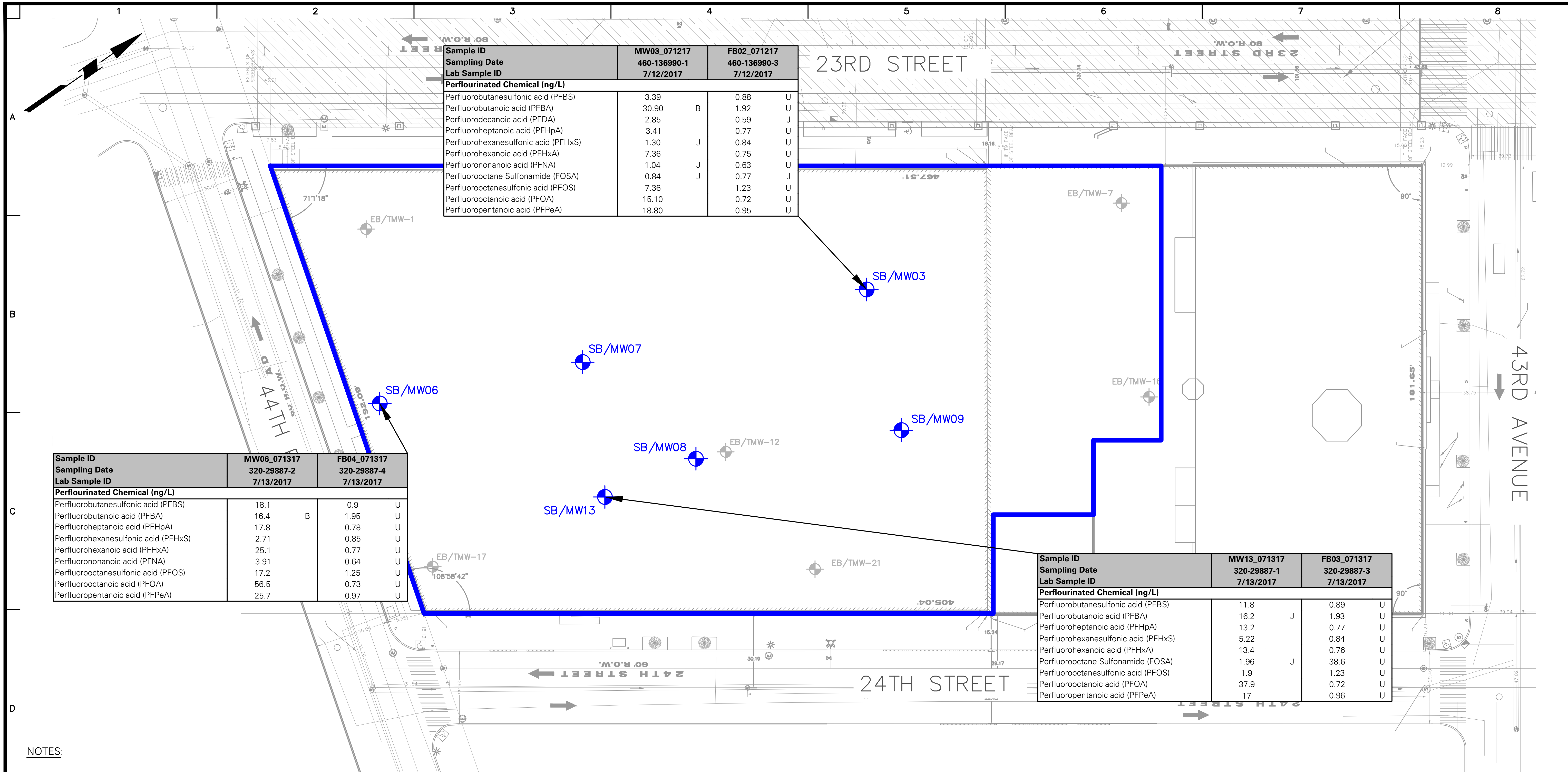
Filename: \\langan.com\data\NYC\data7\170362701\Cadd Data - 170362701\SheetFiles\Environmental\BCP FER\SMP\Figure 6 - Groundwater Sample Location and Results Map_PAR.dwg Date: 12/18/2023 Time: 15:23 User: kgioia Style Table: Langan.stb Layout: ANSIB-BL



Sample ID Sampling Date Lab Sample ID	MW03_071217 460-136990-1 7/12/2017		FB02_071217 460-136990-3 7/12/2017	
Perflourinated Chemical (ng/L)				
Perfluorobutanesulfonic acid (PFBS)	3.39		0.88	U
Perfluorobutanoic acid (PFBA)	30.90	B	1.92	U
Perfluorodecanoic acid (PFDA)	2.85		0.59	J
Perfluoroheptanoic acid (PFHpA)	3.41		0.77	U
Perfluorohexanesulfonic acid (PFHxS)	1.30	J	0.84	U
Perfluorohexanoic acid (PFHxA)	7.36		0.75	U
Perfluorononanoic acid (PFNA)	1.04	J	0.63	U
Perfluorooctane Sulfonamide (FOSA)	0.84	J	0.77	J
Perfluorooctanesulfonic acid (PFOS)	7.36		1.23	U
Perfluorooctanoic acid (PFOA)	15.10		0.72	U
Perfluoropentanoic acid (PFPeA)	18.80		0.95	U

Sample ID Sampling Date Lab Sample ID	MW06_071317 320-29887-2 7/13/2017		FB04_071317 320-29887-4 7/13/2017	
Perflourinated Chemical (ng/L)				
Perfluorobutanesulfonic acid (PFBS)	18.1		0.9	U
Perfluorobutanoic acid (PFBA)	16.4	B	1.95	U
Perfluoroheptanoic acid (PFHpA)	17.8		0.78	U
Perfluorohexanesulfonic acid (PFHxS)	2.71		0.85	U
Perfluorohexanoic acid (PFHxA)	25.1		0.77	U
Perfluorononanoic acid (PFNA)	3.91		0.64	U
Perfluorooctanesulfonic acid (PFOS)	17.2		1.25	U
Perfluorooctanoic acid (PFOA)	56.5		0.73	U
Perfluoropentanoic acid (PFPeA)	25.7		0.97	U

Sample ID Sampling Date Lab Sample ID	MW13_071317 320-29887-1 7/13/2017		FB03_071317 320-29887-3 7/13/2017	
Perflourinated Chemical (ng/L)				
Perfluorobutanesulfonic acid (PFBS)	11.8		0.89	U
Perfluorobutanoic acid (PFBA)	16.2	J	1.93	U
Perfluoroheptanoic acid (PFHpA)	13.2		0.77	U
Perfluorohexanesulfonic acid (PFHxS)	5.22		0.84	U
Perfluorohexanoic acid (PFHxA)	13.4		0.76	U
Perfluorooctane Sulfonamide (FOSA)	1.96	J	38.6	U
Perfluorooctanesulfonic acid (PFOS)	1.9		1.23	U
Perfluorooctanoic acid (PFOA)	37.9		0.72	U
Perfluoropentanoic acid (PFPeA)	17		0.96	U

NOTES:

1. BASE MAP TAKEN FROM ARCHITECTURAL SURVEY OF 23-10 43RD AVENUE ISSUED BY TRUE NORTH SURVEYORS ON MAY 5, 2016.
2. TEMPORARY MONITORING WELL LOCATIONS ARE BASED ON FIELD MEASUREMENTS. PERMANENT MONITORING WELL LOCATIONS ARE TAKEN FROM THE LANGAN MONITORING WELL SURVEY, DATED AUGUST 2, 2017.
3. ONLY DETECTED COMPOUNDS ARE SHOWN.
4. NO REGULATORY CRITERIA EXIST FOR PFCS.
5. ng/L = NANOGRAMS PER LITER
6. J = THE RESULT IS AN ESTIMATE
7. U = THE ANALYTE WAS ANALYZED FOR BUT WAS NOT DETECTED AT A LEVEL AT OR ABOVE THE REPORTING LIMIT.
8. PFAS = POLY- AND PER-FLUOROALKYL SUBSTANCES.
9. RI = REMEDIAL INVESTIGATION

LEGEND:

SITE BOUNDARY

SB/MW02 RI SOIL BORING AND PERMANENT MONITORING WELL

EB/TMW-1 PREVIOUS SOIL BORING AND TEMPORARY MONITORING WELL (LANGAN, JUNE 2016)

40 0 20 40

SCALE IN FEET

LANGAN

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Langan Engineering and Environmental Services, Inc.
Langan CT, Inc.
Langan International LLC
Collectively known as Langan

Project

43-30 24TH STREET

BLOCK No. 436, LOT No. 1

LONG ISLAND CITY NEW YORK

Figure Title

REMAINING GROUNDWATER SAMPLE ANALYTICAL RESULTS SUMMARY - PFAS

Project No. 170362701

Date 11/16/2023

Scale 1"=40'

Drawn By KAG | Checked By JF

Submission Date NOVEMBER 2023

Figure No. **5B**

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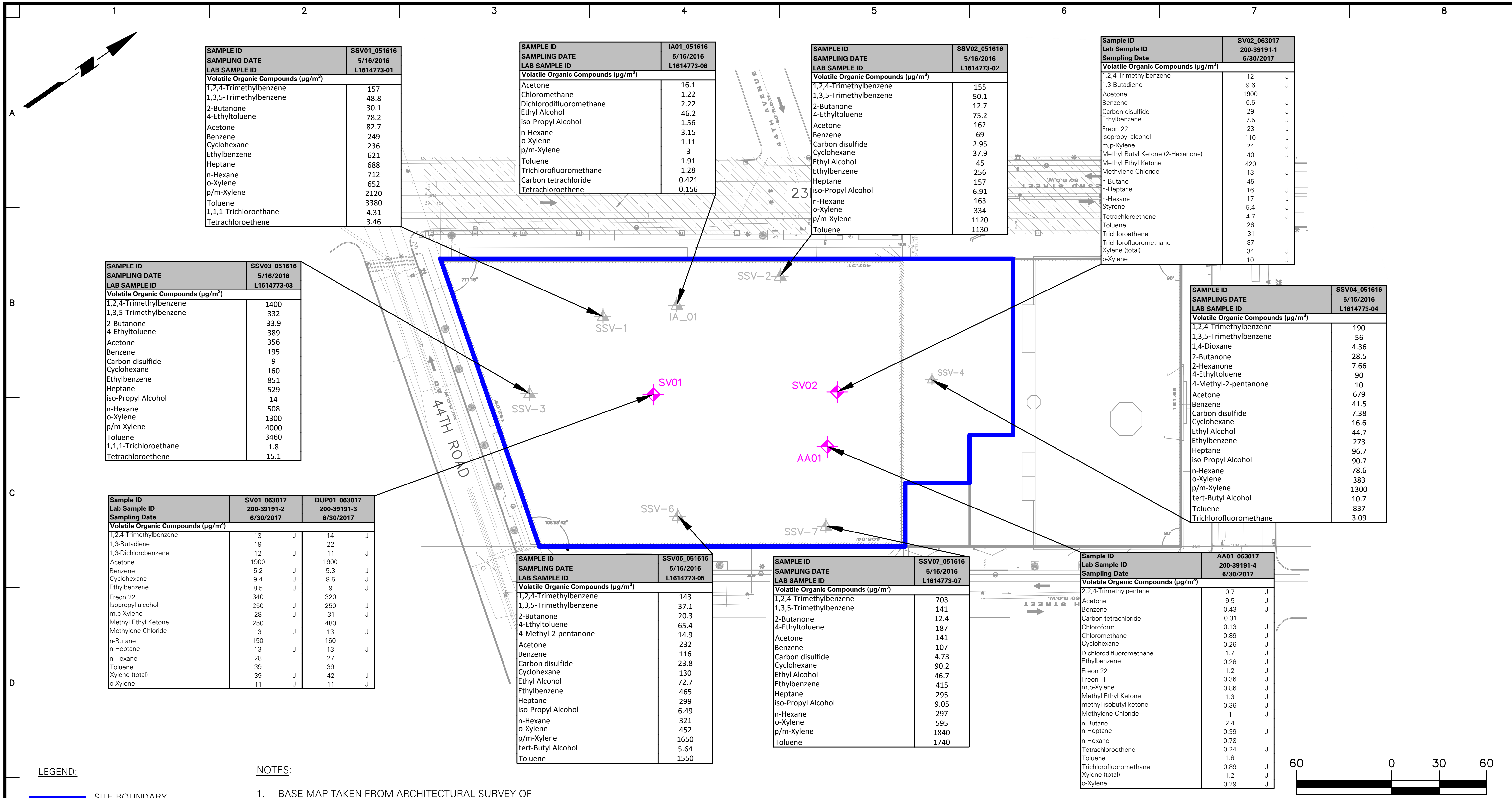
Filename: \\langan.com\data\NYC\data7\170362701\Cadd Data - 170362701\SheetFiles\Environmental\BCP FER\SMP\Figure 5B - PFAS_Groundwater Sample Location and Results Map_PAR.dwg Date: 12/18/2023 Time: 15:22 User: kgioia Style Table: Langan.stb Layout: ANSIB-BL



SAMPLE ID	SSV01_051616
SAMPLING DATE	5/16/2016
LAB SAMPLE ID	L1614773-01
Volatile Organic Compounds (µg/m³)	
1,2,4-Trimethylbenzene	157
1,3,5-Trimethylbenzene	48.8
2-Butanone	30.1
4-Ethyltoluene	78.2
Acetone	82.7
Benzene	249
Cyclohexane	236
Ethylbenzene	621
Heptane	688
n-Hexane	712
o-Xylene	652
p/m-Xylene	2120
Toluene	3380
1,1,1-Trichloroethane	4.31
Tetrachloroethene	3.46

SAMPLE ID	IA01_051616
SAMPLING DATE	5/16/2016
LAB SAMPLE ID	L1614773-06
Volatile Organic Compounds (µg/m³)	
Acetone	16.1
Chloromethane	1.22
Dichlorodifluoromethane	2.22
Ethyl Alcohol	46.2
iso-Propyl Alcohol	1.56
n-Hexane	3.15
o-Xylene	1.11
p/m-Xylene	3
Toluene	1.91
Trichlorofluoromethane	1.28
Carbon tetrachloride	0.421
Tetrachloroethene	0.156

SAMPLE ID	SSV02_051616
SAMPLING DATE	5/16/2016
LAB SAMPLE ID	L1614773-02
Volatile Organic Compounds (µg/m³)	
1,2,4-Trimethylbenzene	155
1,3,5-Trimethylbenzene	50.1
2-Butanone	12.7
4-Ethyltoluene	75.2
Acetone	162
Benzene	69
Carbon disulfide	2.95
Cyclohexane	37.9
Ethyl Alcohol	45
Ethylbenzene	256
Heptane	157
iso-Propyl Alcohol	6.91
n-Hexane	163
o-Xylene	334
p/m-Xylene	1120
Toluene	1130

Sample ID	SV02_063017	
Lab Sample ID	200-39191-1	
Sampling Date	6/30/2017	
Volatile Organic Compounds (µg/m³)		
1,2,4-Trimethylbenzene	12	J
1,3-Butadiene	9.6	J
Acetone	1900	
Benzene	6.5	J
Carbon disulfide	29	J
Ethylbenzene	7.5	J
Freon 22	23	J
Isopropyl alcohol	110	J
m,p-Xylene	24	J
Methyl Butyl Ketone (2-Hexanone)	40	J
Methyl Ethyl Ketone	420	
Methylene Chloride	13	J
n-Butane	45	
n-Heptane	16	J
n-Hexane	17	J
Styrene	5.4	J
Tetrachloroethene	4.7	J
Toluene	26	
Trichloroethene	31	
Trichlorofluoromethane	87	
Xylene (total)	34	J
o-Xylene	10	J

SAMPLE ID	SSV03_051616
SAMPLING DATE	5/16/2016
LAB SAMPLE ID	L1614773-03
Volatile Organic Compounds (µg/m³)	
1,2,4-Trimethylbenzene	1400
1,3,5-Trimethylbenzene	332
2-Butanone	33.9
4-Ethyltoluene	389
Acetone	356
Benzene	195
Carbon disulfide	9
Cyclohexane	160
Ethylbenzene	851
Heptane	529
iso-Propyl Alcohol	14
n-Hexane	508
o-Xylene	1300
p/m-Xylene	4000
Toluene	3460
1,1,1-Trichloroethane	1.8
Tetrachloroethene	15.1

SAMPLE ID	SSV04_051616
SAMPLING DATE	5/16/2016
LAB SAMPLE ID	L1614773-04
Volatile Organic Compounds (µg/m³)	
1,2,4-Trimethylbenzene	190
1,3,5-Trimethylbenzene	56
1,4-Dioxane	4.36
2-Butanone	28.5
2-Hexanone	7.66
4-Ethyltoluene	90
4-Methyl-2-pentanone	10
Acetone	679
Benzene	41.5
Carbon disulfide	7.38
Cyclohexane	16.6
Ethyl Alcohol	44.7
Ethylbenzene	273
Heptane	96.7
iso-Propyl Alcohol	90.7
n-Hexane	78.6
o-Xylene	383
p/m-Xylene	1300
tert-Butyl Alcohol	10.7
Toluene	837
Trichlorofluoromethane	3.09

Sample ID	SV01_063017		DUP01_063017	
Lab Sample ID	200-39191-2		200-39191-3	
Sampling Date	6/30/2017		6/30/2017	
Volatile Organic Compounds (µg/m³)				
1,2,4-Trimethylbenzene	13	J	14	J
1,3-Butadiene	19		22	
1,3-Dichlorobenzene	12	J	11	J
Acetone	1900		1900	
Benzene	5.2	J	5.3	J
Cyclohexane	9.4	J	8.5	J
Ethylbenzene	8.5	J	9	J
Freon 22	340		320	
Isopropyl alcohol	250	J	250	J
m,p-Xylene	28	J	31	J
Methyl Ethyl Ketone	250		480	
Methylene Chloride	13	J	13	J
n-Butane	150		160	
n-Heptane	13	J	13	J
n-Hexane	28		27	
Toluene	39		39	
Xylene (total)	39	J	42	J
o-Xylene	11	J	11	J

SAMPLE ID	SSV06_051616
SAMPLING DATE	5/16/2016
LAB SAMPLE ID	L1614773-05
Volatile Organic Compounds (µg/m³)	
1,2,4-Trimethylbenzene	143
1,3,5-Trimethylbenzene	37.1
2-Butanone	20.3
4-Ethyltoluene	65.4
4-Methyl-2-pentanone	14.9
Acetone	232
Benzene	116
Carbon disulfide	23.8
Cyclohexane	130
Ethyl Alcohol	72.7
Ethylbenzene	465
Heptane	299
iso-Propyl Alcohol	6.49
n-Hexane	321
o-Xylene	452
p/m-Xylene	1650
tert-Butyl Alcohol	5.64
Toluene	1550

SAMPLE ID	SSV07_051616
SAMPLING DATE	5/16/2016
LAB SAMPLE ID	L1614773-07
Volatile Organic Compounds (µg/m³)	
1,2,4-Trimethylbenzene	703
1,3,5-Trimethylbenzene	141
2-Butanone	12.4
4-Ethyltoluene	187
Acetone	141
Benzene	107
Carbon disulfide	4.73
Cyclohexane	90.2
Ethyl Alcohol	46.7
Ethylbenzene	415
Heptane	295
iso-Propyl Alcohol	9.05
n-Hexane	297
o-Xylene	595
p/m-Xylene	1840
Toluene	1740

Sample ID	AA01_063017	
Lab Sample ID	200-39191-4	
Sampling Date	6/30/2017	
Volatile Organic Compounds (µg/m³)		
2,2,4-Trimethylpentane	0.7	J
Acetone	9.5	J
Benzene	0.43	J
Carbon tetrachloride	0.31	
Chloroform	0.13	J
Chloromethane	0.89	J
Cyclohexane	0.26	J
Dichlorodifluoromethane	1.7	J
Ethylbenzene	0.28	J
Freon 22	1.2	J
Freon TF	0.36	J
m,p-Xylene	0.86	J
Methyl Ethyl Ketone	1.3	J
methyl isobutyl ketone	0.36	J
Methylene Chloride	1	J
n-Butane	2.4	
n-Heptane	0.39	J
n-Hexane	0.78	
Tetrachloroethene	0.24	J
Toluene	1.8	
Trichlorofluoromethane	0.89	J
Xylene (total)	1.2	J
o-Xylene	0.29	J

60 0 30 60
SCALE IN FEET

LEGEND:

SITE BOUNDARY

SV01 RI SOIL VAPOR PROBE

AA01 RI AMBIENT AIR SAMPLE

SSV-6 PREVIOUS SOIL VAPOR PROBE AND INDOOR AIR AND AMBIENT AIR SAMPLES (LANGAN, JUNE 2016)

NOTES:

1. BASE MAP TAKEN FROM ARCHITECTURAL SURVEY OF 23-10 43RD AVENUE ISSUED BY TRUE NORTH SURVEYORS ON MAY 5, 2016.
2. BORING LOCATIONS ARE BASED ON FIELD MEASUREMENTS.
3. ONLY DETECTED COMPOUNDS ARE SHOWN.
4. µg/m³ = MICROGRAMS PER METER CUBED
5. J = THE RESULT IS AN ESTIMATE
6. RI = REMEDIAL INVESTIGATION

LANGAN
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Parsippany, NJ 07054
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Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C.
Langan Engineering and Environmental Services, Inc.
Langan CT, Inc.
Langan International LLC
Collectively known as Langan

Project
43-30 24TH STREET
BLOCK No. 436, LOT No. 1
LONG ISLAND CITY NEW YORK

Figure Title
REMAINING SOIL VAPOR SAMPLE ANALYTICAL RESULTS SUMMARY

Project No. 170362701
Date 11/16/2023
Scale 1"=60'
Drawn By JFY
Checked By KS
Submission Date FEBRUARY 2018
Figure No. 6

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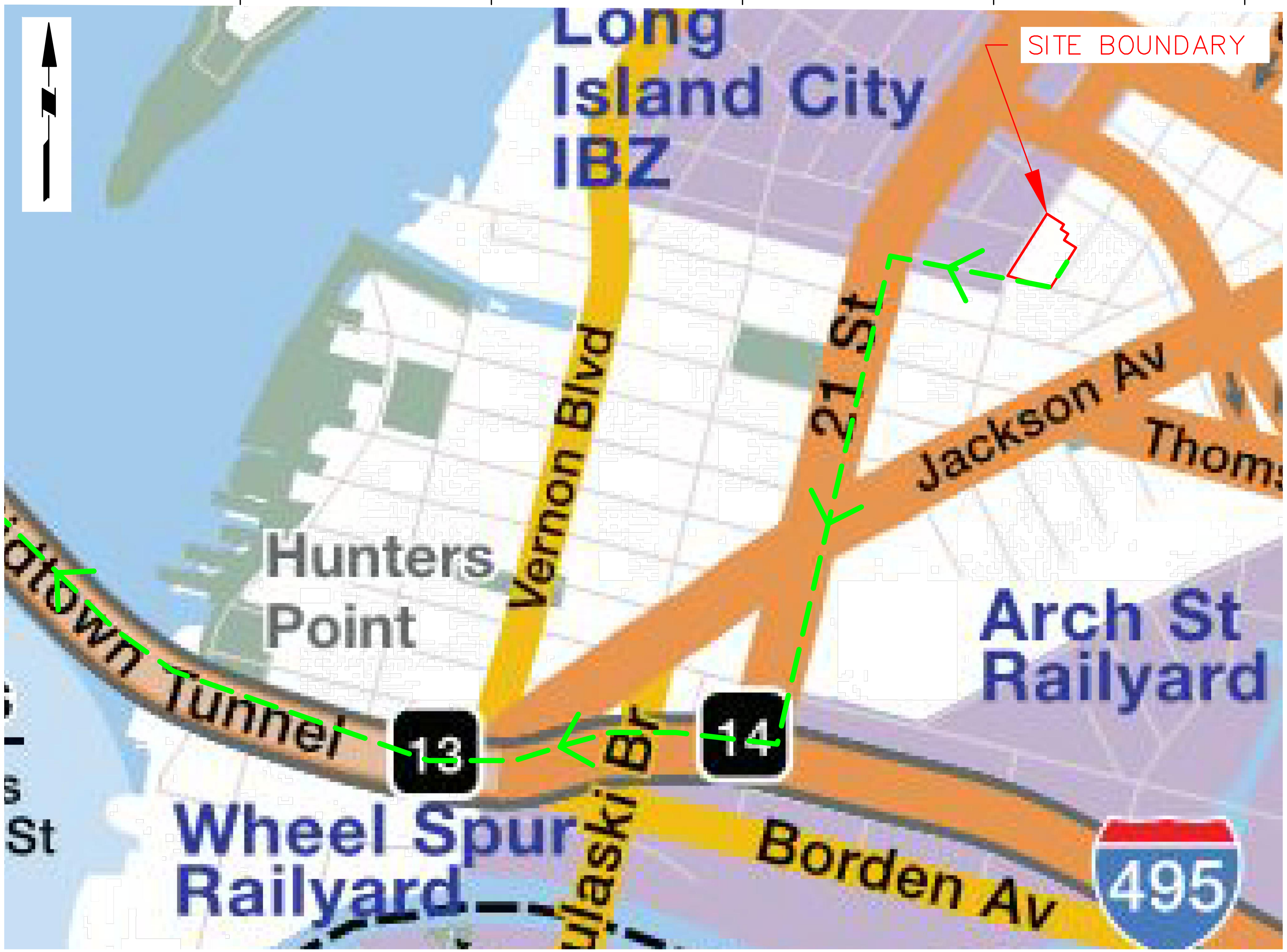
Filename: \\langan.com\data\NYC\data7\170362701\Cadd Data - 170362701\SheetFiles\Environmental\BCP FER\SMP\Figure 6 - Soil Vapor Sample Location and Results Map.dwg Date: 12/18/2023 Time: 15:17 User: kgioia Style Table: Langan.stb Layout: ANSIB-BL



Legend

Local Truck Route
Trucks with an origin or destination for the purpose of delivery, loading or servicing within the respective Borough, shall only operate on designated local routes, except that an operator may operate on a non-designated street for the purpose of arriving at his/her destination. This shall be accomplished by leaving a designated truck route at the intersection that is nearest to their destination, proceeding by the most direct route, and then returning to the nearest designated truck route by the most direct route. If the operator has additional destinations in the same general area, he/she may proceed by the most direct route to his/her next destination without returning to a designated truck route, provided that the operator's next destination does not require that he/she cross a designated truck route.

Through Truck Route
Trucks having neither an origin nor a destination within the respective Borough shall restrict the operation of such vehicles to those street segments designated as Through Truck Routes.

Through Truck Route on Expressway

Through Truck Route on Tunnel

Exception 53' Trailers Allowed
For definition see information on reverse side.

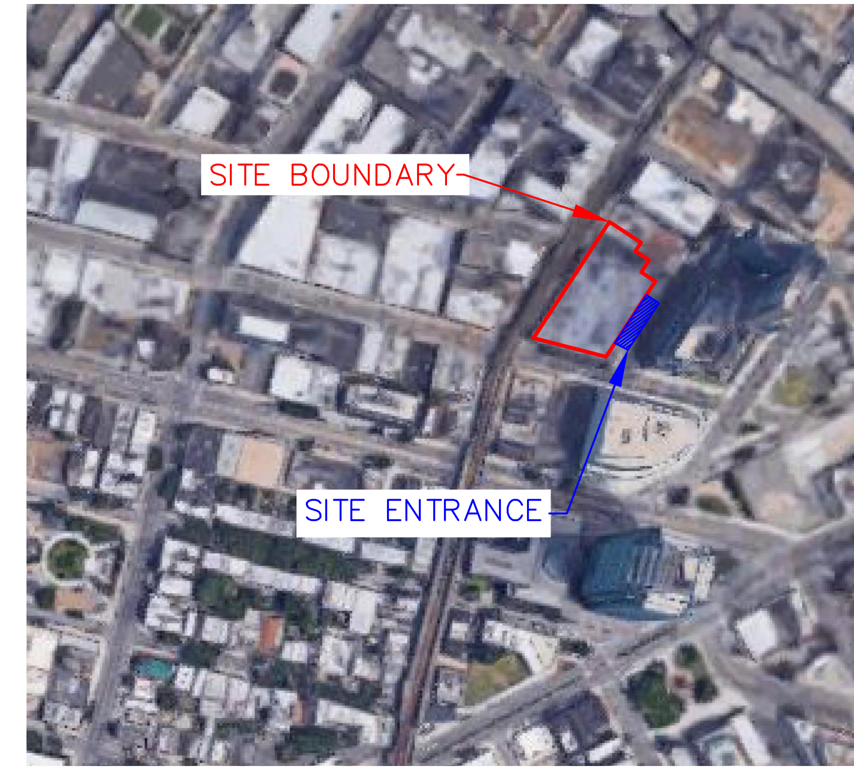
Industrial Business Zones (IBZ)

Parks and Open Spaces

29A Highway Exit

Commercial Vehicles Prohibited

Low Vertical Clearance Area



AERIAL REFERENCE

LEGEND:

- SITE BOUNDARY
- TRUCK ROUTE

NOTES:

1. TRUCK ROUTE MAP ADAPTED FROM THE NEW YORK CITY DEPARTMENT OF TRANSPORTATION (NYC DOT) 2015 TRUCK ROUTE MAP.
2. LOCATION OF SITE ACCESS IS SUBJECT TO CHANGE, PENDING CONSTRUCTION LOGISTICS.

LANGAN	Project	Figure Title	Project No.	Figure No.
300 Kimball Drive Parsippany, NJ 07054 T: 973.560.4900 F: 973.560.4901 www.langan.com Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C. Langan Engineering and Environmental Services, Inc. Langan CT, Inc. Langan International LLC Collectively known as Langan	43-30 24TH STREET BLOCK No. 436, LOT No. 1 LONG ISLAND CITY NEW YORK	TRUCK ROUTE MAP	170362702 Date 12/18/2023 Scale NTS Drawn By KG / Checked By JF Submission Date	7 Sheet 11 of 11

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APPENDIX A

ENVIRONMENTAL EASEMENT, SURVEY, AND METES/BOUNDS DESCRIPTION

NYC DEPARTMENT OF FINANCE
OFFICE OF THE CITY REGISTER

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

2023103100450001002E0CA9

Document ID: 2023103100450001 Document Date: 10-23-2023 Preparation Date: 11-01-2023
Document Type: EASEMENT
Document Page Count: 9

PRESENTER:	**RETURN TO:**
SIVE PAGET & RIESEL, P.C. 560 LEXINGTON AVENUE, 15TH FLOOR NEW YORK, NY 10022 212-421-2150 NDUNCAN@SPRLAW.COM	SIVE PAGET & RIESEL, P.C. 560 LEXINGTON AVENUE, 15TH FLOOR NEW YORK, NY 10022 212-421-2150 NDUNCAN@SPRLAW.COM

PROPERTY DATA

Borough	**Block**	**Lot**		**Unit**	**Address**
QUEENS	436	1	Entire Lot		23-15 44 ROAD

Property Type: OTHER

CROSS REFERENCE DATA

CRFN_______ *or* DocumentID________ *or* ________ Year_____ Reel____ Page_____ *or* File Number__________

PARTIES

GRANTOR/SELLER:	**GRANTEE/BUYER:**
CP VIII LIC OWNER, LLC C/O: CARMEL PARTNERS, 510 MADISON AVE., 8TH FLOOR NEW YORK, NY 10022	PEOPLE OF STATE OF NEW YORK BY DEPT. ENVIRONMENTAL 625 BROADWAY ALBANY, NY 12233

FEES AND TAXES

Mortgage :

Mortgage Amount:	$	0.00
Taxable Mortgage Amount:	$	0.00
Exemption:		
TAXES: County (Basic):	$	0.00
City (Additional):	$	0.00
Spec (Additional):	$	0.00
TASF:	$	0.00
MTA:	$	0.00
NYCTA:	$	0.00
Additional MRT:	$	0.00
TOTAL:	$	0.00
Recording Fee:	$	82.00
Affidavit Fee:	$	0.00

Filing Fee:	$	100.00
NYC Real Property Transfer Tax:	$	0.00
NYS Real Estate Transfer Tax:	$	0.00

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

Recorded/Filed 11-02-2023 09:50
City Register File No.(CRFN):
2023000284378

Colette McClain-Jacques

City Register Official Signature

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

THIS INDENTURE made this 23rd day of October, 2023, between Owner, CP VIII LIC Owner, LLC, having an office at c/o Carmel Partners, 1000 Sansome St. 1st Floor, County of San Francisco, State of California (the "Grantor"), and The People of the State of New York (the "Grantee"), acting through their Commissioner of the Department of Environmental Conservation (the "Commissioner", or "NYSDEC" or "Department" as the context requires) with its headquarters located at 625 Broadway, Albany, New York 12233,

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

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

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

WHEREAS, Grantor, is the owner of real property located at the address of 23-15 44th Road a/k/a 43-30 24th Street in the City of New York, Borough and County of Queens and State of New York, known and designated on the tax map of the New York City Department of Finance as tax map parcel number: Block 436 Lot 1, being the same as that property conveyed to Grantor by deed dated March 16, 2022 and recorded in the City Register of the City of New York as City Register File No. 2022000126610. The property subject to this Environmental Easement (the "Controlled Property") comprises approximately 1.297 +/- acres, and is hereinafter more fully described in the Land Title Survey, dated February 14, 2023 and revised September 11, 2023, prepared by John Vida, License No. 050298, which will be attached to the Site Management Plan. The Controlled Property description is set forth in and attached hereto as Schedule A; and

WHEREAS, the Department accepts this Environmental Easement in order to ensure the protection of public health and the environment and to achieve the requirements for remediation established for the Controlled Property until such time as this Environmental Easement is extinguished pursuant to ECL Article 71, Title 36; and

NOW THEREFORE, in consideration of the mutual covenants contained herein and the terms and conditions of Brownfield Cleanup Agreement Index Number: C241189-10-16, Grantor conveys to Grantee a permanent Environmental Easement pursuant to ECL Article 71, Title 36 in, on, over, under, and upon the Controlled Property as more fully described herein ("Environmental Easement").

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

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

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

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

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

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

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

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

(6) Data and information pertinent to Site Management of the Controlled Property must be reported at the frequency and in a manner defined in the SMP;

(7) All future activities on the property that will disturb remaining

contaminated material must be conducted in accordance with the SMP;

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

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

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

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

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

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

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

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

This property is subject to an Environmental Easement held by the New York State Department of Environmental Conservation pursuant to Title 36 of Article 71 of the Environmental Conservation

Law.

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

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

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

(2) the institutional controls and/or engineering controls employed at such site:

(i) are in-place;

(ii) are unchanged from the previous certification, or that any identified changes to the controls employed were approved by the NYSDEC and that all controls are in the Department-approved format; and

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

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

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

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

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

(7) the information presented is accurate and complete.

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

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

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

B. The right to give, sell, assign, or otherwise transfer part or all of the underlying fee interest to the Controlled Property, subject and subordinate to this Environmental Easement;

5. Enforcement

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

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

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

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

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

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

Parties shall address correspondence to:

Site Number: C241189
Office of General Counsel
NYSDEC
625 Broadway
Albany New York 12233-5500

With a copy to:

Site Control Section
Division of Environmental Remediation
NYSDEC
625 Broadway
Albany, NY 12233

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

7. Recordation. Grantor shall record this instrument, within thirty (30) days of execution of this instrument by the Commissioner or her/his authorized representative in the office of the

recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

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

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

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

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

Remainder of Page Intentionally Left Blank

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

CP VIII LIC Owner, LLC:

By: ______________________

Print Name: Matthew Feldman

Title: EVP Date: 10/18/23

Grantor's Acknowledgment

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

On the 18TH day of OCTOBER, in the year 2023, before me, the undersigned, personally appeared MATTHEW FELDMAN, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

____
Notary Public - State of New York

ALLISON KELLER
Notary Public - State of New York
NO. 01KE0005603
Qualified in Queens County
My Commission Expires Apr 14, 2027

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

By: Andrew Guglielmi
Andrew O. Guglielmi, Director
Division of Environmental Remediation

Grantee's Acknowledgment

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

On the 23rd day of October, in the year 2023 before me, the undersigned, personally appeared Andrew O. Guglielmi, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/ executed the same in his/her/ capacity as Designee of the Commissioner of the State of New York Department of Environmental Conservation, and that by his/her/ signature on the instrument, the individual, or the person upon behalf of which the individual acted, executed the instrument.

Cheryl A. Salem
Notary Public - State of New York

Cheryl A. Salem
Notary Public State of New York
Registration No. 01SA0002177
Qualified in Albany County
My Commission Expires March 3, 2027

SCHEDULE "A" PROPERTY DESCRIPTION

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

BEGINNING at the corner formed by the intersection of the northerly side of 44th Road with the easterly side of 23rd Street;

RUNNING THENCE northerly along the easterly side of 23rd Street 361.69 feet to a point;

THENCE easterly at right angles to the easterly side of 23rd Street 111.31 feet to a point;

THENCE southerly parallel with the easterly side of 23rd Street 27.50 feet to a point;

THENCE easterly at right angles to the easterly side of 23rd Street 30.17 feet to a point;

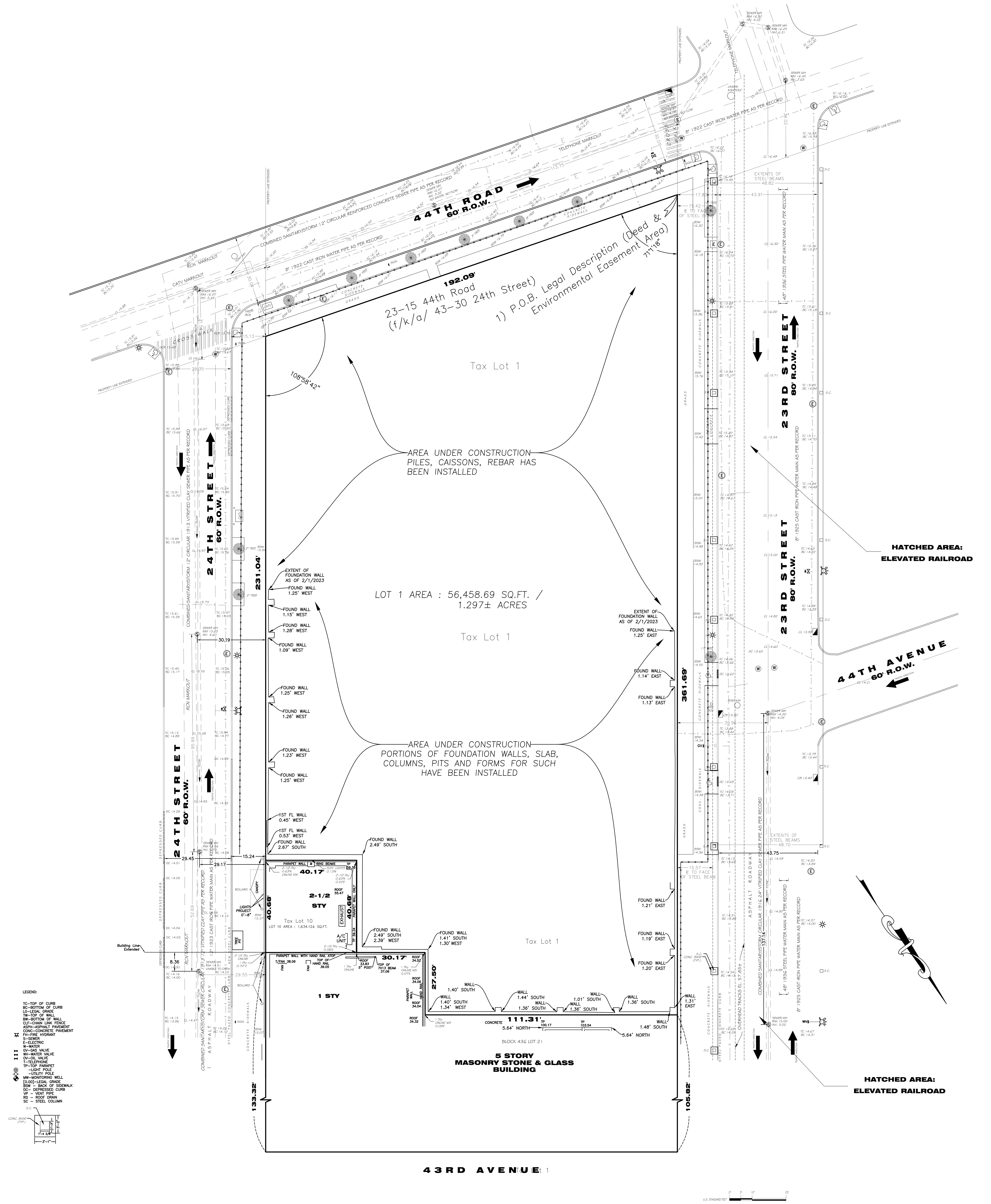
THENCE southerly parallel with the easterly side of 23rd Street 40.68 feet to a point;

THENCE easterly at right angles to the easterly side of 23rd Street 40.17 feet to a point in the westerly side of 24th Street. Said point being 174.00 feet southerly from the corner formed by the intersection of the southerly side of 43rd Avenue with the westerly side of 24th Street.

THENCE southerly along the westerly side of 24th Street 231.04 feet to the corner formed by the intersection of the northerly side of 44th Road with the westerly side of 24th Street;

THENCE westerly along the northerly side of 44th Road 192.09 feet to the point or place of BEGINNING.

AREA OF LOT 1 & ENVIRONMENTAL EASEMENT AREA : 56,458.69 SQ.FT. / 1.297± ACRES



NOTES:

1) ELEVATIONS SHOWN ON THIS SURVEY MAP REFER TO NORTH AMERICAN VERTICAL DATUM OF 1988 AS ESTABLISHED AND MAINTAINED BY NATIONAL GEODETIC SURVEY OF THE NATIONAL OCEAN SERVICE, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION OR SUCCESSOR AGENCY.

2) ALL DIMENSIONS SHOWN HEREON ARE IN THE UNITED STATES STANDARD OF MEASUREMENT.

3) THIS IS TO CERTIFY THAT THERE ARE NO STREAMS OR NATURAL WATER COURSES VISIBLE ON THE PREMISES SHOWN HEREON.

VAULTS, IF ANY, BELOW SIDEWALK LEVEL, ARE NOT LOCATED OR SHOWN HEREON.

THE SUBSURFACE UTILITY INFORMATION SHOWN HEREON HAS BEEN EXTRACTED FROM INFORMATION OBTAINED FROM THE VARIOUS MUNICIPAL DEPARTMENTS AND PRIVATE COMPANIES AND IS PLACED ON THIS SURVEY FOR SCHEMATIC PURPOSES ONLY. SUCH INFORMATION IS NOT GUARANTEED AS TO ACCURACY OR COMPLETENESS EITHER BY SAID DEPARTMENTS OR COMPANIES NOR BY THE UNDERSIGNED. BEFORE ANY DRILLING, EXCAVATION OR CONSTRUCTION ON OR NEAR THE PREMISES SHOWN HEREON, IT IS REQUIRED BY NEW YORK STATE INDUSTRIAL CODE 53 THAT THE SUBSURFACE UTILITIES BE MARKED OUT AND IDENTIFIED BY THE COMPANIES OR AGENCIES HAVING JURISDICTION.

UTILITY MAPS SUPPLIED BY RESPECTIVE UTILITY AND GOVERMENTAL AGENCY, AND AS SUCH IT IS RECOMMENDED THAT BEFORE CONSTRUCTION COMMENCES THAT THE APPROPRIATE UTILITIES ARE CONTACTED. THE UTILITIES SHOWN ON THIS SURVEY MAP HAVE BEEN LOCATED BY FIELD OBSERVATIONS AND GUARANTEE IS GIVEN AS TO THE COMPLETENESS, LOCATION, SIZE OR TYPE OF UTILITY. IT IS RECOMMENDED THAT BEFORE CONSTRUCTION COMMENCES THAT THE APPROPRIATE UTILITIES ARE CONTACTED.

4) ESTABLISHED LEGAL GRADES SHOWN PER FINAL SECTION MAP 15 AS FOUND IN THE STATE OF NEW YORK, COUNTY OF QUEENS, OFFICE OF THE PRESIDENT, TOPOGRAPHICAL BUREAU.

5) STREET NAMES AND R.O.W. WIDTHS, BLOCK, AND LOT NUMBERS AS PER CURRENT TAX MAPS.

6) OFFSETS (IF SHOWN) ARE FOR SURVEYING REFERENCES ONLY AND ARE NOT TO BE USED IN CONSTRUCTION OF ANY TYPE.

7) ELECTRIC AND GAS CON ED MAPS ARE NO LONGER AVAILABLE TO THIRD PARTIES. THIS INFORMATION MUST BE ATTAINED BY OWNERSHIP. UPON RECIEPT OF THIS INFORMATION FROM OWNERSHIP PLAT WILL BE APPROPRIATELY AMMENDED.

Flood Map Note:

BY GRAPHIC PLOTTING ONLY, THIS PROPERTY MAY LIE WITHIN ZONE X – AREA OF MINIMAL FLOOD HAZARD) OF THE FLOOD INSURANCE RATE MAP COMMUNITY PANEL NO. 3604970202F , WHICH BEARS AN EFFECTIVE DATE OF SEPTEMBER 5, 2007.

THE SUBJECT PROPERTY DOES NOT LIE IN A FEDERALLY DESIGNED FLOOD HAZARD ZONE.

Zoning Note:

ACCORDING TO NYC ZONING MAP 9B LOT 21 IN BLOCK 436 LIES WITHIN ZONE M1-6/R10 (SPECIAL MIXED USE DISTRICT)

Legal Description (Deed & Environmental Easement Area), Block 436, Lot 1

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

BEGINNING at the corner formed by the intersection of the northerly side of 44th Road with the easterly side of 23rd Street;

RUNNING THENCE northerly along the easterly side of 23rd Street 361.69 feet to a point;

THENCE easterly at right angles to the easterly side of 23rd Street 111.31 feet to a point;

THENCE southerly parallel with the easterly side of 23rd Street 27.50 feet to a point;

THENCE easterly at right angles to the easterly side of 23rd Street 30.17 feet to a point;

THENCE southerly parallel with the easterly side of 23rd Street 40.68 feet to a point;

THENCE easterly at right angles to the easterly side of 23rd Street 40.17 feet to a point in the westerly side of 24th Street. Said point being 174.00 feet southerly from the corner formed by the intersection of the southerly side of 43rd Avenue with the westerly side of 24th Street.

THENCE southerly along the westerly side of 24th Street 231.04 feet to the corner formed by the intersection of the northerly side of 44th Road with the westerly side of 24th Street;

THENCE westerly along the northerly side of 44th Road 192.09 feet to the point or place of BEGINNING.

AREA OF LOT 1 & ENVIRONMENTAL EASEMENT AREA : 56,458.69 SQ.FT. / 1.297± ACRES

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

I CERTIFY TO:
CP VIII LIC Owner, LLC
THAT THIS SURVEY WAS PREPARED AND REVIEWED UNDER MY SUPERVISION IN THE OFFICE AND THE FIELD.

UNAUTHORIZED ALTERATION OR ADDITION TO THIS SURVEY IS A VIOLATION OF SECTION 7209 OF THE NEW YORK EDUCATION LAW.
COPIES OF THIS SURVEY MAP NOT BEARING THE LAND SURVEYOR'S EMBOSSED SEAL AND ORIGINAL SIGNATURE SHALL NOT BE CONSIDERED TO BE A VALID TRUE COPY.
GUARANTEES INDICATED HEREON SHALL RUN ONLY TO THE PERSON FOR WHOM THE SURVEY IS PREPARED, AND ON HIS BEHALF TO THE TITLE COMPANY, GOVERNMENTAL AGENCY, AND LENDING INSTITUTION LISTED HEREON, AND TO THE ASSIGNEES OF THE LENDING INSTITUTION. GUARANTEES ARE NOT TRANSFERABLE TO ADDITIONAL INSTITUTIONS OR SUBSEQUENT OWNERS.
CERTIFICATIONS INDICATED HEREON SIGNIFY THAT THIS SURVEY WAS PREPARED IN ACCORDANCE WITH THE EXISTING CODE OF PRACTICE FOR LAND SURVEYORS ADOPTED BY THE NEW YORK STATE ASSOCIATION OF PROFESSIONAL LAND SURVEYORS.

REVISION	AUTH.	DATE	FIELD DATE: 2-14-23
Description Block Number		9/11/23	FB PG
			SCALE: 1:20
			DRAWN BY: WGL
			CHKD BY: JJV
			COMP FILE:

Environmental Easement Survey of
Long Island City Center (C241189)

SITUATED IN
THE BOROUGH OF QUEENS
CITY OF LONG ISLAND
STATE OF NEW YORK

23-15 44TH ROAD (f/k/a 43-30 24TH STREET)
BLOCK 436 LOT 1

True North Surveyors, P.C.
111 Kosciuszko Road, Whitehouse Station, NJ 08889
phone: (908) 534-6248 fax: (908) 534-6237
John J. Vida N.Y.P.L.S. Lic. No. 050298
PROFESSIONAL LAND SURVEYOR

APPENDIX B

SITE CONTACT LIST

APPENDIX B - SITE CONTACT LIST

LONG ISLAND CITY CENTER – 43-30 24TH STREET
LONG ISLAND CITY, QUEENS, NEW YORK
BROWNFIELD CLEANUP PROGRAM SITE NO. C241189

Key contacts for this project are as follows:

Site Owner and Remedial Party:	Owner: CP VIII LIC Owner LLC c/o Carmel Partners Representative: Matthew Feldman Telephone: (212) 202-5783 E-mail: mfeldman@carmelpartners.com
Remedial Party's Consultant:	Langan Engineering Remedial Engineer Ms. Jessica Friscia, P.E. Telephone: (973) 560-4900 E-mail: jfriscia@langan.com Langan Engineering Program Manager Mr. Steve Ciambruschini, P.G. Telephone: (973) 560-4900 E-mail: sciambruschini@langan.com Langan Engineering Health & Safety Officer Mr. Tony Moffa Telephone: (215) 756-2523 E-mail: tmoffa@langan.com Langan Engineering Field Safety Officer Mr. William Bohrer, PG Telephone: (212) 479-5533 E-mail: wbohrer@langan.com
Qualified Environmental Professional:	Langan Engineering Program Manager Mr. Steve Ciambruschini, P.G. Telephone: (973) 560-4900 E-mail: sciambruschini@langan.com NYSDEC: NYSDEC Project Manager Christopher Allan Telephone No.: (718) 482-9706 Email: Christopher.allan@dec.ny.gov

NYSDEC Section Chief
Cris-Sandra Maycock
Telephone No.: (718) 482-4679
Email: cris-sandra.maycock@dec.ny.gov

NYSDEC Site Control
Ms. Kelly Lewandowski
Telephone: (518) 402-9553
E-mail: Kelly.lewandowski@dec.ny.gov

NYSDEC Attorney
Heather Leibowitz
Telephone: (718) 482-6554
E-mail: heather.leibowitz@dec.ny.gov

NYSDOH Project Manager
Sarita Wagh
Telephone: (518) 402-9543
Email: beei@health.ny.gov

Remedial Party's Attorney:

Sive, Paget & Riesel, P.C.
Mr. Michael Bogin, Esq.
Telephone: (646) 378-7210
E-mail: mbogin@sprlaw.com

Document Repositories:

The document repositories identified below have been established to provide the public with convenient access to important project documents:

https://www.dec.ny.gov/data/DecDocs/C241189/

Queens Public Library – Long Island City
37-44 21 Street
Long Island City, NY 11101
(212) 308-6243

Queens Community Board 2
43-22 50th Street, Room 2B
Woodside, NY 11377
(718) 533-8773

APPENDIX C

RESPONSIBILITIES OF OWNER AND REMEDIAL PARTY

APPENDIX C– RESPONSIBILITIES OF OWNER AND REMEDIAL PARTY

Responsibilities

The responsibilities for implementing the Site Management Plan ("SMP") for the **Long Island City Center** site located 43-30 24th Street (the "site"), number **C241189**, are divided between the site owner and Remedial Party, as defined below. The owner is currently listed as:

CP VIII LIC Owner LLC
c/o Carmel Partners
510 Madison Ave, 8th Floor
New York, NY 10022

Solely for the purposes of this document and based upon the facts related to a particular site and the remedial program being carried out, the term Remedial Party ("RP") refers to any of the following: Certificate of Completion (COC) holder, volunteer, applicant, responsible party, and, in the event the New York State Department of Environmental Conservation ("NYSDEC") is carrying out remediation or site management, the NYSDEC and/or an agent acting on its behalf. The RP is:

CP VIII LIC Owner LLC
c/o Carmel Partners
510 Madison Ave, 8th Floor
New York, NY 10022

Nothing on this page shall supersede the provisions of an Environmental Easement (EE), Consent Order, Consent Decree, agreement, or other legally binding document that affects rights and obligations relating to the site.

Site Owner's Responsibilities:

1) The owner shall follow the provisions of the SMP as they relate to future construction and excavation at the site.

2) In accordance with a periodic time frame determined by the NYSDEC, the owner shall periodically certify, in writing, that all Institutional Controls set forth in the EE remain in place and continue to be complied with. The owner shall provide a written certification to the RP, upon the RP's request, in order to allow the RP to include the certification in the site's Periodic Review Report (PRR) certification to the NYSDEC.

3) In the event the site is delisted, the owner remains bound by the EE and shall submit, upon request by the NYSDEC, a written certification that the EE is still in place and has been complied with.

4) The owner shall grant access to the site to the RP and the NYSDEC and its agents for the purposes of performing activities required under the SMP and assuring compliance with the SMP.

5) The owner is responsible for assuring the security of the remedial components located on its property to the best of its ability. If damage to the remedial components or vandalism is evident, the owner shall notify the site's RP and the NYSDEC in accordance with the timeframes indicated in Section 1.3-Notifications.

6) If some action or inaction by the owner adversely impacts the site, the owner must notify the site's RP and the NYSDEC in accordance with the time frame indicated in Section 1.3-Notifications and coordinate the performance of necessary corrective actions with the RP.

7) The owner must notify the RP and the NYSDEC of any change in ownership of the site property (identifying the tax map numbers in any correspondence) and provide contact information for the new owner of the site property. NYSDEC Title 6 New York Codes, Rules, and Regulations (6 NYCRR) Part 375-1.11(d) contains notification requirements applicable to any construction or activity changes and changes in ownership. Among the notification requirements is the following: sixty days prior written notification must be made to the NYSDEC. Notification is to be submitted to the NYSDEC Division of Environmental Remediation's Site Control Section. Notification requirements for a change in use are detailed in Section 2.4 of the SMP. A change of use includes, but is not limited to, any activity that may increase direct human or environmental exposure (e.g., day care, school or park). A 60-Day Advance Notification Form and Instructions are found at http://www.dec.ny.gov/chemical/76250.html.

8) In accordance with the tenant notification law, within 15 days of receipt, the owner must supply a copy of any vapor intrusion data, that is produced with respect to structures and that exceeds NYSDOH or OSHA guidelines on the site, whether produced by the NYSDEC, RP, or owner, to the tenants on the property. The owner must otherwise comply with the tenant and occupant notification provisions of Environmental Conservation Law Article 27, Title 24.

Remedial Party Responsibilities

1) The RP must follow the SMP provisions regarding any construction and/or excavation it undertakes at the site.

2) The RP shall report to the NYSDEC all activities required for remediation, operation, maintenance, monitoring, and reporting. Such reporting includes, but is not limited to, periodic review reports and certifications, electronic data deliverables, corrective action work plans and reports, and updated SMPs.

3) Before accessing the site property to undertake a specific activity, the RP shall provide the owner advance notification that shall include an explanation of the work expected to be completed. The RP shall provide to (i) the owner, upon owner's request, (ii) the NYSDEC project manager, and (iii) other entities, if required by the SMP, a copy of any data generated during the site visit and/or any final report produced.

4) If the NYSDEC project manager determines that an update of the SMP is necessary, the RP shall update the SMP and obtain final approval from the NYSDEC project manager. Within 5 business days after NYSDEC project manager approval, the RP shall submit a copy of the approved SMP to the owner.

5) The RP shall notify the NYSDEC and the owner of any changes in RP ownership and/or control and of any changes in the party/entity responsible for the operation, maintenance, and monitoring of and reporting with respect to any remedial system (ECs). The RP shall provide contact information for the new party/entity. Such activity constitutes a Change of Use pursuant to 375-1.11(d) and requires 60-days prior notice to the NYSDEC. A 60-Day Advance Notification Form and Instructions are found at http://www.dec.ny.gov/chemical/76250.html .

6) The RP shall notify the NYSDEC of any damage to or modification of the systems as required under Section 1.3- Notifications of the SMP.

7) Prior to a change in use that impacts the remedial system or requirements and/or responsibilities for implementing the SMP, the RP shall submit to the NYSDEC for approval an amended SMP.

8) Any change in use, change in ownership, change in site classification (e.g., delisting), reduction or expansion of remediation, and other significant changes related to the site may result in a change in responsibilities and, therefore, necessitate an update to

the SMP and/or updated legal documents. The RP shall contact the NYSDEC project manager to discuss the need to update such documents.

Change in RP ownership and/or control and/or site ownership does not affect the RP's obligations with respect to the site unless a legally binding document executed by the NYSDEC releases the RP of its obligations.

Future site owners and RPs and their successors and assigns are required to carry out the activities set forth above.

APPENDIX D

EXCAVATION WORK PLAN

APPENDIX D – EXCAVATION WORK PLAN (EWP)

D-1 Notification

At least 15 days prior to the start of any activity that is anticipated to encounter remaining contamination, the site owner or their representative will notify the New York State Department of Environmental Conservation (NYSDEC). The table below includes contact information for the above notification. The information on this table will be updated as necessary to provide accurate contact information. A full listing of site-related contact information is provided in Appendix B.

Notifications*

Name	Contact Information
Remedial Engineer and Project Manager	Jessica Friscia, P.E. Phone No.: 973-560-4900 Email: jfriscia@langan.com
Program Manager	Steven Ciambruschini Phone No.: 973-560-4900 Email: sciambruschini@langan.com
NYSDEC Project Manager	Christopher Allan Phone No.: 718-482-4065 Email: christopher.allan@dec.ny.gov
NYSDEC Section Chief	Cris-Sandra Maycock Phone No.: 718-482-4679 Email: cris-sandra.maycock@dec.ny.gov
NYSDEC Site Control	Kelly Lewandowski Phone No.: 518-402-9543 Email: kelly.lewandowski@dec.ny.gov
NYSDOH Project Manager	Sarita Wagh Phone No.: 518-402-7860 Email: BEEI@health.ny.gov
Site Owner and Remedial Party	Matthew Feldman Phone No.: 212-202-5783 Email:mfeldman@carmelpartners.com

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

This notification will include:

- A detailed description of the work to be performed, including the location and areal extent of excavation, plans/drawings for site re-grading, estimated volumes of contaminated soil to be excavated, and any modification of truck routes;
- A summary of environmental conditions anticipated to be encountered in the work areas, including the nature and concentration levels of contaminants of concern, potential presence of grossly contaminated media, and plans for any pre-construction sampling;
- A schedule for the work, detailing the start and completion of all intrusive work;
- A summary of the applicable components of this EWP;
- A statement that the work will be performed in compliance with this EWP and 29 Code of Federal Regulations (CFR) 1910.120 and CFR 1926 Subpart P;
- A copy of the contractor's health and safety plan (HASP), in electronic format, if it differs from the HASP provided in Appendix E of this Site Management Plan (SMP);
- Identification of disposal facilities for potential waste streams; and
- Identification of sources of any anticipated backfill, along with all required request to import forms and all supporting documentation including, but not limited to, chemical testing results.

The NYSDEC project manager will review the notification and may impose additional requirements for the excavation that are not listed in this EWP.

D-2 Soil Screening Methods

Visual, olfactory and instrument-based (e.g., photoionization detector [PID]) soil screening will be performed by a field engineer, geologist, or scientist under the direction of a qualified environmental professional (QEP) during all excavations into known or potentially contaminated material (remaining contamination). Soil screening will be performed when invasive work is done and will include all excavation and invasive work performed during development, such as excavations for foundations and utility work, after issuance of the Certificate of Completion (COC). All potentially contaminated soil/fill will be field screened using a PID or similar equipment.

Soils will be segregated based on previous environmental data and field screening results into material that requires off-site disposal and material that requires testing to determine if the material can be reused on-site. Further discussion of off-site disposal of materials and on-site reuse is provided in Section D-6 of this Appendix.

D-3 Soil Staging Methods

Soil stockpiles will be continuously encircled with a berm and/or silt fence. Hay bales will be used as needed near catch basins, surface waters and other discharge points.

Stockpiles will be kept covered at all times with appropriately anchored tarps. Stockpiles will be routinely inspected, and damaged tarp covers will be promptly replaced.

Stockpiles will be inspected at a minimum once each week and after every storm event. Results of inspections will be recorded in a logbook and maintained at the site and available for inspection by the NYSDEC.

D-4 Materials Excavation and Load-Out

A QEP, as defined in 6NYCRR Part 375, or person under their supervision, will oversee all invasive work and the excavation and load-out of all excavated materials.

The owner of the property and remedial party (if applicable) and its contractors are responsible for safe execution of all invasive and other work performed under this EWP or SMP.

The presence of utilities and easements on the site will be investigated by owner. It will be determined whether a risk or impediment to the planned work under this SMP is posed by utilities or easements on the site. A site utility stakeout will be completed for al utilities prior to any ground intrusive activities at the site.

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

A truck wash will be operated on-site, as appropriate. The QEP or field staff under their supervision will be responsible for ensuring that all outbound trucks will be washed at the truck wash before leaving the site until activities performed under this section are complete. Truck wash waters will be collected and disposed of off-site at a permitted facility in an appropriate manner. See Section D-8 Fluids Management for additional details. Locations where vehicles enter or exit the site shall be inspected daily for evidence of off-site soil tracking.

The QEP will be responsible for ensuring that all egress points for truck and equipment transport from the site are clean of soil, fill, and sediment derived from the site during intrusive excavation activities. Cleaning of the adjacent streets will be performed as needed to maintain a clean condition with respect to site-derived soil, fill, and sediment. Soil, fill, and sediment accumulated from the street cleaning and egress cleaning activities will be disposed off-site at a permitted landfill facility in accordance with all applicable local, State, and Federal regulations. See Section D-6 Materials Disposal Off-site for additional details.

D-5 Materials Transport Off-Site

All transport of materials will be performed by licensed haulers in accordance with appropriate local, state, and federal regulations, including New York Code, Rules, and Regulations (NYCRR) Part 364. Haulers will be appropriately licensed and trucks properly placarded.

Materials transported by trucks exiting the site will be secured with tight-fitting covers. Loose-fitting canvas-type truck covers will be prohibited. If loads contain wet material capable of producing free liquid, truck liners will be used.

Truck transport routes are shown on Figure 7 of the SMP. All trucks loaded with site soil/fill will exit the vicinity of the site using only these approved truck routes. Truck routes will take into account: (a) limiting transport through residential areas and past sensitive sites; (b) use of city mapped truck routes; (c) prohibiting off-site queuing of trucks entering the facility; (d) limiting total distance to major highways; (e) promoting safety in access to highways; and (f) overall safety in transport; (g) community input [where necessary].

Trucks will be prohibited from stopping and idling unnecessarily in the neighborhood outside the project site. Egress points for truck and equipment transport from the site will be kept clean of soil, fill, and sediment during site remediation and development. See Section D-4 Soil/Fill Excavation and Load-Out for additional details. Queuing of trucks will be performed on-site to minimize off-site disturbance. Off-site queuing will be minimized.

D-6 Materials Disposal Off-Site

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

Off-site disposal locations for excavated soils will be identified in the pre-excavation notification. This will include estimated quantities and a breakdown by class of disposal facility if appropriate, (e.g., hazardous waste disposal facility, solid waste landfill, petroleum treatment facility, concrete and demolition (C&D) debris recovery facility). Actual disposal quantities and associated documentation will be reported to the NYSDEC project manager in the subsequent Periodic Review Report (PRR). This documentation will include, but will not be limited to: waste profiles, test results, facility acceptance letters, manifests, bills of lading and facility receipts.

Non-hazardous historic fill and contaminated soils taken off-site will be handled consistent with 6 NYCRR Parts 360, 361, 362, 363, 364, and 365. Material that does not meet Unrestricted Use (UU) Soil Cleanup Objectives (SCO) is prohibited from being taken to a New York State C&D recovery facility (6 NYCRR Part 360-15 registered or permitted facility).

D-7 Materials Reuse On-Site

The QEP as defined in 6 NYCRR Part 375 will ensure that procedures defined for material reuse in this SMP are followed and that unacceptable soil (i.e., contaminated) does not remain on-site.

Proposed materials for reuse on-site must be sampled for full suite analytical parameters including per- and polyfluoroalkyl substances (PFAS) and 1,4-dioxane. The sampling frequency will be in accordance with DER-10 Table 5.4(e)10 unless prior approval is obtained from the NYSDEC project manager for modification of the sampling frequency. The analytical results of soil/fill material testing must meet the site use criteria presented in NYSDEC DER-10 Appendix 5 – Allowable Constituent Levels for Imported Fill or Soil for all constituents listed, and the NYSDEC Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances [October 2020 or date of current version, whichever is later] guidance values. Approvals for modifications to the analytical parameters must be obtained from the NYSDEC project manager prior to the sampling event.

Soil/fill for reuse on-site will be segregated and staged as described in Sections D-2 and D-3 of this EWP. The anticipated size and location of stockpiles will be provided in the 15-day notification to the NYSDEC project manager. Stockpile locations will be based on the location of site excavation activities and proximity to nearby site features. Soil/fill reuse on-site will comply with requirements of NYSDEC DER-10 Section 5.4(e)4. Any modifications to the requirements of DER-10 Section 5.4(e)4 must be approved by the NYSDEC project manager prior to reuse on site.

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

D-8 Fluids Management

All liquids to be removed from the site, including but not limited to, excavation dewatering, decontamination waters and groundwater monitoring well purge and development waters, will be handled, transported and disposed off-site at a permitted facility in accordance with applicable local, State, and Federal regulations. Dewatering, purge and development fluids will not be recharged back to the land surface or subsurface of the site, and will be managed off-site, unless prior approval is obtained from NYSDEC.

Discharge of water generated during large-scale construction activities to surface waters (e.g., a local pond, stream or river) will be performed under a State Pollutant Discharge Elimination System (SPDES) permit.

D-9 Backfill from Off-Site Sources

All material proposed for import onto the site will be approved by the QEP, as defined in 6 NYCRR Part 375, and will be in compliance with provisions in this SMP prior to receipt at the site. A Request to Import/Reuse Fill or Soil form, which can be found at http://www.dec.ny.gov/regulations/67386.html, will be prepared and submitted to the NYSDEC project manager allowing a minimum of 5 business days for review. A copy of the form is presented in Appendix G.

All imported soils will meet the backfill and cover soil quality standards established in 6 NYCRR 375-6.7(d) and DER-10 Appendix 5 for Restricted-Residential use. Based on an evaluation of the land use, protection of groundwater and protection of ecological resources criteria, the resulting soil quality standards are listed in Table 2 of the SMP. Soils that meet 'exempt' fill requirements under 6 NYCRR Part 360, but do not meet backfill or cover soil objectives for this site, will not be imported onto the site without prior approval by NYSDEC. Soil material will be sampled for the full suite of analytical parameters, including PFAS and 1, 4-dioxane. Solid waste will not be imported onto the site.

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

D-10 Stormwater Pollution Prevention

Barriers and hay bale checks will be installed and inspected once a week and after every storm event. Results of inspections will be recorded in a logbook and maintained at the site and available for inspection by the NYSDEC. All necessary repairs shall be made immediately.

Accumulated sediments will be removed as required to keep the barrier and hay bale check functional.

All undercutting or erosion of the silt fence toe anchor shall be repaired immediately with appropriate backfill materials.

Manufacturer's recommendations will be followed for replacing silt fencing damaged due to weathering.

Erosion and sediment control measures identified in the SMP shall be observed to ensure that they are operating correctly. Where discharge locations or points are accessible, they shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters.

Silt fencing or hay bales will be installed around the entire perimeter of the construction area.

D-11 Excavation Contingency Plan

If underground tanks or other previously unidentified contaminant sources are found during post-remedial subsurface excavations or development related construction, excavation activities will be suspended until sufficient equipment is mobilized to address the condition. The NYSDEC project manager will be promptly notified of the discovery.

Sampling will be performed on product, sediment and surrounding soils, etc. as necessary to determine the nature of the material and proper disposal method. Chemical analysis will be performed for a full list of analytes (TAL metals, TCL VOCs, SVOCs, pesticides, PCBs, PFAS and 1,4-dioxane), unless the site history and previous sampling results provide a sufficient justification to limit the list of analytes. In this case, a reduced list of analytes will be proposed to the NYSDEC project manager for approval prior to sampling. Any tanks will be closed as per NYSDEC regulations and guidance.

Identification of unknown or unexpected contaminated media identified by screening during invasive site work will be promptly communicated by phone to NYSDEC's project manager. Reportable quantities of petroleum product will also be reported to the NYSDEC spills hotline. These findings will be also included in the PRR.

D-12 Community Air Monitoring Plan

Two stationary air-monitoring stations will be set up at site perimeters during intrusive site work for continuous monitoring. The locations of air sampling stations will be based on the prevailing wind direction and will be adjusted on a daily or more frequent basis based on actual wind directions to provide an upwind and at least one downwind monitoring station. If a sensitive receptor, such as a school, day care or residential area is adjacent to the site, a fixed monitoring station should be located at that site perimeter, regardless of wind direction, and discussed in the text. Each station will include a photoionization detector (PID) and a DustTrak aerosol monitor, or equivalent, capable of recording particulate concentrations up to 10 micrometers in diameter (PM10). Action levels for the protection of the community and visitors are set forth in the CAMP, which is included in the HASP. If action levels are exceeded dust or VOC suppression will be implemented as needed.

Exceedances of action levels listed in the CAMP will be reported to NYSDEC and NYSDOH Project Managers. All data is to be reported in the final report for the excavation activity.

<u>D-12A: Special Requirements for Work Within 20 Feet of Potentially Exposed Individuals or Structures</u>

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 part-per-million (ppm), monitoring should occur within the occupied structure(s). Depending upon the nature of contamination, chemical-specific colorimetric tubes of sufficient sensitivity may be necessary for comparing the exposure point concentrations with appropriate pre-determined response levels (response actions should also be pre-determined). 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 micrograms per cubic meter ($\mu g/m^3$), work activities should be suspended until controls are implemented and are successful in reducing the total particulate concentration to 150 $\mu g/m^3$ 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.

D-12B: 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.

D-13 Odor Control Plan

Work practices to minimize odors and vapors will be used during all intrusive activities. Offending odor and organic vapor controls may include the application of foam suppressants or tarps over the odor or VOC source areas. Foam suppressants may include biodegradable foams applied over the source material for short-term control of the odor and VOCs.

If nuisance odors are identified at the site boundary, or if odor complaints are received, work will be halted, and the source of odors will be identified and corrected. Work will not resume until all nuisance odors have been abated. NYSDEC and NYSDOH will be notified of all odor events and of any other complaints about the project. Implementation of all odor monitoring is the responsibility of the Remedial Engineer (RE). The RE will advise the contractor of exceedances that could warrant additional controls or work stoppage. Implementation of effective odor controls is the responsibility of the contractor. Work may not resume until odor is controlled. Any odor control measures that are implemented will be summarized in the PRR.

All necessary means will be employed to prevent on- and off-site nuisances. If odors develop and cannot be otherwise controlled, additional means to eliminate odor nuisances will include: (a) limiting excavations areas; (b) direct load-out of soils to trucks for off-site disposal; (c) use of chemical odorants in spray or misting systems; and (d) use of staff to monitor odors in surrounding neighborhoods.

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

D-14 Dust Control Plan

Particulate monitoring must be conducted according to the CAMP provided in Section D-12. If particulate levels at the site exceed the thresholds listed in the CAMP or if airborne dust is observed on the site or leaving the site, the dust suppression techniques listed below will be employed. The remedial party will also take measures listed below to prevent dust production on the site.

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

- Dust suppression will be achieved by spraying water directly onto off-road areas including excavations and stockpiles.
- Clearing and grubbing of larger sites will be done in stages to limit the area of exposed, unvegetated soils vulnerable to dust production.
- Gravel will be used on roadways to provide a clean and dust-free road surface.

- On-site roads will be limited in total area to minimize the area requiring dust suppression.
- If dust cannot be controlled using these methods, a dedicated water truck may be required.

D-15 Other Nuisances

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

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

D-16 Reporting

A report is to be submitted to the NYSDEC within 90 days of completion of the activities performed under this EWP. This report shall contain a summary of the activities performed; a summary of all data gathered and results; information about any media that was removed from the site: volume, contamination levels, area from which removed; and any other information that may be indicate a change to the "remaining contamination" that is at the site. Such changes may require revision of the SMP.

APPENDIX E

HEALTH AND SAFETY PLAN

HEALTH AND SAFETY PLAN

FOR

43-30 24TH STREET
LONG ISLAND CITY, NEW YORK
New York City Queens Tax Block 436, Lot 1

Prepared For

CP VIII LIC Owner LLC
c/o Carmel Partners
510 Madison Ave, 8th Floor
New York, NY 10022

Prepared By:

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300 Kimball Drive
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Langan Project No. 170362701

LANGAN

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* Items to be posted prominently on site, or made readily available to personnel.

1.0 INTRODUCTION

1.1 General

This CONSTRUCTION HEALTH AND SAFETY PLAN (CHASP) was developed to address disturbance of known and reasonably anticipated subsurface contaminants and comply with Occupational Safety and Health Administration (OSHA) Standard 29 CFR 1910.120(b)(4), *Hazardous Waste Operations and Emergency Response* during possible future under Site Management Plan (SMP) at 43-30 24th Street in Long Island City, Queens, New York (New York City Queens Tax Block 436, Lot 1) ("the Site"). This CHASP provides the minimum requirements for implementing site operations during future possible soil intrusive activities. All contractors performing work on this site shall implement their own CHASP that, at a minimum, adheres to this CHASP. The contractor is responsible for their own health and safety and that of their subcontractors. Langan personnel will implement this CHASP while onsite.

The management of the day-to-day site activities and implementation of this CHASP in the field is the responsibility of the site Langan Field Team Leader (FTL). Assistance in the implementation of this CHASP can also be obtained from the site Langan Health and Safety Officer (HSO) and the Langan Health and Safety Manager (HSM). Contractors operating on the site shall designate their own FTL, HSO and HSM. The content of this CHASP may change or undergo revision based upon additional information made available to health and safety personnel, monitoring results, or changes in the work plan.

1.2 Site Location and Background

The Site is located at 43-30 24th Street and is identified as Block 436, Lot 1 on the Queens Borough New York City Tax Map. The Site was remediated for Restricted-Residential (including Commercial) use and, after construction, will be improved with a 67-story residential and commercial building with a footprint area of about 56,500 square feet.

The Site is located in an urban setting that is characterized by residential, commercial and industrial buildings. The site is bound to the north by Block 436, Lots 21 and 10 and 43rd Avenue; to the west by 23rd Street and the elevated No. 7 subway line; to the south by 44th Road; and to the east by 24th Street. A Site Location Map is provided as Figure 1.

1.3 Summary of Work Tasks

The general categories of work tasks that may be performed at the site include, but are not limited to:

1.3.1 Soil Screening

As part of future excavation activities, the Langan personnel will report when they have observed visual and olfactory indications of possible soil impact. Langan personnel will also report concentrations of volatile organic vapors (VOCs) above background when using a properly calibrated hand held photoionization detector (PID, or equivalent).

1.3.2 Soil Sampling

Soil samples for excavation endpoint or delineation sampling (along with QA/QC samples) may be collected into laboratory-supplied batch-certified clean glassware and submitted to a New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP).

1.3.3 Stockpiling

Potentially impacted soil may be stockpiled pending laboratory analysis and determining proper off-site disposal. Langan personnel will coordinate with the contractor in stockpiling soils (in accordance with the SMP, where applicable).

1.3.4 Characterization of Excavated Material

When required by the SMP, Langan personnel will characterize excavated soil or clean backfill in accordance with Langan standards.

1.3.5 Excavation Backfill

Areas of the site that were over-excavated may be backfilled to development grade (i.e., the grade required to complete construction of the foundation and sidewalk extension). Imported material will consist of clean fill that meets the 6 New York Codes, Rules and Regulations (NYCRR) Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives (UU SCOs) or other acceptable fill material such as virgin stone from a permitted mine or quarry or recycled concrete aggregate (RCA), from a New York State Department of Environmental Conservation (NYSDEC)-registered facility in compliance with 6 NYCRR Part 360 registration and permitting requirements for the period of RCA acquisition. Imported RCA must be derived from recognizable and uncontaminated concrete. RCA is not acceptable for, and will not be used as, site cover or drainage material.

1.3.6 Groundwater Investigation and Sampling

When required, temporary or permanent groundwater monitoring wells will be installed and sampled to evaluate groundwater quality. Groundwater samples will be collected from one or more of the temporary monitoring wells in accordance with the Langan Low Flow Groundwater Sampling SOP (SOP #12). Groundwater samples will be submitted to an NYSDOH ELAP-certified laboratory and analyzed for constituents as specified in the work plan. The temporary monitoring wells will be backfilled and abandoned in accordance with State and Local regulations.

1.3.7 Drum Sampling

Excess or impacted soil and water that is drummed during the remedial action activities must be labeled in accordance with the Langan Drum Labeling Standard Operating Procedure (SOP-#9). Langan personnel will collect drum samples, as required, prior to off-site drum disposal. Samples will be placed into laboratory-supplied batch-certified clean glassware and submitted to a NYSDOH ELAP-certified laboratory.

2.0 IDENTIFICATION OF KEY PERSONNEL/HEALTH AND SAFETY PERSONNEL

The following briefly describes the health and safety (H&S) designations and general responsibilities that may be employed for this site. The titles have been established to accommodate the project needs and requirements and ensure the safe conduct of site activities. The H&S personnel requirements for a given work location are based upon the proposed site activities.

2.1 Langan Project Manager

The Langan Environmental Project Manager (PM) is Jessica Friscia, her responsibilities include:

- Ensuring that this CHASP is developed, current, 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 CHASP.

2.2 Langan Corporate Health and Safety Manager

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

- Updating the *Construction Health and Safety Program for Hazardous Waste Operations.*
- Assisting the site Health and Safety Officer (HSO) with development of the CHASP, updating CHASP as dictated by changing conditions, jobsite inspection results, etc. and approving changes to this CHASP.
- Assisting the HSO in the implementation of this CHASP and conducting Jobsite Safety

Inspections and assisting with communication of results and correction of shortcomings found.

- Maintaining records on personnel (medical evaluation results, training and certifications, accident investigation results, etc.).

2.3 Langan Site Health & Safety Officer

The Langan site HSO is William Bohrer. His responsibilities include:

- Participating in the development and implementation of this CHASP.
- When on-site, assisting the Langan Field Team Leader in conducting Tailgate Safety Meetings and Jobsite Safety Inspections and correcting any shortcomings in a timely manner.
- Ensuring that proper PPE is available, worn by employees, and properly stored and maintained.
- Controlling entry into and exit from the site contaminated areas or zones.
- Monitoring employees 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.
- Resolving conflicts that may arise concerning safety requirements and working conditions.
- Reporting all incidents, injuries and near misses to the Langan Incident/Injury Hotline immediately and the client representative.

2.4 Langan Field Team Leader Responsibilities

The Langan Field Team Leader (FTL) is to be determined prior to the start of the start of field activities. The Field Team Leader’s responsibilities include:

- The management of the day-to-day site activities and implementation of this CHASP in the field.
- Participating in and/or conducting Tailgate Safety Meetings and Jobsite Safety Inspections and correcting any shortcomings in a timely manner.
- When a Community Air Monitoring Operating Program (CAMP) is part of the scope, the FTL will set up and maintaining community air monitoring activities and instructing the responsible contractor to implement organic vapor or dust mitigation when necessary.
- Overseeing the implementation of activities specified in the work plan.

2.5 Contractor Responsibilities

The contractor shall develop and implement their own CHASP for their employees, lower-tier subcontractors, and consultants. The contractor is responsible for their own health and safety and that of their subcontractors. Contractors operating on the site shall designate their own FTL, HSO and HSM. The contractor's CHASP will be at least as stringent as this Langan CHASP. The contractor must be familiar with and abide by the requirements outlined in their own CHASP. A contractor may elect to adopt Langan's CHASP as its own provided that it has given written notification to Langan, but where Langan's CHASP excludes provisions pertinent to the contractor’s work (i.e., confined space entry); the contractor must provide written addendums to this CHASP. Additionally, the contractor must:

- Ensure their employees are trained in the use of all appropriate PPE for the tasks involved;
- Notify Langan of any hazardous material brought onto the job site or site related area, the hazards associated with the material, and must provide a material safety data sheet (MSDS) or safety data sheet (SDS) for the material;
- Have knowledge of, understand, and abide by all current federal, state, and local health and safety regulations pertinent to the work;
- Ensure their employees handling hazardous materials, if identified at the Site, have received current training in the appropriate levels of 29 CFR 1910.120, *Hazardous Waste Operations and Emergency Response* (HAZWOPER) if hazardous waste is identified at the Site;
- Ensure their employees handling hazardous materials, if identified at the Site, have been fit-tested within the year on the type respirator they will wear; and
- Ensure all air monitoring is in place pertaining to the health and safety of their employees as required by OSHA 1910.120; and
- All contractors must adherer to all federal, state, and local regulatory requirements.

3.0 TASK/OPERATION SAFETY AND HEALTH RISK ANALYSES

A Task-Hazard Analysis (Table 1) was completed for general construction hazards that may be encountered at the Site. The potential contaminants that might be encountered during the field activities and the exposure limits are listed in Table 2 complete inventory of MSDS/SDS for chemical products used on site is included as Attachment E.

3.1 Specific Task Safety Analysis

3.1.1 Soil Screening and Sampling

When conducting soil screening and collecting soil samples, Langan personnel will don chemical resistant gloves in addition to the standard personal protection equipment (PPE).

3.1.2 Stockpile Sampling

The Langan personnel are not to scale or otherwise climb stockpiles. If the soil sampling plan requires sampling from the stockpile above ground level, samples are to be obtained using suitable excavation equipment operated by the contractor (i.e. front end loader).

3.1.3 Groundwater Investigation and Sampling

Sampling groundwater requires the donning of chemical resistant gloves in addition to the standard PPE and cut resistant gloves when cutting sampling-tubing to length. Langan personnel are not to operate drilling equipment nor assemble or install monitoring well equipment. These tasks are to be completed by the driller contractor.

3.1.4 Drum Sampling

Drilling fluid, rinse water, grossly-contaminated soils samples and cuttings may be containerized in 55-gallon drums for transport and disposal off site. Each drum must be labeled in accordance with the Langan Drum Labeling Standard Operating Procedure (SOP-#9). Langan may collect drum samples, as required, prior to off-site drum disposal. Samples will be placed into laboratory-supplied batch-certified clean glassware and submitted to a NYSDOH ELAP-certified laboratory.

Langan employees and contractors are not to move or open any orphaned (unlabeled) drum found on the site without approval of the project manager.

3.2 Radiation Hazards

No radiation hazards are known or expected at the site.

3.3 Physical Hazards

Physical hazards, which may be encountered during site operations for this project, are detailed in Table 1.

3.3.1 Explosion

No explosion hazards are expected for the scope of work at this site.

3.3.2 Heat Stress

The use of Level C protective equipment, or greater, may create heat stress. Monitoring of personnel wearing personal protective clothing should commence when the ambient temperature is 72^{O}F or above. Table 6 presents the suggested frequency for such monitoring. Monitoring frequency should increase as ambient temperature increases or as slow recovery rates are observed. Refer to the Table 7 to assist in assessing when the risk for heat related illness is likely. To use this table, the ambient temperature and relative humidity must be obtained (a regional weather report should suffice). Heat stress monitoring should be performed by the HSO or the FTL, who shall be able to recognize symptoms related to heat stress.

To monitor the workers, be familiar with the following heat-related disorders and their symptoms:

- **Heat Cramps:** Painful spasm of arm, leg or abdominal muscles, during or after work
- **Heat Exhaustion:** Headache, nausea, dizziness; cool, clammy, moist skin; heavy sweating; weak, fast pulse; shallow respiration, normal temperature
- **Heat Stroke**: Headache, nausea, weakness, hot dry skin, fever, rapid strong pulse, rapid deep respirations, loss of consciousness, convulsions, coma. *This is a life threatening condition***.**

Do not permit a worker to wear a semi-permeable or impermeable garment when they are showing signs or symptoms of heat-related illness.

To monitor the worker, measure:

- **Heart rate:** Count the radial pulse during a 30-second period as early as possible in the rest period. If the heart rate exceeds 100 beats per minute at the beginning of the rest period, shorten the next work cycle by one-third and keep the rest period the same. If the heart rate still exceeds 100 beats per minute at the next rest period, shorten the following work cycle by one-third. A worker cannot return to work after a rest period until their heart rate is below 100 beats per minute.
- **Oral temperature:** Use a clinical thermometer (3 minutes under the tongue) or similar device to measure the oral temperature at the end of the work period (before drinking). If oral temperature exceeds 99.6°F (37.6°C), shorten the next work cycle by one-third without changing the rest period. A worker cannot return to work after a rest period until their oral temperature is below 99.6°F. If oral temperature still exceeds 99.6°F (37.6°C) at the beginning of the next rest period, shorten the following cycle by one-third. Do not permit a worker to wear a semi-permeable or impermeable garment when oral temperature exceeds 100.6°F (38.1°C).

Prevention of Heat Stress - Proper training and preventative measures will aid in averting loss of worker productivity and serious illness. Heat stress prevention is particularly important because once a person suffers from heat stroke or heat exhaustion, that person may be predisposed to additional heat related illness. To avoid heat stress the following steps should be taken:

- Adjust work schedules.
- Mandate work slowdowns as needed.

- Perform work during cooler hours of the day if possible or at night if adequate lighting can be provided.
- Provide shelter (air-conditioned, if possible) or shaded areas to protect personnel during rest periods.
- Maintain worker's body fluids at normal levels. This is necessary to ensure that the cardiovascular system functions adequately. Daily fluid intake must approximately equal the amount of water lost in sweat, id., eight fluid ounces (0.23 liters) of water must be ingested for approximately every eight ounces (0.23 kg) of weight lost. The normal thirst mechanism is not sensitive enough to ensure that enough water will be drunk to replace lost sweat. When heavy sweating occurs, encourage the worker to drink more. The following strategies may be useful:
  - Maintain water temperature 50° to 60°F (10° to 16.6°C).
  - Provide small disposal cups that hold about four ounces (0.1 liter).
  - Have workers drink 16 ounces (0.5 liters) of fluid (preferably water or dilute drinks) before beginning work.
  - Urge workers to drink a cup or two every 15 to 20 minutes, or at each monitoring break. A total of 1 to 1.6 gallons (4 to 6 liters) of fluid per day are recommended, but more may be necessary to maintain body weight.
  - Train workers to recognize the symptoms of heat related illness.

3.3.3 Cold-Related Illness

If work on this project begins in the winter months, thermal injury due to cold exposure can become a problem for field personnel. Systemic cold exposure is referred to as hypothermia. Local cold exposure is generally called frostbite.

- **Hypothermia -** Hypothermia is defined as a decrease in the patient core temperature below 96°F. The body temperature is normally maintained by a combination of central (brain and spinal cord) and peripheral (skin and muscle) activity. Interference with any of these mechanisms can result in hypothermia, even in the absence of what normally is considered a "cold" ambient temperature. Symptoms of hypothermia include: shivering, apathy, listlessness, sleepiness, and unconsciousness.
- **Frostbite -** Frostbite is both a general and medical term given to areas of local cold injury. Unlike systemic hypothermia, frostbite rarely occurs unless the ambient temperatures are less than freezing and usually less than 20°F. Symptoms of frostbite are: a sudden blanching or whitening of the skin; the skin has a waxy or white appearance and is firm to the touch; tissues are cold, pale, and solid.

Prevention of Cold-Related Illness - To prevent cold-related illness:

- Educate workers to recognize the symptoms of frostbite and hypothermia
- Identify and limit known risk factors:

- Assure the availability of enclosed, heated environment on or adjacent to the site.
- Assure the availability of dry changes of clothing.
- Assure the availability of warm drinks.
- Start (oral) temperature recording at the job site:
- At the FSO or Field Team Leader's discretion when suspicion is based on changes in a worker's performance or mental status.
- At a worker's request.
- As a screening measure, two times per shift, under unusually hazardous conditions (e.g., wind-chill less than 20^{O}F, or wind-chill less than 30^{O}F with precipitation).
- As a screening measure whenever anyone worker on the site develops hypothermia.

Any person developing moderate hypothermia (a core temperature of 92^{O}F) cannot return to work for 48 hours.

3.3.4 Noise

Work activities during the proposed activities may be conducted at locations with high noise levels from the operation of equipment. Hearing protection will be used as necessary.

3.3.5 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. All hand and power tools should be inspected for health and safety hazards prior to use. If deemed unserviceable/un-operable, notify supervisor and tag equipment out of service. Ground Fault Circuit Interrupters (GFCIs) are required for all power tools requiring direct electrical service.

3.3.6 Slips, Trips and Fall Hazards

Care should be exercised when walking at the site, especially when carrying equipment. The presence of surface debris, uneven surfaces, pits, facility equipment, and soil piles contribute to tripping hazards and fall hazards. To the extent possible, all hazards should be identified and marked on the site, with hazards communicated to all workers in the area.

3.3.7 Utilities (Electrocution and Fire Hazards)

The possibility of encountering underground utilities poses fire, explosion, and electrocution hazards. All excavation work will be preceded by review of available utility drawings and by notification of the subsurface work to the N.Y. One –Call--Center. Potential adverse effects of electrical hazards include burns and electrocution, which could result in death.

3.4 Biological Hazards

3.4.1 Animals

No animals are expected to be encountered during site operations.

3.4.2 Insects

Insects are not expected to be encountered during site operations.

3.5 Additional Safety Analysis

3.5.1 Presence of Non-Aqueous Phase Liquids (NAPL)

There is potential for exposure to NAPL at this site. Special care and PPE should be considered when NAPL is observed as NAPL is a typically flammable fluid and releases VOCs known to be toxic and/or carcinogenic. If NAPL is present in a monitoring well, vapors from the well casing may contaminate the work area breathing zone with concentrations of VOCs potentially exceeding health and safety action levels. In addition, all equipment used to monitor or sample NAPL (or ground water from wells containing NAPL) must be intrinsically safe. Equipment that directly contacts NAPL must also be resistant to organic solvents.

At a minimum, a PID should be used to monitor for VOCs when NAPL is observed. If NAPL is expected to be observed in an excavation or enclosed area, air monitoring must be started using calibrated air monitoring equipment designed to sound an audio alarm when atmospheric concentrations of VOC are within 10% of the LEL. In normal atmospheric oxygen concentrations, the LEL monitoring may be done with a Wheatstone bridge/catalytic bead type sensor (i.e. MultiRAE). However in oxygen depleted atmospheres (confined space), only an LEL designed to work in low oxygen environments may be used. Best practices require that the LEL monitoring unit be equipped with a long sniffer tube to allow the LEL unit to remain outside the UST excavation.

When NAPL is present, Langan personnel are required to use disposable nitrile gloves at all times to prevent skin contact with contaminated materials. They should also consider having available a respirator and protective clothing (Tyvek® overalls), especially if NAPL is in abundance and there are high concentrations of VOCs.

All contaminated disposables including PPE and sampling equipment must be properly disposed of in labeled 55-gallong drums

3.6 Job Safety Analysis

A Job Safety Analysis (JSA) is a process to identify existing and potential hazards associated with each job or task so these hazards can be eliminated, controlled or minimized. A JSA will be performed at the beginning of each work day, and additionally whenever an employee begins a new task or moves to a new location. All JSAs must be developed and reviewed by all parties involved. A blank JSA form and documentation of completed JSAs are in Attachment G.

4.0 PERSONNEL TRAINING

4.1 Basic Training

Completion of an initial 40-hour HAZWOPER training program as detailed in OSHA's 29 CFR 1910.120(e) is required for all employees working on a site engaged in hazardous substance removal or other activities which expose or potentially expose workers to hazardous substances, health hazards, or safety hazards as defined by 29 CFR 1910.120(a). Annual 8-hour refresher training is also required to maintain competencies to ensure a safe work environment. In addition to these training requirements, all employees must complete the OSHA 10 hour Construction Safety and Health training and supervisory personnel must also receive eight additional hours of specialized management training. Training records are maintained by the HSM.

4.2 Initial Site-Specific Training

Training will be provided to specifically address the activities, procedures, monitoring, and equipment for site operations at the beginning of each field mobilization and the beginning of each discrete phase of work. The training will include the site and facility layout, hazards, and emergency services at the site, and will detail all the provisions contained within this CHASP. For a HAZWOPER operation, training on the site must be for a minimum of 3 days. Specific issues that will be addressed include the hazards described in Section 3.0.

4.3 Tailgate Safety Briefings

Before starting work each day or as needed, the Langan HSO will conduct a brief tailgate safety meeting to assist site personnel in conducting their activities safely. Tailgate meetings will be documented in Attachment H. Briefings will include the following:

- Work plan for the day;
- Review of safety information relevant to planned tasks and environmental conditions;
- New activities/task being conducted;
- Results of Jobsite Safety Inspection Checklist;
- Changes in work practices;
- Safe work practices; and
- Discussion and remedies for noted or observed deficiencies.

5.0 MEDICAL SURVEILLANCE

All personnel who will be performing field work involving potential exposure to toxic and hazardous substances (defined by 29 CFR 1910.120(a)) will be required to have passed an initial baseline medical examination, with 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.

Additionally, personnel who may be required to perform work while wearing a respirator must receive medical clearance as required under CFR 1910.134(e), *Respiratory Protection*. 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 the HSM.

6.0 PERSONAL PROTECTIVE EQUIPMENT

6.1 Levels of Protection

Langan will provide PPE to Langan employees to protect them from the specific hazards they are likely to encounter on-site. Direct hired contractors will provide their employees with equivalent PPE to protect them from the specific hazards likely to be encountered 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. The upgrading/downgrading of the level of protection will be based on continuous air monitoring results as described in Section 6.0 (when applicable). The decision to modify standard PPE will be made by the site HSO or FTL after conferring with the PM. The levels of protection are described below.

Level D Protection (as needed)

- Safety glasses with side shields or chemical splash goggles
- Safety boots/shoes
- Coveralls (Tyvek® or equivalent)
- Hard hat
- Long sleeve work shirt and work pants
- Nitrile gloves
- Hearing protection
- Reflective safety vest

Level D Protection (Modified, as needed)

- Safety glasses with sideshields or chemical splash goggles
- Safety boots/shoes (toe-protected)
- Disposable chemical-resistant boot covers
- Coveralls (polycoated Tyvek or equivalent to be worn when contact with wet contaminated soil, groundwater, or non-aqueous phase liquids is anticipated)
- Hard hat
- Long sleeve work shirt and work pants

- Nitrile gloves
- Hearing protection (as needed)
- Personal floatation device (for work within 5 ft of the water)
- Reflective traffic vest

Level C Protection (as needed)

- Full or Half face, air-purifying respirator, with NIOSH approved HEPA filter
- Inner (latex) and outer (nitrile) chemical-resistant gloves
- Safety glasses with side shields or chemical splash goggles
- Chemical-resistant safety boots/shoes
- Hard hat
- Long sleeve work shirt and work pants
- Coveralls (Tyvek® or equivalent)
- Hearing protection (as needed)
- Reflective safety 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 the HSM and is available if needed. The monitoring procedures and equipment are outlined in Section 6.0 (when applicable).

6.2 Respirator Fit-Test

All Langan employees who may be exposed to hazardous substances at the work site are in possession of a full or half face-piece, air-purifying respirator and have been successfully fit-tested within the past year. Fit-test records are maintained by the HSM.

6.3 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.

7.0 AIR QUALITY MONITORING AND ACTIONS LEVELS

7.1 Monitoring During Site Operations

Atmospheric air monitoring results may be collected and 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 HSO may establish an exclusion zone or require a person to wear a respirator even though atmospheric air contaminant concentrations are below established CHASP action levels.

During site work involving disturbance of petroleum-impacted or fill material, real time air monitoring may be conducted for volatile organic compounds (VOCs). A photoionization detector (PID) and/or flame ionization detector (FID) will be used to monitor concentrations of VOCs at personnel breathing-zone height. Air monitoring will be the responsibility of the HSO or designee. Air monitoring may be conducted during intrusive activities associated with the completion of excavation, debris removal, and soil grading. 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 CHASP.

7.1.1 Volatile Organic Compounds

Monitoring with a PID, such as a MiniRAE 2000 (10.6v) or equivalent may occur during intrusive work in the AOCs. Colormetric Indicator Tubes for benzene may be used as backup for the PID, if measurements remain above background monitor every 2 hours. The HSO will monitor the employee breathing zone <u>at least</u> every 30 minutes, or whenever there is any indication that concentrations may have changed (odors, visible gases, etc.) since the last measurement. If VOC levels are observed above 5 ppm for longer than 5 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 AOC every 30 minutes in addition to the employee breathing zone. Instrument action levels for monitored gases are provided in Table 4.

7.1.2 Metals

Based upon the site historical fill, there is a potential for the soils to contain PAHs and metals. 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 Mini-Ram may be used to monitor for air particulates. 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 0.100 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 AOC every 30 minutes in addition to the employee breathing zone. Instrument action levels for dust monitoring are provided in Table 4.

7.2 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.

7.3 Determination of Background Levels

Background (BKD) levels for VOCs and dust will be established prior to intrusive activities within the AOC at an upwind location. 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 HSO.

Table 4 lists the instrument action levels.

8.0 COMMUNITY AIR MONITORING PROGRAM

Community air monitoring may be conducted in compliance with the NYSDOH Generic CAMP outlined below:

Monitoring for dust and odors will be conducted during all ground intrusive activities by the FTL. Continuous monitoring on the perimeter of the work zones for odor, VOCs, and dust may be required for all ground intrusive activities such as soil excavation and handling activities. The work zone is defined as the general area in which machinery is operating in support of remediation activities. A portable PID will be used to monitor the work zone and for periodic monitoring for VOCs during activities such as soil and groundwater sampling and .soil excavation. The site perimeter will be monitored for fugitive dust emissions by visual observations as well as instrumentation measurements (if required). When required, particulate or dust will be monitored continuously with real-time field instrumentation that will meet, at a minimum, the performance standards from DER-10 Appendix 1B.

If VOC monitoring is required, the following actions will be taken based on VOC levels measured:

- If total VOC levels exceed 5 ppm above background for the 15-minute average at the perimeter, work activities will be temporarily halted and monitoring continued. If levels readily decrease (per instantaneous readings) below 5 ppm above background, work activities will resume with continued monitoring.
- If total VOC levels at the downwind perimeter of the hot zone persist at levels in excess of 5 ppm above background but less than 25 ppm, work activities will be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps work activities will resume provided that the total organic vapor level 200 feet downwind of the hot 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 above background for the 15-minute average.
- If the total VOC level is above 25 ppm at the perimeter of the hot zone, activities will be shutdown.

If dust monitoring with field instrumentation is required, the following actions will be taken based on instrumentation measurements:

- If the downwind particulate level is 100 micrograms per cubic meter ($\mu g/m^3$) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression must be employed. Work may continue with dust suppression techniques provided that downwind PM10 levels do not exceed 150 $\mu g/m^3$ above the background level and provided that no visible dust is migrating from the work area.
- If, after implementation of dust suppression techniques, downwind PM10 levels are greater than 150 $\mu g/m^3$ above the background 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 PM10 concentration to within 150 $\mu g/m^3$ of the upwind level and in preventing visible dust migration.

8.1 Vapor Emission Response Plan

This section applies if VOC monitoring is required. If the ambient air concentration of organic vapors exceeds 5 ppm above background at the perimeter of the hot zone, boring and well installation, and excavation activities will be halted or odor controls will be employed, and monitoring continued. When work shut-down occurs, downwind air monitoring as directed by the HSO or FTL will be implemented to ensure that vapor emission does not impact the nearest residential or commercial structure at levels exceeding those specified in the Major Vapor Emission section.

If the organic vapor level decreases below 5 ppm above background, sampling and boring and well installation can resume, provided:

- The organic vapor level 200 feet downwind of the hot zone or half the distance to the nearest residential or commercial structure, whichever is less, is below 1 ppm over background, and
- More frequent intervals of monitoring, as directed by the HSO or FTL, are conducted.

8.2 Major Vapor Emission

This section applies if VOC monitoring is required. If any organic levels greater than 5 ppm over background are identified 200 feet downwind from the work site, or half the distance to the nearest residential or commercial property, whichever is less, all work activities must be halted or odor controls must be implemented.

If, following the cessation of the work activities, or as the result of an emergency, organic levels persist above 5 ppm above background 200 feet downwind or half the distance to the nearest residential or commercial property from the hot zone, then the air quality must be monitored within 20 feet of the perimeter of the nearest residential or commercial structure (20 Foot Zone).

If either of the following criteria is exceeded in the 20 Foot Zone, then the Major Vapor Emission Response Plan shall automatically be implemented.

- Sustained organic vapor levels approaching 5 ppm above background for a period of more than 30 minutes, or
- Organic vapor levels greater than 5 ppm above background for any time period.

8.3 Major Vapor Emission Response Plan

Upon activation, the following activities will be undertaken:

- The local police authorities will immediately be contacted by the HSO or FTL and advised of the situation;
- Frequent air monitoring will be conducted at 30-minute intervals within the 20 Foot Zone. If two successive readings below action levels are measured, air monitoring may be halted or modified by the HSO or FTL; and
- All Emergency contacts will go into effect as appropriate.

8.4 Dust Suppression Techniques

Preventative measures for dust generation may include wetting site fill and soil, construction of an engineered construction entrance with gravel pad, a truck wash area, covering soils with tarps, and limiting vehicle speeds to five miles per hour.

Work practices to minimize odors and vapors include limiting the time that the excavations remain open, minimizing stockpiling of contaminated-source soil, and minimizing the handling of contaminated material. Offending odor and organic vapor controls may include the application of foam suppressants or tarps over the odor or VOC source areas. Foam suppressants may include biodegradable foams applied over the source material for short-term control of the odor and VOCs.

If odors develop and cannot be otherwise controlled, additional means to eliminate odor nuisances will include: direct load-out of soils to trucks for off-site disposal; use of chemical odorants in spray or misting systems; and, use of staff to monitor odors in surrounding neighborhoods.

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

9.0 WORK ZONES AND DECONTAMINATION

9.1 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 HSO 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 HSO allowing adequate space for the activity to be completed, field members and emergency equipment.

9.2 Contamination Zone

9.2.1 Personnel Decontamination Station

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

9.2.2 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.

9.2.3 Personnel Decontamination Sequence

Decontamination may be performed by removing all PPE used in EZ and placing it in drums/trash cans at the CRZ. Baby wipes should 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, and tools are provided below.

9.2.4 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.

9.2.5 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.

9.2.6 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.

9.3 Support Zone

The support zone or cold zone will include the remaining areas of the job site. Break areas and support facilities (include equipment storage and maintenance areas) will be located in this zone. No equipment or personnel will be permitted to enter the cold zone from the hot zone without passing through the decontamination station in the warm zone (if necessitated). Eating, smoking, and drinking will be allowed only in this area.

9.4 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:

Hand Signal	Meaning
Hand gripping throat	Out of air; cannot breathe
Grip partners wrists or place both hands around waist	Leave immediately without debate
Hands on top of head	Need assistance
Thumbs up	OK; I'm alright; I understand
Thumbs down	No; negative
Simulated "stick" break with fists	Take a break; stop work

9.5 The Buddy System

When working in teams of two or more, workers will use the "buddy system" for all work activities to ensure that rapid assistance can be provided in the event of an emergency. This requires work groups to be organized such that workers can remain close together and maintain visual contact with one another. Workers using the "buddy system" have the following responsibilities:

- Provide his/her partner with assistance.
- Observe his/her partner for signs of chemical or heat exposure.
- Periodically check the integrity of his/her partner's PPE.
- Notify the HSO or other site personnel if emergency service is needed.

10.0 NEAREST MEDICAL ASSISTANCE

The address and telephone number of the nearest hospital:

Rockefeller University Hospital
1230 York Avenue
New York, NY
(212) 327-8000

Map with directions to the hospital are shown in Figure 2. This information will either be posted prominently at the site or will be available to all personnel all of the time. Further, all field personnel, including the HSO & FTL, will know the directions to the hospital.

11.0 STANDING ORDERS/SAFE WORK PRACTICES

The standing orders, which consist of a description of safe work practices that must always be followed while on-site by Langan employees and contractors, are shown in Attachment A. The site HSO and FTL each have the responsibility for enforcing these practices. The standing orders will be posted prominently at the site, or are made available to all personnel at all times. Those who do not abide by these safe work practices will be removed from the site.

12.0 SITE SECURITY

No unauthorized personnel shall be permitted access to the work areas.

13.0 UNDERGROUND UTILITIES

As provided in Langan's Underground Utility Clearance Guidelines, the following safe work practices should be followed by Langan personnel and the contractor before and during subsurface work in accordance with federal, state and local regulations:

- Obtain available utility drawings from the property owner/client or operator.
- Provide utility drawings to the project team.
- In the field, mark the proposed area of subsurface disturbance (when possible).
- Ensure that the utility clearance system has been notified.
- Ensure that utilities are marked before beginning subsurface work.
- Discuss subsurface work locations with the owner/client and contractors.
- Obtain approval from the owner/client and operators for proposed subsurface work locations.
- Use safe digging procedures when applicable.
- Stay at least 10 feet from all equipment performing subsurface work.

14.0 SITE SAFETY INSPECTION

The Langan HSO or alternate will check the work area daily, at the beginning and end of each work shift or more frequently to ensure safe work conditions. The HSO or alternate must complete the Jobsite Safety Inspection Checklist, found in Attachment F. Any deficiencies shall be shared with the FTL, HSM and PM and will be discussed at the daily tailgate meeting.

15.0 HAND AND POWER TOOLS

All hand- and electric-power tools and similar equipment shall be maintained in a safe operating condition. All electric-power tools must be inspected before initial use. Damaged tools shall be removed immediately from service or repaired. Tools shall be used only for the purpose for which they were designed. All users must be properly trained in their safe operation.

16.0 EMERGENCY RESPONSE

16.1 General

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 ***(800) 9-LANGAN*** (800-952-6426) extension 4699 should be called as soon as possible.

16.2 Responsibilities

16.2.1 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.

16.2.2 Emergency Coordinator

The HSO or their designated alternate will serve as the Emergency Coordinator. The Emergency Coordinator 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. They are also responsible for ensuring the HSM are notified of all incidents, all injuries, near misses, fires, spills, releases or equipment damage. The Emergency Coordinator is required to immediately notify the HSM of any fatalities or catastrophes (three or more workers injured and hospitalized.

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 Plan.

16.2.3 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.

16.3 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 of identify any emergency situation.

16.4 Local Emergency Support Units

In order to be able to deal with any emergency that might occur during investigative activities at the site, the Emergency Notification Numbers (Table 5) will be posted and provided to all personnel conducting work within the EZ.

Figure 2 shows 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. Always contact first responders when there are serious or life threatening emergencies on the site. Project personnel are instructed not to drive injured personnel to the Hospital. In the event of an injury, provide first aid and keep the injured party calm and protected from the elements and treat for shock when necessary.

16.5 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.

16.6 Emergency Medical Treatment

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

- First Aid Kit: Contractor Mobile Office or Vehicles
- Emergency Eye Wash: Contractor Mobile office or 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. 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.

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

Only in non-emergency situations may an injured person be transported to an urgent care facility. Due to hazards that may be present at the site and the conditions under which operations are conducted, it is possible that an emergency situation may develop. Emergency situations can be characterized as injury or acute chemical exposure to personnel, fire or explosion, environmental release, or hazardous weather conditions.

16.8 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.

16.9 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).

16.9.1 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.

16.10 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 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.

16.11 Overt Chemical Exposure

The following are standard procedures to treat chemical exposures. Other, specific procedures detailed on the Material Safety Data Sheet (MSDS) 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.

16.12 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 advice 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.

16.13 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.

16.14 Spill Control and Response

All small spills/environmental releases shall be contained as close to the source as possible. Whenever possible, the MSDS 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 CHASP, 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.

16.15 Emergency Equipment

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

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

16.16 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.

16.17 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)-9-LANGAN (ext. #4699) and the client representative to report the incident or near miss. For emergencies involving personnel injury and/or exposure, the HSO and affected employee will complete and submit an Employee Exposure/Injury Incident Report (Attachment C) to the Langan Corporate Health and Safety Manager as soon as possible following the incident.

17.0 RECORDKEEPING

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

17.1 Field Change Authorization Request

Any changes to the work to be performed that is not included in the CHASP 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.

17.2 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 the HSM.

17.3 Onsite Log

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

17.4 Daily Safety Meetings (“Tailgate Talks”)

Completed safety briefing forms will be maintained by the HSO.

17.5 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.

17.6 Hazard Communication Program/MSDS-SDS

Material safety data sheets (MSDS) of Safety Data Sheets (SDS) have been obtained for applicable substances and are included in this CHASP (Attachment E). Langan's written hazard communication program, in compliance with 29 CFR 1910.1200, is maintained by the HSM.

17.7 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, extension 4699 and the Project Manager to report the incident or near miss. The Project Manager will contact the client or client representative. A written report must be completed and submitted HSM 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.

18.0 CONFINED SPACE ENTRY

Confined spaces are not anticipated at the site during planned construction activities. If confined spaces are identified, the contractor must implement their own confined space program that all applicable federal, state and local regulations. Confined spaces **will not** be entered by Langan personnel.

19.0 CHASP ACKNOWLEDGEMENT FORM

All Langan personnel and contractors will sign this CHASP Compliance Agreement indicating that they have become familiar with this CHASP and that they understand it and agree to abide by it.

Printed Name	Signature	Company	Date

TABLES

TABLE 1
TASK HAZARD ANALYSES

Task	Hazard	Description	Control Measures	First Aid
1.3.1 – 1.3.7	Contaminated Soil or Groundwater-Dermal Contact	Contaminated water spills on skin, splashes in eyes; contact with contaminated soil/fill during construction activities or sampling.	Wear proper PPE; follow safe practices, maintain safe distance from construction activities	See Table 2, seek medical attention as required
1.3.1 – 1.3.7	Lacerations, abrasions, punctures	Cutting bailer twine, pump tubing, acetate liners, etc. with knife; cuts from sharp site objects or previously cut piles, tanks, etc.; Using tools in tight spaces	Wear proper PPE; follow safe practices	Clean wound, apply pressure and/or bandages; seek medical attention as required.
1.3.1 – 1.3.7	Contaminated Media Inhalation	Opening drums, tanks, wells; vapors for non-aqueous phase liquids or other contaminated site media; dust inhalation during excavation; vapor accumulation in excavation	Follow air monitoring plan; have quick access to respirator, do not move or open unlabeled drums found at the site, maintain safe distance from construction activities	See Table 2, seek medical attention as required
1.3.1 – 1.3.7	Lifting	Improper lifting/carrying of equipment and materials causing strains	Follow safe lifting techniques; Langan employees are not to carry contractor equipment or materials	Rest, ice, compression, elevation; seek medical attention as required
1.3.1 – 1.3.7	Slips, trips, and falls	Slips, trips and falls due to uneven surfaces, cords, steep slopes, debris and equipment in work areas	Good housekeeping at site; constant awareness and focus on the task; avoid climbing on stockpiles; maintain safe distance from construction activities and excavations; avoid elevated areas over six feet unless fully accredited in fall protection and wearing an approved fall protection safety apparatus	Rest, ice, compression, elevation; seek medical attention as required
1.3.1 – 1.3.7	Noise	Excavation equipment, hand tools, drilling equipment.	Wear hearing protection; maintain safe distance from construction activities	Seek medical attention as required
1.3.1 – 1.3.7	Falling objects	Soil material, tools, etc. dropping from drill rigs, front-end loaders, etc.	Hard hats to be worn at all times while in work zones; maintain safe distance from construction activities and excavations	Seek medical attention as required
1.3.1 – 1.3.7	Underground/ overhead utilities	Excavation equipment, drill rig auger makes contact with underground object; boom touches overhead utility	"One Call" before dig; follow safe practices; confirm utility locations with contractor; wear proper PPE; maintain safe distance from construction activities and excavations	Seek medical attention as required
1.3.1 – 1.3.7	Insects (bees, wasps, hornet, mosquitoes, and spider)	Sings, bites	Insect Repellent; wear proper protective clothing (work boots, socks and light colored pants);field personnel who may have insect allergies (e.g., bee sting) should provide this information to the HSO or FSO prior to commencing work, and will have allergy medication on site.	Seek medical attention as required
1.3.1 – 1.3.7	Vehicle traffic / Heavy Equipment Operation	Vehicles unable to see workers on site, operation of heavy equipment in tight spaces, equipment failure, malfunctioning alarms	Wear proper PPE, especially visibility vest; use a buddy system to look for traffic; rope off area of work with cones and caution tape or devices at points of hazard, maintain safe distance from construction activities and equipment	Seek medical attention as required

TABLE 2
CONTAMINANT HAZARDS OF CONCERN

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.7	Perfluorobutanesulfonic acid FC-98 Nonaflate Nonafluorobutanesulphonic acid Perfluorobutane sulfonate PFBS	375-73-5	NA	None None	Groundwater	inhalation, skin or eye contact, ingestion	irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.7	Perfluorobutanoic Acid Heptafluorobutyric acid Heptafluorobutanoic acid Perfluorobutyric acid PFBA	375-22-4	NA	None None	Groundwater	inhalation, skin or eye contact, ingestion	irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.7	Perfluorodecanoic acid PFDA	335-76-2	NA	None None	Groundwater	inhalation, skin or eye contact, ingestion	irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.7	Perfluorododecanoic acid Perfluoralauric acid Tricosafluorododecanoic acid PFDoA	307-55-1	NA	None None	Groundwater	inhalation, skin or eye contact, ingestion	irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.7	Perfluoroheptanoic Acid PFHpA	375-85-9	NA	None None	Groundwater	inhalation, skin or eye contact, ingestion	irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.7	Perfluorhexanesulfonic Acid PFHxS	375-85-9	NA	None None	Groundwater	inhalation, skin or eye contact, ingestion	irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.7	Perfluorohexanoic Acid PFNxA	375-95-1	NA	None None	Groundwater	inhalation, skin or eye contact, ingestion	irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.7	Perfluoronoanoic Acid PFNA	375-95-1	NA	None None	Groundwater	Groundwater	inhalation, skin or eye contact, ingestion; strong acid	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.7	Perfluorooctanesulfonamide FOSA	754-91-6	NA	None None	Groundwater	NA	NA	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.7	Perfluorooctanesulfonic Acid PFOS	1763-23-1	NA	None None	Groundwater	inhalation, skin or eye contact, ingestion	irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.7	Perfluorooctanoic Acid PFOA pentadecafluorooctanoic acid perfluorooctanoate perfluorocaprylic acid	335-67-1	NA	None None	Groundwater	inhalation, skin or eye contact, ingestion	irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.7	Perfluoropentanoic Acid PFPeA	2706-90-3	NA	None None	Groundwater	inhalation, skin or eye contact, ingestion	irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.7	Perfluorotridecanoic Acid PFTriA	72629-94-8	NA	None None	Groundwater	inhalation, skin or eye contact, ingestion	irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.7	1,1'-Biphenyl Biphenyl Phenyl benzene Diphenyl	92-52-4	None	1 mg/m^3 100 mg/m^3	Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, throat; headache, nausea, lassitude (weakness, exhaustion), numb limbs; liver damage	Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.7	1,1-Dichloroethane Asymmetrical dichloroethane Ethylidene chloride 1,1-Ethylidene dichloride 1,1-DCA	75-34-3	PID	100 ppm 3000 ppm	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the skin; central nervous system depression; liver, kidney, lung damage	Eye: Irrigate immediately Skin: Soap flush promptly Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.7	1,2,4-Trimethylbenzene	95-63-6	PID	None None	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat, respiratory system; bronchitis; hypochromic anemia; headache, drowsiness, lassitude (weakness, exhaustion), dizziness, nausea, incoordination; vomiting, confusion; chemical pneumonitis (aspiration liquid)	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.7	1,2-Dichloroethylene 1,2-DCE cis-1,2-Dichloroethylene mixture of cis and trans Acetylene dichloride cis-Acetylene dichloride trans-Acetylene dichloride sym-Dichloroethylene cis- 1,2-Dichloroethene Trans-1,2-Dichloroethylene, tDCE cDCE cis-1,2-Dichloroethene Trans-1,2-Dichloroethene	540-59-0	PID	200 ppm 1000 ppm	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, respiratory system; central nervous system depression	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.7	1,3,5-Trimethylbenzene Mesitylene sym-Trimethylbenzene	108-67-8	PID	None None	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat, respiratory system; bronchitis; hypochromic anemia; headache, drowsiness, lassitude (weakness, exhaustion), dizziness, nausea, incoordination; vomiting, confusion; chemical pneumonitis (aspiration liquid)	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.7	1,3-Butadiene Biethylene Bivinyl Butadiene Divinyl Erythrene Vinylethylene	106-99-0	PID	1 ppm 2000 ppm	Vapor	inhalation, skin and/or eye contact (liquid)	irritation to the eyes, nose, throat; drowsiness, dizziness; liquid: frostbite; teratogenic, reproductive effects; [potential occupational carcinogen]	Eye: Frostbite Skin: Frostbite Breathing: Respiratory support
1.3.1 – 1.3.7	1,3-Dichlorobenzene m-Dichlorobenzol; m-Phenylene dichloride	541-73-1	PID	None None	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, swelling periorbital (situated around the eye); profuse rhinitis; headache, anorexia, nausea, vomiting; weight loss, jaundice, cirrhosis; in animals: liver, kidney injury; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.7	2,2,4-Trimethylpentane	540-84-1	PID	NA NA	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat, respiratory system; bronchitis; hypochromic anemia; headache, drowsiness, lassitude (weakness, exhaustion), dizziness, nausea, incoordination; vomiting, confusion; chemical pneumonitis (aspiration liquid)	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.7	2-Butanone Ethyl methyl ketone MEK Methyl acetone Methyl ethyl ketone	78-93-3	PID	200 ppm 3000 ppm	Soil Groundwater Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose; headache; dizziness; vomiting; dermatitis	Eye: Irrigate immediately Skin: Water wash immediately Breathing: Fresh air Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.7	2-Chloronaphthalene	91.58-7	NA	NA MA	Groundwater Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation eyes, nose; skin	Eye: Irrigate immediately , Medical attention Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention
1.3.1 – 1.3.7	2-Hexanone Butyl methyl ketone MBK Methyl butyl ketone Methyl n-butyl ketone	591-78-6	PID	100 ppm 1600 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, nose; peripheral neuropathy: lassitude (weakness, exhaustion), paresthesia; dermatitis; headache, drowsiness	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.7	2-Methylnaphthalene β-methylnaphthalene	91-57-6	PID	NA NA	Groundwater Soil Vapor	inhalation, ingestion or skin absorption, eye contact	irritation to the skin, eyes, mucous membranes and upper respiratory tract. It may also cause headaches, nausea, vomiting, diarrhea, anemia, jaundice, euphoria, dermatitis, visual disturbances, convulsions and comatose	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentratio n on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.7	4-Methyl-2-pentanone Hexone Isobutyl methyl ketone Methyl isobutyl ketone MIBK	108-10-1	PID	100 ppm 500 ppm	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, mucous membrane; headache, narcosis, coma; dermatitis; in animals: liver, kidney damage	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.7	Acenaphthene 1,2-Dihydroacenaphthylene 1,8-Ethylenenaphthalene peri-Ethylenenaphthalene Naphthyleneethylene Tricyclododecapentaene	83-32-9	PID	NA NA	Soil	inhalation, ingestion, skin and/or eye contact,	irritation to the skin, eyes, mucous membranes and upper respiratory tract; If ingested, it can cause vomiting	Eye: Irrigate immediately Skin: Soap wash immediately, if redness or irritation develop, seek medical attention immediately Breathing: Move to fresh air Swallow: do not induce vomiting, seek medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.7	Acenaphthylene Cycopental(de)naphthalene, Acenaphthalene	208-96-8	PID	NA NA	Soil	inhalation, ingestion, skin and/or eye contact	irritation to the skin, eyes, mucous membranes and upper respiratory tract	Eye: Irrigate immediately, seek medical attention immediately, Skin: Soap wash immediately, if redness or irritation develop, seek medical attention immediately Breathing: Move to fresh air Swallow: do not induce vomiting, seek medical attention immediately
1.3.1 – 1.3.7	Acetone Dimethyl ketone Ketone propane 2-Propanone	67-64-1	PID	1000 ppm 2500 ppm	Groundwater Soil	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, nose, throat; headache, dizziness, central nervous system depression; dermatitis	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.7	Aluminum	7429-90-5	None	0.5 mg/m3 50 mg/m3	Soil	inhalation, skin and/or eye contact	irritation to the eyes, skin, respiratory system	Eye: Irrigate immediately Breathing: Fresh air

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.7	Anthracene	120-12-7	PID	0.2 mg/m^3 80 mg/m^3 (Coal Pitch Tar)	Soil	inhalation, skin or eye contact, ingestion	irritation to the skin, eyes, mucous membranes and upper respiratory tract, abdominal pain if ingested.	Eye: Irrigate immediately, seek medical attention immediately, Skin: Soap wash immediately, Breathing: Move to fresh air, refer to medical attention; Swallow: refer to medical attention
1.3.1 – 1.3.7	Antimony	7440-36-0	None	0.5 mg/m^3 50 mg/m^3	Groundwater Soil	inhalation, ingestion, skin and/or eye contact	irritation skin, possible dermatitis; resp distress; diarrhea; muscle tremor, convulsions; possible gastrointestinal tract	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.7	Arsenic	NA	None	0.5 mg/m^3 NA	Groundwater Soil	inhalation, ingestion, skin and/or eye contact	irritation skin, possible dermatitis; resp distress; diarrhea; muscle tremor, convulsions; possible gastrointestinal tract	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.7	Barium	10022-31-8	None	0.5 mg/m^3 50 mg/m^3	Groundwater Soil	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, upper respiratory system; skin burns; gastroenteritis; muscle spasm; slow pulse	Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.7	Benzaldehyde Benzoic aldehyde Benzenecarbonal Benzenecarboxaldehyde Phenylmethanal	100-52-7	PIF	NA NA	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, respiratory system	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.7	Benzene Benzol Phenyl hydride	71-43-2	PID	3.19 mg/m^3 1,595 mg/mg^3	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; lassitude (weakness, exhaustion) [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.7	Benzo(a)anthracene Benzanthracene Benzanthrene 1,2-Benzanthracene Benzo[b]phenanthrene Tetraphene	56-55-3	PID	0.2 mg/m^3 80 mg/m^3 (Coal Pitch Tar)	Groundwater Soil	inhalation, skin or eye contact, ingestion	dermatitis, bronchitis, [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentratio n on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.7	Benzo(a)pyrene	50-32-8	PID	0.2 mg/m^3 80 mg/m^3 (Coal Pitch Tar)	Soil	inhalation, skin or eye contact, ingestion	dermatitis, bronchitis, [potential occupational carcinogen]	Eye: Irrigate immediately, seek medical attention Skin: Soap wash immediately; Breathing: move to fresh air; Swallow: Induce vomiting if conscious, seek medical attention immediately
1.3.1 – 1.3.7	Benzo(b)fluoranthene	205-99-2	PID	0.2 mg/m^3 80 mg/m^3 (Coal Pitch Tar)	Soil	inhalation, skin or eye contact, ingestion	irritation to eyes and skin, respiratory irritation(dizziness, weakness, fatigue, nausea, headache)	Eye: Irrigate immediately, refer to medical attention Skin: Soap wash immediately Breathing: move to fresh air Swallow: Medical attention immediately
1.3.1 – 1.3.7	Benzo(g,h,i)perylene Benzo(ghi)perylene	191-24-2	PID	0.2 mg/m^3 80 mg/m^3 (Coal Pitch Tar)	Soil	inhalation, skin or eye contact, ingestion	NA	Eye: Irrigate immediately, refer to medical attention Skin: Soap wash immediately Breathing: move to fresh air Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.7	Benzo(k)fluoranthene	207-08-9	PID	0.2 mg/m^3 80 mg/m^3 (Coal Pitch Tar)	Soil	inhalation, skin or eye contact, ingestion	irritation to eyes and skin, respiratory irritation (dizziness, weakness, fatigue, nausea, headache)	Eye: Irrigate immediately, refer to medical attention Skin: Soap wash immediately Breathing: move to fresh air Swallow: Medical attention immediately
1.3.1 – 1.3.7	Benzyl butyl phthalate Butyl benzyl phthalate	86-66-7	None	NA NA	Groundwater Soil Vapor	inhalation, skin or eye contact, ingestion	irritation to eyes and skin, respiratory irritation (dizziness, weakness, fatigue, nausea, headache	Eye: Irrigate immediately, refer to medical attention Skin: Soap wash immediately Breathing: move to fresh air Swallow: Medical attention immediately
1.3.1 – 1.3.7	Beryllium	7440-41-7	None	0.002 mg/m^3 4 mg/m^3	Soil	inhalation, skin and/or eye contact	berylliosis (chronic exposure): anorexia, weight loss, lassitude (weakness, exhaustion), chest pain, cough, clubbing of fingers, cyanosis, pulmonary insufficiency; irritation to the eyes; dermatitis; [potential occupational carcinogen]	Eye: Irrigate immediately Breathing: Fresh air

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid	
1.3.1 – 1.3.7	Beta-Endosulfan Endosulfan II (beta) Endosulfan II	33213-65-9	115-29-7	None	NA NA	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation skin; nausea, confusion, agitation, flushing, dry mouth, tremor, convulsions, headache; in animals: kidney, liver injury; decreased testis weight	Eye: Ir immed Skin: S immed Breath Respir suppor Swallo attenti immed
1.3.1 – 1.3.7	Bis(2-ethylhexyl)phthalate Di-sec octyl phthalate DEHP Di(2-ethylhexyl)phthalate Octyl phthalate	117-81-7	None	5 mg/m^3 5000 mg/m^3	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, mucous membrane; in animals: liver damage; teratogenic effects; [potential occupational carcinogen	Eye: Irrigate immediately Breathing: Respiratory support Swallow: Medical attention immediately	
1.3.1 – 1.3.7	n-Butane Normal Butane Methyl ethyl methane Butyl Hydride Diethyl Quartane	106-97-8	PID	NA NA	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; lassitude (weakness, exhaustion) [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.7	Cadmium	7440-43-9	None	0.005 mg/m^3 9 mg/m^3	Soil	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]	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.7	Calcium	7440-70-2	None	NA	Groundwater Soil	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, upper resp tract; ulcer, perforation nasal septum; pneumonitis; dermatitis	Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.7	Carbazole 9-azafluorene Dibenzopyrrole Diphenylenimine diphenyleneimide	86-74-8	None	NA NA	Soil	inhalation, skin absorption (liquid), skin and/or eye contact	irritation to eyes and skin, respiratory irritation	Eye: Irrigate immediately, refer to medical attention Skin: Soap wash immediately Breathing: move to fresh air Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.7	Carbon disulfide	75-15-0	PID	20 ppm 500 ppm	Soil Groundwater Vapor	inhalation, skin or eye contact, ingestion	irritation to the eyes, skin, respiratory system	Eye: Irrigate immediately (liquid) Skin: Water flush immediately (liquid) Breathing: Respiratory support
1.3.1 – 1.3.7	Carbon tetrachloride Carbon chloride Carbon tet Freon® 10 Halon® 104 Tetrachloromethane	56-23-5	PID	10 ppm 200 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin; central nervous system depression; nausea, vomiting; liver, kidney injury; drowsiness, dizziness, incoordination; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.7	Chloroform Methane trichloride Trichloromethane	67-66-3	None	50 ppm 500 ppm	Groundwater Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin; dizziness, mental dullness, nausea, confusion; headache, lassitude (weakness, exhaustion); anesthesia; enlarged liver; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.7	Chromium Hexavalent- Trivalent-	7440-47-3	None	1.0 mg/m^3 250 mg/m^3	Groundwater Soil	inhalation absorption ingestion	irritation to eye, skin, and respiratory	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.7	Chrysene Benzo[a]phenanthrene 1,2-Benzphenanthrene	218-01-9	PID	0.2 mg/m^3 80 mg/m^3 (Coal Pitch Tar)	Groundwater Soil	inhalation, absorption, ingestion, consumption	irritation to eye, skin, and respiratory, gastrointestinal irritation nausea, vomit, diarrhea [potential occupational carcinogen]	Eyes: Irrigate immediately Skin: Soap wash promptly. Breath: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.7	Cobalt	7440-48-4	None	0.1mg/m^3 20 mg/m^3	Soil	inhalation, ingestion, skin and/or eye contact	Cough, dyspnea (breathing difficulty), wheezing, decreased pulmonary function; weight loss; dermatitis; diffuse nodular fibrosis; resp hypersensitivity, asthma	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.7	Copper	7440-50-8	None	1.0 mg/m^3 100 mg/m^3	Groundwater Soil	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, nose, metallic taste; dermatitis; anemia	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.7	Cumene Cumol Isopropylbenzene 2-Phenyl propane	98-82-8	PID	50 ppm 900 ppm	Groundwater Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, mucous membrane; dermatitis; headache, narcosis, coma	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.7	Cyclohexane Benzene hexahydride Hexahydrobenzene Hexamethylene Hexanaphthene	110-82-7	PID	300 ppm 1300 ppm	Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, respiratory system; drowsiness; dermatitis; narcosis, coma	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.7	DDE 4,4-DDE 1,1-bis-(4-chlorophenyl)-2,2-dichloroethene Dichlorodiphenyldichloroethylene	72-55-9	None	NA NA	Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	Oral ingestion of food is the primary source of exposure for the general population. Acute and chronic ingestion may cause nausea, vomiting, diarrhea, stomach pain, headache, dizziness, disorientation, tingling sensation, kidney damage, liver damage, convulsions, coma, and death. 4,4' DDE may cross the placenta and can be excreted in breast milk	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.7	DDT 4,4-DDT p,p'-DDT Dichlorodiphenyltrichloroethane 1,1,1-Trichloro-2,2-bis(p-chlorophenyl)ethane	50-29-3	None	1 mg/m^3 500 mg/m^3	Groundwater Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the 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]	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentratio n on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.7	Dibenzo(a,h)anthracene	53-70-3	PID	0.2 mg/m^3 80 mg/m^3 (Coal Pitch Tar)	Groundwater Soil	inhalation, absorption, ingestion, consumption	irritation to eyes, skin, respiratory, and digestion [potential occupational carcinogen]	Eyes: Irrigate immediately Skin: Soap wash promptly. Breath: Respiratory support PID Swallow: Medical attention immediately
1.3.1 – 1.3.7	Dibenzofuran	132-64-9	None	NA NA	Soil	inhalation, absorption	irritation to eyes, and skin	Eyes: Irrigate immediately Skin: Soap wash promptly.
1.3.1 – 1.3.7	Dibutyl phthalate Di-n-butyl phthalate Butyl phthalate n-Butyl phthalate 1,2-Benzenedicarboxylic acid dibutyl ester o-Benzenedicarboxylic acid dibutyl ester DBP Palatinol C, Elaol Dibutyl-1,2-benzene-dicarboxylate	84-74-2	None	5 mg/m^3 4000 mg/m^3	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, upper respiratory system, stomach	Eye: Irrigate immediately Skin: Wash regularly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.7	Dichlorodifluoromethane Difluorodichloromethane, Fluorocarbon 12, Freon® 12, Genetron® 12, Halon® 122, Propellant 12, Refrigerant 12	75-71-8	None	1000 pp, 15,000 ppm	Groundwater Soil Vapor	inhalation, skin and/or eye contact (liquid)	dizziness, tremor, asphyxia, unconsciousness, cardiac arrhythmias, cardiac arrest; liquid: frostbite	Eye: Frostbite Skin: Frostbite Breathing: Respiratory support

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.7	Chlorodifluoromethane Chlorodifluoromethane Difluoromonochloromethane Monochlorodifluoromethane HCFC-22 R-22 Genetron 22 Freon 22 Arcton 4 Arcton 22 UN 1018 Difluorochloromethane Fluorocarbon-22 Refrigerant 22	75-45-6	None	NA NA	Groundwater Soil Vapor	inhalation, skin and/or eye contact (liquid)	dizziness, tremor, asphyxia, unconsciousness, cardiac arrhythmias, cardiac arrest; liquid: frostbite	Eye: Frostbite Skin: Frostbite Breathing: Respiratory support
1.3.1 – 1.3.7	1,1,2-Trichloro-1,2,2-trifluoroethane CFC-113 Freon 113 Frigen 113 TR Freon TF	76-13-1	None	1000 ppm 2000 ppm	Groundwater Soil Vapor	inhalation, skin and/or eye contact (liquid)	dizziness, tremor, asphyxia, unconsciousness, cardiac arrhythmias, cardiac arrest; liquid: frostbite	Eye: Frostbite Skin: Frostbite Breathing: Respiratory support
1.3.1 – 1.3.7	Dieldrin HEOD 1,2,3,4,10,10-Hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-1,4-endo exo-5,8-dimethanonaphthalene	60-57-1	PID	0.25 mg/m^3 50 mg/m^3	Groundwater Soil Water	inhalation, skin absorption, ingestion, skin and/or eye contact	headache, dizziness; nausea, vomiting, malaise (vague feeling of discomfort), sweating; myoclonic limb jerks; clonic, tonic convulsions; coma; [potential occupational carcinogen]; in animals: liver, kidney damage	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.7	Diesel Fuel automotive diesel fuel oil No. 2 distillate diesoline diesel oil diesel oil light diesel oil No. 1-D summer diesel	68334-30-5	PID	NA NA	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat; burning sensation in chest; headache, nausea, lassitude (weakness, exhaustion), restlessness, incoordination, confusion, drowsiness; vomiting, diarrhea; dermatitis; chemical pneumonitis (aspiration liquid)	Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.7	Di-n-octyl phthalate Di-sec octyl phthalate DEHP, Di(2-ethylhexyl)phthalate, DOP, bis-(2-Ethylhexyl)phthalate, Octyl phthalate	117-84-0	None	5 mg/m^3 5000 mg/m^3	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, mucous membrane; in animals: liver damage; teratogenic effects; [potential occupational carcinogen]	Eye: Irrigate immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.7	Dioxane Diethylene dioxide Diethylene ether Dioxan p-Dioxane 1,4-Dioxane	123-91-1	PID	100 ppm 500 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat; drowsiness, headache; nausea, vomiting; liver damage; kidney failure; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Water wash promptly Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.7	Endrin 1,2,3,4,10,10-Hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-1,4-endo,endo-5,8-dimethanonaphthalene; Hexadrin	72-20-8	None	0.1 mg/m^3 2 mg/m^3	Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	epileptiform convulsions; stupor, headache, dizziness; abdominal discomfort, nausea, vomiting; insomnia; aggressiveness, confusion; drowsiness, lassitude (weakness, exhaustion); anorexia; in animals: liver damage	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.7	Ethanol Absolute alcohol Alcohol cologne spirit drinking alcohol ethane monoxide ethylic alcohol EtOH ethyl alcohol ethyl hydrate ethyl hydroxide ethylol grain alcohol hydroxyethane methylcarbinol	64-17-5	PID	1000 ppm 3300 ppm	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose; headache, drowsiness, lassitude (weakness, exhaustion), narcosis; cough; liver damage; anemia; reproductive, teratogenic effects	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Fresh air Swallow: Medical attention immediately
1.3.1 – 1.3.7	Ethyl benzene Ethylbenzene Ethylbenzol Phenylethane	100-40-4	PID	435 mg/m^3 3,472 mg/m^3	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, mucous membrane; headache; dermatitis; narcosis, coma	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentratio n on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.7	Fluoranthene Benzo(j, k)fluorene	206-44-0	PID	0.2 mg/m^3 80 mg/m^3 (Coal Pitch Tar)	Groundwater Soil	inhalation, skin or eye contact, ingestion	irritation to eyes and skin, respiratory irritation(dizziness, weakness, fatigue, nausea, headache)	Eye: Irrigate immediately, refer to medical attention Skin: Soap wash immediately Breathing: move to fresh air Swallow: Medical attention immediately
1.3.1 – 1.3.7	Fluorene	86-73-7	PID	0.2 mg/m^3 80 mg/m^3 (Coal Pitch Tar)	Soil	inhalation, skin or eye contact, ingestion	irritation to eyes and skin, respiratory irritation(dizziness, weakness, fatigue, nausea, headache)	Eye: Irrigate immediately, refer to medical attention Skin: Soap wash immediately Breathing: move to fresh air Swallow: Medical attention immediately
1.3.1 – 1.3.7	Fuel Oil No. 2	68476-30-2	PID	NA NA	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat; burning sensation in chest; headache, nausea, lassitude (weakness, exhaustion), restlessness, incoordination, confusion, drowsiness; vomiting, diarrhea; dermatitis; chemical pneumonitis (aspiration liquid)	Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.7	Gasoline	8006-61-9	PID	NA NA	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, mucous membrane; dermatitis; headache, lassitude (weakness, exhaustion), blurred vision, dizziness, slurred speech, confusion, convulsions; chemical pneumonitis (aspiration liquid)	Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.7	Helium	7440-59-7	Helium Detector	NA NA	NA	inhalation	dizziness, headache, and nausea	Breathing: Respiratory support
1.3.1 – 1.3.7	Heptane n-Heptane	142-82-5	PID	500 ppm 750 ppm	Goundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	dizziness, stupor, incoordination; loss of appetite, nausea; dermatitis; chemical pneumonitis (aspiration liquid); unconsciousness	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.7	Indeno(1,2,3-cd)pyrene	193-39-5	None	0.2 mg/m^3 80 mg/m^3 (Coal Pitch Tar)	Groundwater Soil	inhalation, absorption, ingestion, consumption	irritation to eyes, skin, respiratory, and digestion [potential occupational carcinogen]	Eyes: Irrigate immediately Skin: Soap wash promptly. Breath: Respiratory support Swallow: Medical attention immediately, wash mouth with water

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.7	Iron	7439-89-6	None	10 mg/m^3 NA	Groundwater Soil	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, mucous membrane; abdominal pain, diarrhea, vomiting	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.7	Isophorone 1,1,3-Trimethyl-3-cyclohexene-5-one Isoforone Isoacetophorone	78-59-1	None	25 ppm 200 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, respiratory system	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.7	Isopropyl alcohol Iso-Propyl Alcohol Carbinol IPA Isopropanol 2-Propanol sec-Propyl alcohol Rubbing alcohol	67-63-0	PID	400 ppm 2000 ppm	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, nose, throat; drowsiness, dizziness, headache; dry cracking skin; in animals: narcosis	Eye: Irrigate immediately Skin: Water flush Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.7	Lead	7439-92-1	None	0.050 mg/m^3 100 mg/m^3	Groundwater Soil	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 to the eyes; hypertension	Eye: Irrigate immediately Skin: Soap flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.7	Magnesium	7439-95-4	None	15 mg/m^3 NA	Soil	inhalation, skin and/or eye contact	irritation to the eyes, skin, respiratory system; cough	Eye: Irrigate immediately Breathing: Fresh air
1.3.1 – 1.3.7	Manganese	7439-96-5	None	5 mg/m^3 500 mg/m^3	Groundwater Soil	inhalation, ingestion	aerosol is irritating to the respiratory tract	Eye: Irrigate immediately Skin: Soap flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.7	Mercury	7439-97-6	None	0.1 mg/m^3 10 mg/m^3	Groundwater Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin; cough, chest pain, dyspnea (breathing difficulty), bronchitis, pneumonitis; tremor, insomnia, irritability, headache, lassitude (weakness, exhaustion); stomatitis, salivation; gastrointestinal disturbance, anorexia, weight loss; proteinuria	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.7	Methoxychlor p,p'-Dimethoxydiphenyltrichloroethane DMDT Methoxy-DDT 2,2-bis(p-Methoxyphenyl)-1,1,1-trichloroethane 1,1,1-Trichloro-2,2-bis-(p-methoxyphenyl)ethane	72-43-5	None	15 mg/m^3 5000 mg/m^3	Groundwater Soil Vapor	inhalation, ingestion	fasciculation, trembling, convulsions; kidney, liver damage; [potential occupational carcinogen]	Skin: Soap wash Breathing: Fresh air Swallow: Medical attention immediately
1.3.1 – 1.3.7	Methyl Acetate	79-20-9	PID	200 ppm 3100 ppm	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat; headache, drowsiness; optic nerve atrophy; chest tightness; in animals: narcosis	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.7	Methyl Chloride Chloromethane Monochloromethane	74-87-3	NA	100 ppm 2000 ppm	Groundwater Soil	inhalation, skin and/or eye contact	dizziness, nausea, vomiting; visual disturbance, stagger, slurred speech, convulsions, coma; liver, kidney damage; liquid: frostbite; reproductive, teratogenic effects; [potential occupational carcinogen]	Eye: Frostbite Skin: Frostbite Breathing: Respiratory support
1.3.1 – 1.3.7	Methyl chloroform Chlorothene 1,1,1-Trichloroethane 1,1,1-Trichloroethane-(stabilized) 1,1,1-TCA	71-55-6	PID	350 ppm 700 ppm	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin; headache, lassitude (weakness, exhaustion), central nervous system depression, poor equilibrium; dermatitis; cardiac arrhythmias; liver damage	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.7	Methyl *tert*-butyl ether MTBE Methyl tertiary-butyl ether Methyl t-butyl ether tert-Butyl methyl ether tBME tert-BuOMe	1634-04-4	PID	NA NA	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat; burning sensation in chest; headache, nausea, lassitude (weakness, exhaustion), restlessness, incoordination, confusion, drowsiness; vomiting, diarrhea; dermatitis; chemical pneumonitis (aspiration liquid)	Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.7	Methylcyclohexane Methyl cyclohexane Hexahydrotoluene Cyclohexylmethane Toluene hexahydride	108-87-2	PID	500 ppm 1200 ppm	Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat; dizziness, drowsiness; in animals: narcosis	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.7	Methylene Chloride Dichloromethane Methylene dichloride	75-09-2	PID	25 ppm 2300 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin; lassitude (weakness, exhaustion), drowsiness, dizziness; numb, tingle limbs; nausea; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.7	Molybdenum	7439-98-7	NA	NA NA	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, respiratory system	Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.7	m-Xylenes 1,3-Dimethylbenzene m-Xylol Metaxylene	108-38-3	PID	100 ppm 900 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; corneal vacuolization; nausea, vomiting, abdominal pain; dermatitis	Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.7	Naphthalene Naphthalin Tar camphor White tar	91-20-3	PID	50 mg/m^3 250 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes; headache, confusion, excitement, malaise (vague feeling of discomfort); nausea, vomiting, abdominal pain; irritation bladder; profuse sweating; hematuria (blood in the urine); dermatitis, optical neuritis	Eye: Irrigate immediately Skin: Molten flush immediately/solid-liquid soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.7	n-Butylbenzene	104-51-8	PID	NA NA	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin; dry nose, throat; headache; low blood pressure, tachycardia, abnormal cardiovascular system stress; central nervous system, hematopoietic depression; metallic taste; liver, kidney injury	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.7	n-Hexane Hexane, Hexyl hydride, normal-Hexane	110-54-3	PID	500 ppm 1100 ppm	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, nose; nausea, headache; peripheral neuropathy: numb extremities, muscle weak; dermatitis; dizziness; chemical pneumonitis (aspiration liquid)	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.7	Nickel	7440-02-0	None	NA 10 mg/m^3	Groundwater Soil	ion, ingestion, skin and/or eye contact	sensitization dermatitis, allergic asthma, pneumonitis; [potential occupational carcinogen]	Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.7	Non-Flammable Gas Mixture CALGAS (Equipment Calibration Gas : Oxygen Methane Hydrogen Sulfide Carbon Monoxide Nitrogen	7782-44-7 74-82-8 7783-08-4 830-08-0 7727-37-9	Multi-Gas PID	NA/NA NA/NA 10/100 ppm 50/1200 ppm NA/NA	NA	inhalation	dizziness, headache, and nausea	Breathing: Respiratory support

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.7	Non-Flammable Gas Mixture CALGAS (Equipment Calibration Gas : Oxygen Isobutylene Nitrogen	 7782-44-7 115-11-7 7727-37-9	PID	 NA/NA NA/NA NA/NA	NA	inhalation	dizziness, headache, and nausea	Breathing: Respiratory support
1.3.1 – 1.3.7	n-Propylbenzene Isocumene Propylbenzene 1-Phenylpropane 1-Propylbenzene Phenylpropane	103-65-1	PID	NA NA	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin; dry nose, throat; headache; low blood pressure, tachycardia, abnormal cardiovascular system stress; central nervous system, hematopoietic depression; metallic taste; liver, kidney injury	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.7	o-Xylenes 1,2-Dimethylbenzene ortho-Xylene o-Xylol	95-47-6	PID	100 ppm 900 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; corneal vacuolization; nausea, vomiting, abdominal pain; dermatitis	Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.7	p-Dichlorobenzene p-DCB 1,4-Dichlorobenzene para-Dichlorobenzene Dichlorocide	106-46-7	PID	75 ppm 150 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, swelling periorbital (situated around the eye); profuse rhinitis; headache, anorexia, nausea, vomiting; weight loss, jaundice, cirrhosis; in animals: liver, kidney injury; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.7	p-Ethyltoluene 4-Ethyltoluene 1-ethyl-4-methyl-benzene	622-96-8	NA	NA NA	Soil	ingestion, skin and/or eye contact	irritation to the eyes, skin, mucous membrane; headache; dermatitis; narcosis, coma	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.7	Phenanthrene	85-01-8	PID	0.2 mg/m^3 80 mg/m^3 (Coal Pitch Tar)	Groundwater Soil	inhalation, skin or eye contact, ingestion	irritation to eyes and skin, respiratory irritation(dizziness, weakness, fatigue, nausea, headache)	Eye: Irrigate immediately, refer to medical attention Skin: Soap wash immediately Breathing: move to fresh air Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.7	Potassium	7440-09-7	None	NA NA	Soil	inhalation, skin absorption, ingestion, skin and/or eye contact inhalation, ingestion, skin and/or eye contact	eye: Causes eye burns. Skin: Causes skin burns. Reacts with moisture in the skin to form potassium hydroxide and hydrogen with much heat. ingestion: Causes gastrointestinal tract burns. inhalation: May cause irritation of the respiratory tract with burning pain in the nose and throat, coughing, wheezing, shortness of breath and pulmonary edema. Causes chemical burns to the respiratory tract. inhalation may be fatal as a result of spasm, inflammation, edema of the larynx and bronchi, chemical pneumonitis and pulmonary edema.	Eyes: Get medical aid immediately Skin: Get medical aid immediately. Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. ingestion: If victim is conscious and alert, give 2-4 full cups of milk or water. Get medical aid immediately. inhalation: Get medical aid immediately.
1.3.1 – 1.3.7	Potassium hydrogen phthalate	877-24-7	NA	NA NA	NA	skin absorption, ingestion, skin and/or eye contact	nausea, diarrhea, abdominal pain, vomiting;	Skin: Water flush promptly Swallow: Medical attention immediately
1.3.1 – 1.3.7	p-Xylenes 1,4-Dimethylbenzene para-Xylene p-Xylol	106-42-3	PID	100 ppm 900 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; corneal vacuolization; nausea, vomiting, abdominal pain; dermatitis	Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.7	Pyrene benzo[def]phenanthrene	129-00-0	PID	0.2 mg/m^3 80 mg/m^3 (Coal Pitch Tar)	Groundwater Soil	inhalation, skin or eye contact, ingestion	irritation to eyes and skin, respiratory irritation(dizziness, weakness, fatigue, nausea, headache)	Eye: Irrigate immediately, refer to medical attention Skin: Soap wash immediately Breathing: move to fresh air Swallow: Medical attention immediately
1.3.1 – 1.3.7	Selenium	7782-49-2	None	1 mg/m^3 0.2 mg/m^3	Soil	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat; visual disturbance; headache; chills, fever; dyspnea (breathing difficulty), bronchitis; metallic taste, garlic breath, gastrointestinal disturbance; dermatitis; eye, skin burns; in animals: anemia; liver necrosis, cirrhosis; kidney, spleen damage	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.7	Silver	7440-22-4	None	0.01 mg/m^3 10 mg/m^3	Soil	inhalation, ingestion, skin and/or eye contact	blue-gray eyes, nasal septum, throat, skin; irritation, ulceration skin; gastrointestinal disturbance	Eye: Irrigate immediately Skin: Water flush Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.7	Sodium	7440-23-5	None	NA NA	Groundwater Soil	ion, ingestion, skin and/or eye contact	sensitization dermatitis, allergic asthma, pneumonitis; [potential occupational carcinogen]	Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.7	Styrene Ethenyl benzene Phenylethylene Styrene monomer Styrol Vinyl benzene	100-42-5	PID	100 ppm 700 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, nose, respiratory system; headache, lassitude (weakness, exhaustion), dizziness, confusion, malaise (vague feeling of discomfort), drowsiness, unsteady gait; narcosis; defatting dermatitis; possible liver injury; reproductive effects	Eye: Irrigate immediately Skin: Water flush Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.7	Tert-Butyl Alcohol Tertiary Butyl Alcohol 2-Methyl-2-propanol Trimethyl carbinol TBA	75-65-0	PID	100 ppm 1600 ppm	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat; drowsiness, narcosis	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.7	Tetrachloroethylene Perchlorethylene Perchloroethylene PCE Perk Tetrachlorethylene Tetrachloroethene	127-18-4	PID	100 ppm 150 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat, respiratory system; nausea; flush face, neck; dizziness, incoordination; headache, drowsiness; skin erythema (skin redness); liver damage; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.7	Thallium	7440-28-0	None	0.1 mg/m^3 15 mg/m^3	Groundwater Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	nausea, diarrhea, abdominal pain, vomiting; ptosis, strabismus; peri neuritis, tremor; retrosternal (occurring behind the sternum) tightness, chest pain, pulmonary edema; convulsions, chorea, psychosis; liver, kidney damage; alopecia; paresthesia legs	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.7	Toluene Methyl benzene Methyl benzol Phenyl methane Toluol	108-88-3	PID	200 ppm 500 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, nose; lassitude (weakness, exhaustion), confusion, euphoria, dizziness, headache; dilated pupils, lacrimation (discharge of tears); anxiety, muscle fatigue, paresthesia; dermatitis	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.7	Total PCBs Chlorodiphenyl (42% chlorine) Aroclor® 1242 PCB Polychlorinated biphenyl	53469-21-9	None	0.5 mg/m^3 5 mg/m^3	Groundwater Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, chloracne	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.7	Total Xylenes Dimethylbenzene Xylol	1330-20-7	PID	100 ppm 900 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; corneal vacuolization; nausea, vomiting, abdominal pain; dermatitis	Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.7	Trichloroethylene Ethylene trichloride TCE Trichloroethene Trilene	79-01-6	PID	100 ppm 1000 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin; headache, visual disturbance, lassitude (weakness, exhaustion), dizziness, tremor, drowsiness, nausea, vomiting; dermatitis; cardiac arrhythmias, paresthesia; liver injury; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.7	Trichlorofluoromethane Fluorotrichloromethane Freon® 11 Monofluorotrichloromethane Refrigerant 11 Trichloromonofluoromethane	75-69-4	PID	1000 ppm 2000 ppm	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	incoordination, tremor; dermatitis; cardiac arrhythmias, cardiac arrest; asphyxia; liquid: frostbite	Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.7	Vanadium	7440-62-2	None	0.1 mg/m3 15 mg/m3	Groundwater Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	nausea, diarrhea, abdominal pain, vomiting; ptosis, strabismus; peri neuritis, tremor; retrosternal (occurring behind the sternum) tightness, chest pain, pulmonary edema; convulsions, chorea, psychosis; liver, kidney damage; alopecia; paresthesia legs	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.7	Vinyl Chloride Chloroethene Chloroethylen Ethylene monochloride Monochloroethene Monochloroethylene VC Vinyl chloride monomer (VCM)	75-01-4	PID	1 ppm NA	Groundwater Soil Vapor	inhalation, skin and/or eye contact (liquid)	lassitude (weakness, exhaustion); abdominal pain, gastrointestinal bleeding; enlarged liver; pallor or cyanosis of extremities; liquid: frostbite; [potential occupational carcinogen]	Eye: Frostbite Skin: Frostbite Breathing: Respiratory support
1.3.1 – 1.3.7	Vinylidene chloride 1,1-DCE 1,1-Dichloroethene 1,1-Dichloroethylene VDC Vinylidene chloride monomer Vinylidene dichloride	75-35-4	PID	NA NA	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, throat; dizziness, headache, nausea, dyspnea (breathing difficulty); liver, kidney disturbance; pneumonitis; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.7	Zinc	7440-62-2	None	15 mg/m^3 500 mg/m^3	Groundwater Soil	inhalation	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	Breathing: Respiratory support

EXPLANATION OF ABBREVIATIONS

PID = Photoionization Detector
PEL = Permissible Exposure Limit (8-hour Time Weighted Average
IDLH = Immediately Dangerous to Life and Health
ppm = part per million
mg/m^3 = milligrams per cubic meter
500 mg/m3

TABLE 3
Summary of Monitoring Equipment

Instrument	Operation Parameters
Photoionization Detector (PID)	**Hazard Monitored:** Many organic and some inorganic gases and vapors. **Application:** Detects total concentration of many organic and some inorganic gases and vapors. Some identification of compounds is possible if more than one probe is measured. **Detection Method:** Ionizes molecules using UV radiation; produces a current that is proportional to the number of ions. **General Care/Maintenance:** Recharge or replace battery. Regularly clean lamp window. Regularly clean and maintain the instrument and accessories. **Typical Operating Time:** 10 hours. 5 hours with strip chart recorder.
Oxygen Meter	**Hazard Monitored:** Oxygen (O_2). **Application:** Measures the percentage of O_2 in the air. **Detection Method:** Uses an electrochemical sensor to measure the partial pressure of O_2 in the air, and converts the reading to O_2 concentration. **General Care/Maintenance:** Replace detector cell according to manufacturer's recommendations. Recharge or replace batteries prior to explanation of the specified interval. If the ambient air is less than 0.5% C O_2, replace the detector cell frequently. **Typical Operating Time:** 8 – 12 hours.
Additional equipment (if needed, based on site conditions)	
Combustible Gas Indicator (CGI)	**Hazard Monitored:** Combustible gases and vapors. **Application:** Measures the concentration of combustible gas or vapor. **Detection Method:** A filament, usually made of platinum, is heated by burning the combustible gas or vapor. The increase in heat is measured. Gases and vapors are ionized in a flame. A current is produced in proportion to the number of carbon atoms present. **General Care/Maintenance:** Recharge or replace battery. Calibrate immediately before use. **Typical Operating Time:** Can be used for as long as the battery lasts, or for the recommended interval between calibrations, whichever is less.
Flame Ionization Detector (FID) with Gas Chromatography Option *(i.e., Foxboro Organic Vapor Analyzer (OVA))*	**Hazard Monitored:** Many organic gases and vapors (approved areas only). **Application:** In survey mode, detects the concentration of many organic gases and vapors. In gas chromatography (GC) mode, identifies and measures specific compounds. In survey mode, all the organic compounds are ionized and detected at the same time. In GC mode, volatile species are separated. **General Care/Maintenance:** Recharge or replace battery. Monitor fuel and/or combustion air supply gauges. Perform routine maintenance as described in the manual. Check for leaks. **Typical Operating Time:** 8 hours; 3 hours with strip chart recorder.
Potable Infrared (IR) Spectrophotometer	**Hazard Monitored:** Many gases and vapors. **Application:** Measures concentration of many gases and vapors in air. Designed to quantify one or two component mixtures. **Detection Method:** Passes different frequencies of IR through the sample. The frequencies absorbed are specific for each compound. **General Care/Maintenance:** As specified by the manufacturer.

Instrument	Operation Parameters
Direct Reading Colorimetric Indicator Tube	**Hazard Monitored:** Specific gas and vapors. **Application:** Measures concentration of specific gases and vapors. **Detection Method:** The compound reacts with the indicator chemical in the tube, producing a stain whose length or color change is proportional to the compound's concentration. **General Care/Maintenance:** Do not use a previously opened tube even if the indicator chemical is not stained. Check pump for leaks before and after use. Refrigerate before use to maintain a shelf life of about 2 years. Check expiration dates of tubes. Calibrate pump volume at least quarterly. Avoid rough handling which may cause channeling.
Aerosol Monitor	**Hazard Monitored:** Airborne particulate (dust, mist, fume) concentrations **Application:** Measures total concentration of semi-volatile organic compounds, PCBs, and metals. **Detection Method:** Based on light-scattering properties of particulate matter. Using an internal pump, air sample is drawn into the sensing volume where near infrared light scattering is used to detect particles. **General Care/Maintenance:** As specified by the mfr. Also, the instrument must be calibrated with particulates of a size and refractive index similar to those to be measured in the ambient air.
Monitox	**Hazard Monitored:** Gases and vapors. **Application:** Measures specific gases and vapors. **Detection Method:** Electrochemical sensor relatively specific for the chemical species in question. **General Care/Maintenance:** Moisten sponge before use; check the function switch; change the battery when needed.
Gamma Radiation Survey Instrument	**Hazard Monitored:** Gamma Radiation. **Application:** Environmental radiation monitor. **Detection Method:** Scintillation detector. **General Care/Maintenance:** Must be calibrated annually at a specialized facility. **Typical Operating Time:** Can be used for as long as the battery lasts, or for the recommended interval between calibrations, whichever is less.

TABLE 4
INSTRUMENTATION ACTION LEVELS

Photoionization Detector Action Levels	Action Required
Background to 5 ppm	No respirator; no further action required
> 1 ppm but < 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 1 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	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.
> 150 ppm	Evacuate the work area

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 benzene for any 15 minute period.
3. 150 ppm level based on NIOSH Immediately Dangerous to Life and Health (IDLH) for tetrachloroethylene.

TABLE 5
EMERGENCY NOTIFICATION LIST

ORGANIZATION	CONTACT	TELEPHONE
Local Police Department	NYPD	911
Local Fire Department	NYFD	911
Ambulance/Rescue Squad	NYFD	911
Hospital	Rockefeller University Hospital	911 or 212-327-8000
Langan Incident / Injury Hotline		800-952-6426 ex 4699
Langan Project Manager	Jessica Friscia	201-314-7195 (cell)
Langan Health and Safety Manager (HSM)	Tony Moffa	215-756-2523 (cell)
Langan Health & Safety Officer (HSO)	William Bohrer	410-984-3068 (cell)
Langan Field Team Leader (FTL)	To Be Determined	
Client's Representative	Colin McLean	646-237-4866
National Response Center (NRC)		800-424-8802
Chemical Transportation Emergency Center (Chemtrec)		800-424-9300
Center for Disease Control (CDC)		404-639-3534
EPA (RCRA Superfund Hotline)		800-424-9346
TSCA Hotline		202-554-1404
Poison Control Center		800-222-1222

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)-9-LANGAN (ext. #4699).

TABLE 6
SUGGESTED FREQUENCY OF PHYSIOLOGICAL MONITORING FOR FIT AND ACCLIMATED WORKERS[A]

Adjusted Temperature[b]	Normal Work Ensemble[c]	Impermeable Ensemble
90°F or above (32.2°C) or above	After each 45 min. of work	After each 15 min. of work
87.5°F (30.8°-32.2°C)	After each 60 min. of work	After each 30 min. of work
82.5°-87.5°F (28.1°-30.8°C)	After each 90 min. of work	After each 60 min. of work
77.5°-82.5°F (25.3°-28.1°C)	After each 120 min. of work	After each 90 min. of work
72.5°-77.5°F (22.5°-25.3°C)	After each 150 min. of work	After each 120 min. of work

a For work levels of 250 kilocalories/hour.

b Calculate the adjusted air temperature (ta adj) by using this equation: ta adj ^{O}F = ta ^{O}F + (13 x % sunshine). Measure air temperature (ta) with a standard mercury-in-glass thermometer, with the bulb shielded from radiant heat. Estimate percent sunshine by judging what percent time the sun is not covered by clouds that are thick enough to produce a shadow. (100 percent sunshine = no cloud cover and a sharp, distinct shadow; 0 percent sunshine = no shadows.)

c A normal work ensemble consists of cotton coveralls or other cotton clothing with long sleeves and pants.

TABLE 7

HEAT INDEX

	ENVIRONMENTAL TEMPERATURE (Fahrenheit)										
	70	**75**	**80**	**85**	**90**	**95**	**100**	**105**	**110**	**115**	**120**
RELATIVE HUMIDITY	**APPARENT TEMPERATURE***										
0%	64	69	73	78	83	87	91	95	99	103	107
10%	65	70	75	80	85	90	95	100	105	111	116
20%	66	72	77	82	87	93	99	105	112	120	**130**
30%	67	73	78	84	90	96	104	113	123	**135**	**148**
40%	68	74	79	86	93	101	110	123	**137**	**151**	
50%	69	75	81	88	96	107	120	**135**	**150**		
60%	70	76	82	90	100	114	**132**	**149**			
70%	70	77	85	93	106	124	**144**				
80%	71	78	86	97	113	**136**					
90%	71	79	88	102	122						
100%	72	80	91	108							

*Combined Index of Heat and Humidity...what it "feels like" to the body
Source: National Oceanic and Atmospheric Administration

How to use Heat Index:
1. Across top locate Environmental Temperature
2. Down left side locate Relative Humidity
3. Follow across and down to find Apparent Temperature
4. Determine Heat Stress Risk on chart at right

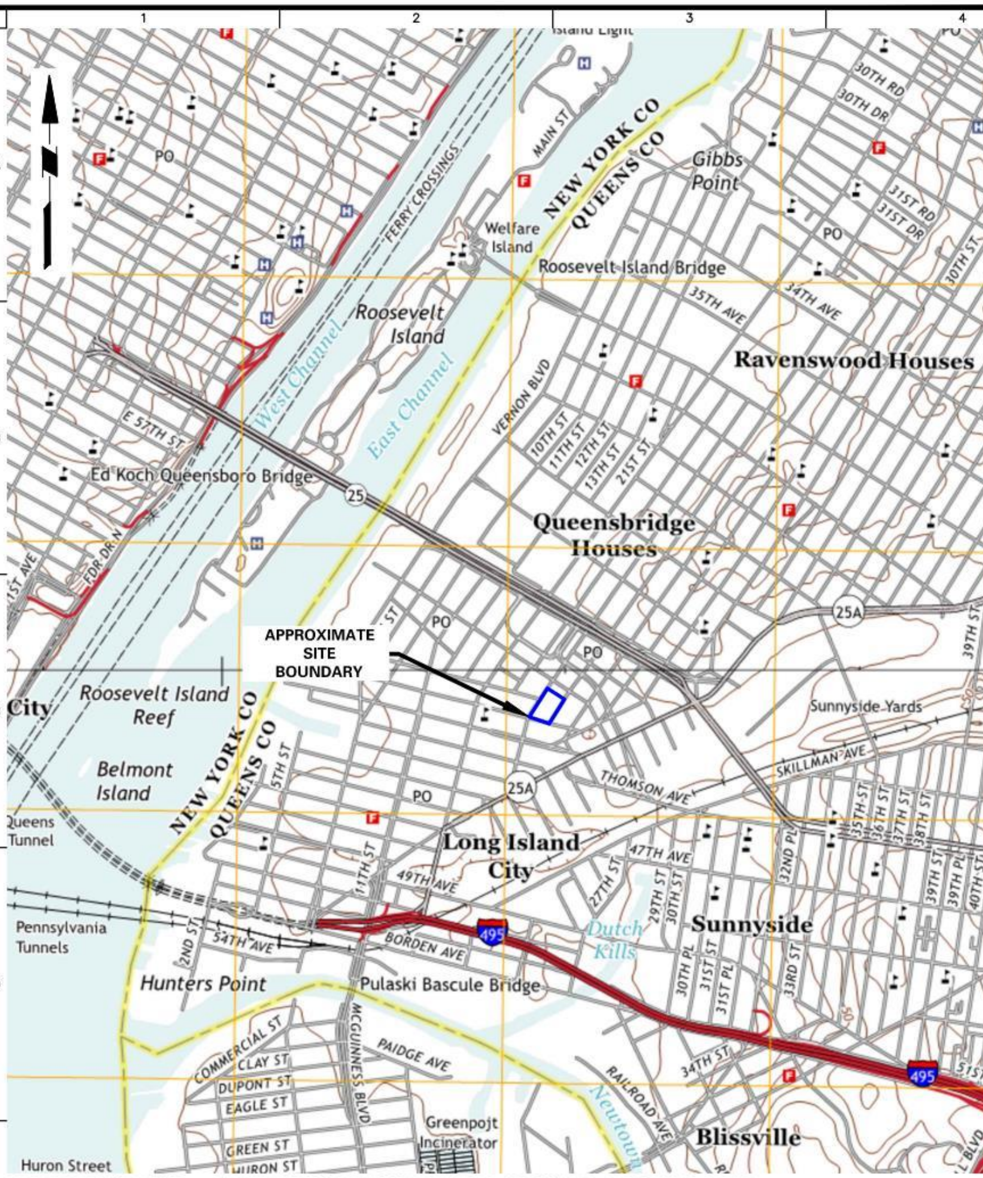
Note: Exposure to full sunshine can increase Heat Index values by up to 15 degrees F.

Apparent Temperature	**Heat Stress Risk with Physical Activity and/or Prolonged Exposure**
90-105	Heat Cramps or Heat Exhaustion Possible
105-130	Heat Cramps or Heat Exhaustion Likely, Heat Stroke Possible
>130	Heatstroke Highly Likely

FIGURES

FIGURE 1

Site Location Map



MAP REFERENCE: USGS 7.5-MINUTE TOPOGRAPHIC QUADRANGLE of BROOKLYN AND QUEENS, DATED 2016

LANGAN
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Langan Engineering and Environmental Services, Inc.
Langan CT, Inc.
Langan International LLC
Collectively known as Langan

Project	43-30 24TH STREET BLOCK No. 436, LOT No. 1 LONG ISLAND CITY NEW YORK	Figure Title: SITE LOCATION MAP	Project No. 170362702 Date 11/17/2023 Scale NTS Drawn By KAG / Checked By JF Submission Date	Figure 1 Sheet 1 of 11

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Filename: \\langan.com\data\NYC\data7\170362701\Cadd Data - 170362701\SheetFiles\Environmental\BCP FER\SMP\Figure 1 - Site Location Map USGS_PAR.dwg Date: 12/18/2023 Time: 14:15 User: kgioia Style Table: Langan.stb Layout: ANSIA-BP

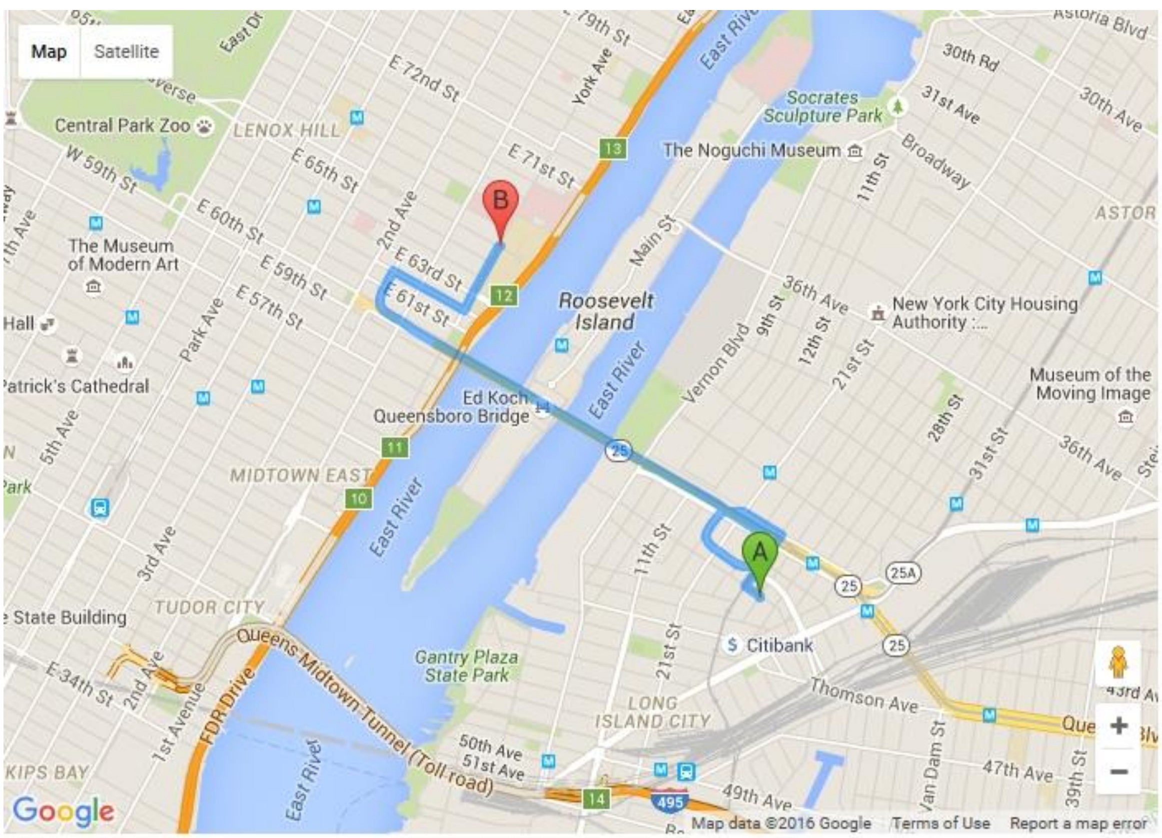
FIGURE 2
HOSPITAL ROUTE PLAN

Hospital Location: Rockefeller University Hospital
1230 York Avenue
New York, NY (212) 327-8000

START: 43-30 24th Street, Long Island City, NY

1. Head northeast on 24th toward 43rd Avenue
2. Turn left at the 1st cross street onto 43rd Avenue
3. Turn right at the 1st cross street onto 23rd Street
4. Turn left onto Bridge Plaza N/Queens Plaza N. Continue to follow Queens Plaza N
5. Take the ramp to Queensboro Bridge Upper Roadway
6. Continue onto Ed Koch Queensboro Bridge
7. Turn right onto East 62nd Street
8. Turn left at the 2nd cross street onto York Avenue
9. Turn right at East 66th Street (Restricted usage road)
10. Destination will be on the left.

END: Rockefeller University Hospital, 1230 York Avenue, New York, NY



ATTACHMENT A

STANDING ORDERS

STANDING ORDERS

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 B

DECONTAMINATION PROCEDURES

PERSONNEL DECONTAMINATION

LEVEL C DECONTAMINATION

Station 1:	Equipment Drop	1. Deposit equipment used on-site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. During hot weather operations, cool down stations may be set up within this area.
Station 2:	Outer Garment, Boots, and Gloves Wash and Rinse	2. Scrub outer boots, outer gloves and chemical-resistant splash suit with decon solution or detergent and water. Rinse off using copious amounts of water.
Station 3:	Outer Boot and Glove Removal	3. Remove outer boots and gloves. Deposit in container with plastic liner.
Station 4:	Canister or Mask Change	4. If worker leaves Exclusion Zone to change canister (or mask), this is the last step in the decontamination procedure. Worker's canister is exchanged, new outer gloves and boot covers donned, joints taped, and worker returns to duty.
Station 5:	Boot, Gloves and Outer Garment Removal	5. Boots, chemical-resistant splash suit, inner gloves removed and deposited in separate containers lined with plastic.
Station 6:	Face piece Removal	6. Face piece is removed (avoid touching face with fingers). Face piece deposited on plastic sheets.
Station 7:	Field Wash	7. Hands and face are thoroughly washed. Shower as soon as possible.

LEVEL D DECONTAMINATION

Station 1:	Equipment Drop	1. Deposit equipment used on-site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. During hot weather operations, cool down stations may be set up within this area.
Station 2:	Outer Garment, Boots, and Gloves Wash and Rinse	2. Scrub outer boots, outer gloves and chemical-resistant splash suit with decon solution or detergent and water. Rinse off using copious amounts of water.
Station 3:	Outer Boot and Glove Removal	3. Remove outer boots and gloves. Deposit in container with plastic liner.
Station 4:	Boot, Gloves and Outer Garment Removal	4. Boots, chemical-resistant splash suit, inner gloves removed and deposited in separate containers lined with plastic.
Station 5:	Field Wash	5. Hands and face are thoroughly washed. Shower as soon as possible.

EQUIPMENT DECONTAMINATION

GENERAL:

Equipment to be decontaminated during the project may include tools, monitoring equipment, respirators, sampling containers, laboratory equipment and drilling equipment.

All decontamination will be done by personnel in protective gear, appropriate for the level of decontamination, as determined by the site HSO. The decontamination work tasks will be split or rotated among support and work crews.

Depending on site conditions, backhoe and pumps may be decontaminated over a portable decontamination pad to contain wash water; or, wash water may be allowed to run off into a storm sewer system. Equipment needed may include a steam generator with high-pressure water, empty drums, screens, screen support structures, and shovels. Drums will be used to hold contaminated wash water pumped from the lined pit. These drums will be labeled as such.

Miscellaneous tools and equipment will be dropped into a plastic pail, tub, or other container. They will be brushed off and rinsed with a detergent solution, and finally rinsed with clean water.

MONITORING EQUIPMENT:

Monitoring equipment will be protected as much as possible from contamination by draping, masking, or otherwise covering as much of the instruments as possible with plastic without hindering the operation of the unit. The PID, HNu or OVA meter, for example, can be placed in a clear plastic bag, which allows reading of the scale and operation of knobs. The probes can be partially wrapped keeping the sensor tip and discharge port clear.

The contaminated equipment will be taken from the drop area and the protective coverings removed and disposed in the appropriate containers. Any dirt or obvious contamination will be brushed or wiped with a disposable paper wipe.

RESPIRATORS:

Respirators will be cleaned and disinfected after every use. Taken from the drop area, the masks (with the cartridges removed and disposed of with other used disposable gear) will be immersed in a cleaning solution and scrubbed gently with a soft brush, followed by a rinse in plain warm water, and then allowed to air dry. In the morning, new cartridges will be installed. Personnel will inspect their own masks for serviceability prior to donning them. And, once the mask is on, the wearer will check the respirator for leakage using the negative and positive pressure fit check techniques.

ATTACHMENT C

EMPLOYEE EXPOSURE/
INJURY INCIDENT REPORT

EMPLOYEE INCIDENT/INJURY REPORT
LANGAN ENGINEERING & ENVIRONMENTAL SERVICES

(Complete and return to Tony Moffa in the Doylestown Office)

Affected Employee Name: ______________________ Date: ______________________

Incident type: ☐ Injury ☐ Report Only/No Injury

☐ Near Miss ☐ Other: ______________________

______

EMPLOYEE INFORMATION (Person completing Form)

Employee Name: ______________________ Employee No: ______________________

Title: ______________________ Office Location: ______________________

Length of time employed or date of hire: ______________________

Mailing address: ______________________

____

Sex: M ☐ F ☐ Birth date: ______________________

Business phone & extension: ______________________ Residence/cell phone: ______________________

ACCIDENT INFORMATION

Project: ______________________ Project #: ______________________

Date & time of incident: ______________________ Time work started & ended: ______________________

Site location: ______________________

Incident Type: Possible Exposure ☐ Exposure ☐ Physical Injury ☐

Names of person(s) who witnessed the incident: ______________________

____

Exact location incident occurred: ______________________

____

Describe work being done: ______________________

Describe what affected employee was doing prior to the incident occurring: ______

Describe in detail how the incident occurred: ______

Nature of the incident (List the parts of the body affected): ______

Person(s) to whom incident was reported (Time and Date): ______

List the names of other persons affected during this incident: ______

Possible causes of the incident (equipment, unsafe work practices, lack of PPE, etc.): ______

Weather conditions during incident: ______

MEDICAL CARE INFORMATION

Did affected employee receive medical care? Yes ☐ No ☐

If Yes, when and where was medical care received: ______

Provide name of facility (hospital, clinic, etc.): ______

Length of stay at the facility? ______

Did the employee miss any work time? Yes ☐ No ☐ Undetermined ☐

Date employee last worked: ______________________ Date employee returned to work: ________________

Has the employee returned to work? Yes ☐ No ☐

Does the employee have any work limitations or restrictions from the injury? : Yes ☐ No ☐

If Yes, please describe: ____

____

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

If Yes, please describe: ____

HEALTH & SAFETY INFORMATION

Was the operation being conducted under an established site specific CONSTRUCTION CONSTRUCTION HEALTH AND SAFETY PLAN?
Yes ☐ No ☐ Not Applicable: ☐

Describe protective equipment and clothing used by the employee:

____

____

____

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

____

____

____

______________________________ ______________________

Employee Signature Date

______________________________ ______________________

Langan Representative Date

ATTACHMENT D

CALIBRATION LOG

DATE:________________ **PROJECT:____________________**

CALIBRATION LOG

Date & Time	Inst Type	Inst #	Media	Initial Reading	Span #	Calibrat. Reading	Performed By:

ATTACHMENT E

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 F

JOBSITE SAFETY INSPECTION CHECKLIST

Jobsite Safety Inspection Checklist

Date: ______________________ **Inspected By:** ______________________

Location: ______________________ **Project #:** ______________________

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

	A	NA	D	Remark
1. CHASP available onsite for inspection?				
2. Health & Safety Compliance agreement (in CHASP) appropriately signed by Langan employees and contractors?				
3. Hospital route map with directions posted on site?				
4. Emergency Notification List posted on site?				
5. First Aid kit available and properly stocked?				
6. Personnel trained in CPR/First Aid on site?				
7. MSDSs readily available, and all workers knowledgeable about the specific chemicals and compounds to which they may be exposed?				
8 Appropriate PPE being worn by Langan employees and contractors?				
9. Project site safe practices ("Standing Orders") posted?				
10. Project staff have 40-hr./8-hr./Supervisor HAZWOPER training?				
11. Project staff medically cleared to work in hazardous waste sites and fit-tested to wear respirators, if needed?				
12. Respiratory protection readily available?				
13. Health & Safety Incident Report forms available?				
14. Air monitoring instruments calibrated daily and results recorded on the Daily Instrument Calibration check sheet?				
15. Air monitoring readings recorded on the air monitoring data sheet/field log book?				
16. Subcontract workers have received 40-hr./8-hr./Spvsr. HAZWOPER training, as appropriate?				
17. Subcontract workers medically cleared to work on site, and fit-tested for respirator wear?				
18. Subcontract workers have respirators readily available?				
19. Mark outs of underground utilities done prior to initiating any subsurface activities?				
20. Decontamination procedures being followed as outlined in CHASP?				
21. Are tools in good condition and properly used?				
22. Drilling performed in areas free from underground objects including utilities?				

23. Adequate size/type fire extinguisher supplied?				
24. Equipment at least 20 feet from overhead powerlines?				
25. Evidence that drilling operator is responsible for the safety of his rig.				
26. Trench sides shored, layer back, or boxed?				
27. Underground utilities located and authorities contacted before digging?				
28. Ladders in trench (25-foot spacing)?				
29. Excavated material placed more than 2 feet away from excavation edge?				
30. Public protected from exposure to open excavation?				
31. People entering the excavation regarding it as a permit-required confined space and following appropriate procedures?				
32. Confined space entry permit is completed and posted?				
33. All persons knowledgeable about the conditions and characteristics of the confined space?				
34. All persons engaged in confined space operations have been trained in safe entry and rescue (non-entry)?				
35. Full body harnesses, lifelines, and hoisting apparatus available for rescue needs?				
36. Attendant and/or supervisor certified in basic first aid and CPR?				
37. Confined space atmosphere checked before entry and continuously while the work is going on?				
38. Results of confined space atmosphere testing recorded?				
39. Evidence of coordination with off-site rescue services to perform entry rescue, if needed?				
40. Are extension cords rated for this work being used and are they properly maintained?				
41. Are GFCIs provided and being used?				

Unsafe Acts: ____

____

____

____

Notes: ____

____

____

____

ATTACHMENT G

JOB SAFETY ANALYSIS FORM

LANGAN	**Job Safety Analysis (JSA)** **Health and Safety**
JSA TITLE: **JSA NUMBER:**	**DATE CREATED:** **CREATED BY**: **REVISION DATE:** **REVISED BY:**

Langan employees must review and revise the Job Safety Analysis (JSA) as needed to address the any site specific hazards not identified. Employees must provide their signatures on the last page of the JSA indicating they have review the JSA and are aware the potential hazards associated with this work and will follow the provided preventive or corrective measures.

PERSONAL PROTECTIVE EQUIPMENT REQUIRED: (PPE): ■ Required	☒ As Needed	
☐ Steel-toed boots	☐ Nitrile gloves	☐ Dermal Protection (Specify)
☐ Long-sleeved shirt	☐ Leather/ Cut-resistant gloves	☐ High visibility vest/clothing
☐ Safety glasses	☐ Face Shield	☐ Hard hat
ADDITIONAL PERSONAL PROTECTIVE EQUIPMENT NEEDED (Provide specific type(s) or descriptions)		
☐ Air Monitoring:	☐ Respirators:	☐ Other:
☐ Dermal Protection:	☐ Cartridges:	☐ Other:

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE OR CORRECTIVE ACTION
1.	1. 2.	1a. 1b. 2a. 2b.
2.	1.	1
Additional items identified in the field.		
Additional Items.		

If additional items are identified during daily work activities, please notify all relevant personnel about the change and document on this JSA.

LANGAN

Job Safety Analysis (JSA)
Health and Safety

JSA Title: **Subsurface Investigation**

JSA Number: **JSA030-01**

A Job Safety Analysis (JSA) must identify all job steps required to complete the task, the potential hazards employees could be exposed to while performing the job step and the preventative/corrective actions required to reduce/mitigate the identified potential hazards. Employees must certify that they have either prepared the JSA or have reviewed the JSA and are aware of the potential hazards associated with this task and will follow the provided preventive/corrective actions.

PERSONAL PROTECTIVE EQUIPMENT (Required or to be worn as needed):

☒ Safety Shoes	☒ Long Sleeves	☒ Safety Vest (Class 2)	☒ Hard Hat	☒ Hearing Protection
☒ Safety Glasses	☒ Safety Goggles	☐ Face Shield	☐ Nitrile Gloves	☐ PVC Gloves
☒ Leather Gloves	☒ Cut Resist. Gloves	☐ Fall Protection	☐ Fire Resistant Clothing	☐ Rubber Boots
☐ Insect/Animal Repellent	☐ Ivy Blocker/Cleaner	☐ Traffic Cones/Signs	☐ Life Vest/Jacket	
☒ Other: Dielectric Overshoes, Sun Block				

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
1. Transport equipment to work area	1. Back/strain 2. Slip/Trip/Falls 3. Traffic 4. Cuts/abrasions/contusions from equipment 5. Accidents due to vehicle operations	1. Use proper lifting techniques/Use wheeled transport 2. Minimize distance to work area/unobstructed path to work area/follow good housekeeping procedures 3. Wear proper PPE (high visibility vest or clothing) 4. Wear proper PPE (leather gloves, long sleeves, Langan approved safety shoes) 5. Observe posted speed limits/ Wear seat belts at all times
2. Traffic	1. Hit by moving vehicle	1. Use traffic cones and signage/ Use High visibility traffic vests and clothing/ Caution tape when working near active roadways.
3. Field Work (drilling, resistivity testing, and inspection)	1. Biological Hazards: insects, rats, snakes, poisonous plants, and other animals 2. Heat stress/injuries 3. Cold Stress/injuries 4. High Energy Transmission Lines 5. Underground Utilities 6. Electrical (soil resistivity testing)	1. Inspect work area to identify biological hazards. Wear light colored long sleeve shirt and long pants/ Use insect repellant as necessary/ Beware of tall grass, bushes, woods and other areas where ticks may live/ Avoid leaving garbage on site to prevent attracting animals/ Identify and avoid contact with poisonous plants/Beware of rats, snakes, or stray animals. 2. Wear proper clothing (light colored)/ drink plenty of water/ take regular breaks/use sun block 3. Wear proper clothing/ dress in layers/ take regular breaks. 4. Avoid direct contact with high energy transmission lines/ position equipment at least 15 feet or as required by PSE&G from the transmission lines/ wear proper PPE (dielectric overshoes 15 kV minimum rating). 5. Call one-call service before performing intrusive field work/ Review utility mark-outs and available utility drawings (with respect to proposed work locations)/ Follow Underground Utility Guidelines

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
		6. See AGI Sting R1 operating manual for specific concerns during operating instrument
4. All activities	1. Slips/ Trips/ Falls 2. Hand injuries, cuts or lacerations during manual handling of materials 3. Foot injuries 4. Back injuries 5. Traffic 6. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.) 7. High Noise levels 8. Overhead hazards 9. Heat Stress/ Cold Stress 10. Eye Injuries	7. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards 8. Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery or dirty objects before handling / Wear leather/ cut-resistant gloves 9. Wear Langan approved safety shoes 10. Use proper lifting techniques / Consider load location, task repetition, and load weigh when evaluating what is safe or unsafe to lift / Obtain assistance when possible 11. Wear high visibility clothing & vest / Use cones or signs to designate work area 12. Be aware of surroundings at all times, including the presence of wildlife/ Do not approach stray dogs / Carry/use dog/animal repellant / Use bug spray when needed 13. Wear proper hearing protection 14. Wear hard hat / Avoid areas were overhead hazards exist. 15. Wear proper attire for weather conditions (sunscreen or protective clothing in sunlight, layers for cold weather) / Drink plenty of fluids to avoid dehydration / Takes breaks as necessary to avoid heat/cold stress 16. Wear safety glasses
Additional items.		
Additional Items identified while in the field. (Delete row if not needed.)		

Print Name	**Sign Name**	**Date**
Prepared by:		
Reviewed by:		

LANGAN	**Job Safety Analysis (JSA)** **Health and Safety**

JSA Title: **Direct-Push Soil Borings**
JSA Number: **JSA004-01**

A Job Safety Analysis (JSA) must identify all job steps required to complete the task, the potential hazards employees could be exposed to while performing the job step and the preventative/corrective actions required to reduce/mitigate the identified potential hazards. Employees must certify that they have either prepared the JSA or have reviewed the JSA and are aware of the potential hazards associated with this task and will follow the provided preventive/corrective actions.

PERSONAL PROTECTIVE EQUIPMENT REQUIRED:				
☒ Safety Shoes	☒ Long Sleeves	☒ Safety Vest (Class 2)	☒ Hard Hat	☒ Hearing Protection
☒ Safety Glasses	☐ Safety Goggles	☐ Face Shield	☒ Nitrile Gloves	☐ PVC Gloves
☒ Leather Gloves	☒ Cut Resist. Gloves	☐ Fall Protection	☐ Fire Resistant Clothing	☐ Rubber Boots
☐ Insect/Animal Repellent	☐ Ivy Blocker/Cleaner	☐ Traffic Cones/Signs	☐ Life Vest/Jacket	
☒ Other: Half-face respirator, dust cartridges, PID (if applicable)				

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
5. Move equipment to work site	6. Back strain when lifting equipment 7. Slips/ Trips/ Falls while moving equipment 8. Traffic (if applicable) 9. Pinched fingers or running over toes during geoprobe set-up 10. Overturn drilling rig while transporting to loading dock on flat-bed tow truck	6. Use proper lifting technique (use legs for bending and lifting and not the back)/ Use wheeled transport for heavy equipment / Get assistance when handling loads greater than 50 lbs. / Minimize distance to vehicle 7. Use proper lifting technique (use legs for bending and lifting and not the back) / Use wheeled transport for heavy equipment / Get assistance when handling loads greater than 50 lbs. / Minimize distance to vehicle / Have unobstructed path to vehicle or collection point / Do not lift/walk with boxes that are heavy/difficult to lift 8. Wear high visibility safety vests or clothing / Exercise caution 9. Wear proper PPE (cut-resistant gloves) / Stay alert, be aware of geoprobe rig at all times 10. Drill rig should be parked in center of flat-bed tow truck / Emergency brake shall be used at all times during transport on the flat-bed truck/ All unnecessary personnel should stay away from the flat-bed truck during moving activities
6. Calibration of monitoring equipment	1. Skin or eye contact with calibration chemicals 2. Pinch fingers in monitoring equipment	1. Wear proper PPE (safety glasses/ goggles) 2. Wear proper PPE (leather gloves)
7. Set-up geoprobe rig	1. Geoprobe rig movement	1. All field personnel should stay clear of the geoprobe rig while moving / Use a spotter when backing up the geoprobe
8. Advance geoprobe rods below ground surface to desired depth	1. Underground utilities 2. High noise levels	1. Clean all subsurface soil borings to a minimum of 5 feet below grade 2. Wear proper PPE (hearing protection)
9. Remove and open acetate liner	11. Pinched fingers while removing macrocore 12. Cuts/lacerations when cutting acetate liner open 13. Exposure to hazardous vapors	1. Wear proper PPE (nitrile gloves, cut-resistant or leather gloves) 2. Wear proper PPE (cut-resistant or leather gloves) 3. Do not place face over acetate liner when opening / Monitor hazardous vapors in air with PID / Upgrade PPE as necessary based on levels contained in the Health and Safety Plan

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
5. Remove and open acetate liner (cont'd)	14. Skin contact with contaminated soil	4. Wear proper PPE (nitrile gloves)
10. Sample Collections a) Monitor parameters b) Prepare sample containers and labels	1. Contact with potentially contaminated soil 2. Lacerations from broken sample bottles 3. Back strain while transporting full coolers 4. Internal exposure to contaminants and metals through inhalation of dust 5. Slips/ Trips/ Falls	1. Use monitoring devices / Wear proper PPE (safety glasses, nitrile gloves) 2. Do not over-tighten bottle caps / Handle bottles safely to prevent breakage 3. Use proper lifting techniques / Do not lift heavy loads without assistance 4. Avoid creating dust / If necessary, wear a half mask respirator with applicable dust cartridge / Inspect respirator for damage and cleanliness prior to use / Clean respirator after each use and store in a clean, secure location 5. Be alert / Follow good housekeeping procedures
11. Remove excess soil from acetate liner and place in 55-gallon drum (IF NOT PERFORMED BY LANGAN, REMOVE!)	1. Cuts/lacerations from acetate liner 2. Pinched fingers/hand while opening/closing drum 3. Skin contact with contaminated soil 4. Soil debris in eyes	1. Wear proper PPE (cut-resistant or leather gloves) 2. Wear proper PPE (cut-resistant or leather gloves) 3. Wear proper PPE (nitrile gloves) 4. Wear proper PPE (safety glasses)
8. Transport drums to central staging location (IF NOT PERFORMED BY LANGAN, REMOVE!)	1. Back, arm or shoulder strain from moving drums 2. Pinch fingers/hand in drum cart when moving drums 3. Pinch fingers/hand when operating lift-gate on vehicle 4. Contact with potentially contaminated groundwater when moving improperly sealed drums 5. Slips when moving drums 6. Drop drum on feet/toes	17. Use drum cart for moving drums / Use proper lifting techniques / Do not lift heavy loads without assistance 18. Wear proper PPE (cut-resistant or leather gloves) 19. Wear proper PPE (cut-resistant or leather gloves) 20. Wear proper PPE (nitrile gloves underneath work gloves) 21. Follow good housekeeping procedures / Ensure route to move drum and storage space is free from obstructions 22. Wear proper PPE (safety shoes) / Work in a safe manner to prevent dropped drum
9. All activities	1. Slips/ Trips/ Falls 2. Hand injuries, cuts or lacerations during manual handling of materials 3. Foot injuries 4. Back injuries 5. Traffic 6. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.) 7. High Noise levels 8. Overhead hazards 9. Heat Stress/ Cold Stress	1. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards 2. Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery or dirty objects before handling / Wear leather/ cut-resistant gloves 3. Wear Langan approved safety shoes 4. Use proper lifting techniques / Consider load location, task repetition, and load weigh when evaluating what is safe or unsafe to lift / Obtain assistance when possible 5. Wear high visibility clothing & vest / Use cones or signs to designate work area 6. Be aware of surroundings at all times, including the presence of wildlife/ Do not approach stray dogs / Carry/use dog/animal repellant / Use bug spray when needed 7. Wear hearing protection 8. Wear hard hat / Avoid areas were overhead hazards exist. 9. Wear proper attire for weather conditions (sunscreen or protective clothing in sunlight, layers for cold weather) / Drink plenty of fluids to avoid dehydration / Takes breaks as necessary to avoid heat/cold stress

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
9. All activities (cont'd)	10. Eye Injuries	10. Wear safety glasses
Additional items.		
Additional Items identified while in the field. (Delete row if not needed.)		

Print Name	**Sign Name**	**Date**
Prepared by:		
Reviewed by:		

LANGAN	**Job Safety Analysis (JSA)** **Health and Safety**

JSA Title: **Groundwater Sampling**

JSA Number: **JSA008-01**

A Job Safety Analysis (JSA) must identify all job steps required to complete the task, the potential hazards employees could be exposed to while performing the job step and the preventative/corrective actions required to reduce/mitigate the identified potential hazards. Employees must certify that they have either prepared the JSA or have reviewed the JSA and are aware of the potential hazards associated with this task and will follow the provided preventive/corrective actions.

PERSONAL PROTECTIVE EQUIPMENT (Required or to be worn as needed):				
☒ Safety Shoes	☒ Long Sleeves	☒ Safety Vest (Class 2)	☒ Hard Hat	☒ Hearing Protection
☒ Safety Glasses	☐ Safety Goggles	☐ Face Shield	☒ Nitrile Gloves	☐ PVC Gloves
☒ Leather Gloves	☐ Cut Resist. Gloves	☒ Fall Protection	☐ Fire Resistant Clothing	☐ Rubber Boots
☐ Insect/Animal Repellent	☐ Ivy Blocker/Cleaner	☐ Traffic Cones/Signs	☐ Life Vest/Jacket	
☒ Other: Tyvek sleeves, Dermal Protection, PID				

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
12. Transport equipment to work area	1. Back Strain 2. Slips/ Trips/ Falls 3. Traffic 4. Cuts/abrasions from equipment 5. Contusions from dropped equipment	1. Use proper lifting techniques / Use wheeled transport 2. Minimize distance to work area / Have unobstructed path to work area / Follow good housekeeping procedures 3. Wear proper PPE (high visibility vest or clothing) 4. Wear proper PPE (leather gloves, long sleeves) 5. Wear proper PPE (safety shoes)
13. Remove well cover	3. Scrape knuckles/hand 4. Strain wrist/bruise palm 5. Pinch fingers or hand	1. Wear proper PPE (leather gloves) 2. Using a hammer, tap the end of the wrench to loosen grip of bolts 3. Wear proper PPE (leather gloves)
14. Remove well cap and lock	2. Well can pops from pressure 3. Exposure to hazardous substances through inhalation or dermal exposure 4. Scrape knuckles/hand 5. Strain write/bruise palm	1. Remove cap slowly to relieve pressure / Do not place face over well when opening / Wear proper PPE (safety glasses) 2. Use direct air monitoring/reading instrument (i.e. PID) / Be familiar with and follow actions prescribed in the HASP / Wear proper PPE (nitrile gloves) 3. Wear proper PPE (leather gloves) 4. Using hammer, tap the end of the wrench to loosen grip
15. Measure head-space vapor levels	1. Exposure to hazardous substances through inhalation	1. Do not place face over well when collecting measurement
16. Remove dedicated tubing (if necessary)	1. Exposure to hazardous substances through inhalation or dermal exposure 2. Tubing swings around after removal	1. Wear proper PPE (nitrile gloves, Tyvek sleeves) 2. Wear proper PPE (safety glasses)
17. Set-up plastic sheeting for work site around the well	1. Lacerations when cutting plastic sheeting	1. Use scissors to cut plastic sheeting / Cut motions should always be away from body and body parts
18. Measure depth to water	1. Exposure to hazardous substances through inhalation or dermal exposure 2. Pinch fingers or hand in water level instrument	1. Wear proper PPE (nitrile gloves) 2. Wear proper PPE (leather gloves)
19. Calibrate monitoring	1. Skin or eye contact with calibration chemicals	1. Wear proper PPE (safety glasses, nitrile gloves)

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
equipment	2. Pinch fingers or hand in monitoring equipment	2. Wear proper PPE (leather gloves) / Avoid pinch points
20. Install sampling pump in well	1. Hand injuries during installation of pump 2. Lacerations when cutting tubing 3. Back strain during installation of pump 4. Physical hazards associated with manual lifting of heavy equipment 5. Back strain from starting generator 6. Burns from hot exhaust from generator 7. Electrical shock from improper use of generator and pump 8. Contaminated water spray from loose connections	1. Wear proper PPE (leather gloves, nitrile gloves) 2. Use safety tubing cutter 3. Use proper lifting techniques 4. Use proper lifting techniques / Use wheeled transport for heavy equipment 5. Use arm when starting generator / Do not over-strain if generator does not start 6. Do not touch generator near exhaust / Use proper handle to carry / Allow generator to cool down before moving 7. Properly plug in pump to generator / Do not allow the pump or generator to contact water / Check for breaks in the cord 8. Check all tubing connections to ensure they are tight and secure
10. Purge water	1. Contact with potentially contaminated groundwater 2. Back strain from lifting buckets of water 3. Tripping potential on sample discharge lines and pump electric line	1. Wear proper PPE (safety glasses, nitrile gloves) 2. Use proper lifting techniques / Use wheeled transport 3. Organize discharge of electric line to keep out of way as much as possible / Mark potential tripping hazards with caution tape or safety cones
11. Sample water collection	1. Contact with potentially contaminated groundwater through dermal exposure 2. Contact with and burns from acid used for sample preservation 3. Tripping potential on sample discharge lines and pump electric line 4. Lacerations from broken sample bottles 5. Back strain when transporting coolers full of collected samples 6. Slips/ Trips/ Falls	1. Wear proper PPE (safety glasses, nitrile gloves) 2. Wear proper PPE (safety glasses, nitrile gloves) / Ensure sample bottle lids are secure before use and after sample collection 3. Organize line to keep out of the way as much as possible / Mark potential tripping hazards with caution tape or safety cones 4. Do not over-tighten bottle caps / Handle bottles safely to prevent breakage / Wrap glass bottles in bubble wrap, if possible 5. Use proper lifting techniques / Use wheeled transport / Seek assistance if coolers weight exceeds 50lbs. / Minimize distance to vehicle 6. Have unobstructed path to vehicle or collection point / Follow good housekeeping procedures / Do not lift/walk with coolers that are too heavy/difficult to lift
12. Remove pump and pack up equipment	1. Back strain when removing pump or lifting heavy equipment	1. Use proper lifting technique / Use wheeled transport for heavy equipment
13. Replace well cap and lock	1. Scrape fingers/hand 2. Strain wrist/bruise palm	1. Wear proper PPE (leather gloves) 2. Using hammer, tap the end of the well cap to tighten grip
14. Replace well cover	1. Scrape knuckles/hand 2. Strain write/bruise palm 3. Pinch fingers or hand	1. Wear proper PPE (leather gloves) 2. Using hammer, tap the end of the wrench to tighten the grip of the bolts 3. Wear proper PPE (leather gloves)
15. Transport drums to disposal staging location	1. Back, arm or shoulder strain from moving drums 2. Pinch hazard 3. Contact with potentially contaminated groundwater when moving improperly sealed drums 4. Slips/ Trips/ Falls when moving drum 5. Drop drum on feet/toes	1. Use drum cart for moving drums / Use proper lifting techniques / Obtain assistance, if needed 2. Wear proper PPE (leather gloves) 3. Wear proper PPE (nitrile gloves under leather gloves) / Properly seal drum to prevent leak 4. Ensure route to move drum to storage space is dry and free from obstructions 5. Wear proper PPE (safety shoes)
16. Place used PPE in	1. Pressure build-up inside drum	1. Remove cap from bung hole in drum to relieve pressure

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
designated disposal drum	2. Pinch hazard	2. Wear proper PPE (leather gloves)
17. Decontaminate equipment	1. Splashing water/soap from decontamination 2. Contact with potentially contaminated groundwater through dermal exposure 3. Electrical shock from broken electric cords	1. Wear proper PPE (safety glasses) 2. Wear proper PPE (safety glasses, dermal protection) 3. Properly plug in pump to generator / Do not allow the pump or generator to contact water / Check for breaks in the cord
18. All activities	15. Slips/ Trips/ Falls 16. Hand injuries, cuts or lacerations during manual handling of materials 17. Foot injuries 18. Back injuries 19. Traffic 20. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.) 21. High Noise levels 22. Overhead hazards 23. Heat Stress/ Cold Stress 24. Eye Injuries	23. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards 24. Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery or dirty objects before handling / Wear leather/ cut-resistant gloves 25. Wear Langan approved safety shoes 26. Use proper lifting techniques / Consider load location, task repetition, and load weigh when evaluating what is safe or unsafe to lift / Obtain assistance when possible 27. Wear high visibility clothing & vest / Use cones or signs to designate work area 28. Be aware of surroundings at all times, including the presence of wildlife/ Do not approach stray dogs / Carry/use dog/animal repellant / Use bug spray when needed 29. Wear hearing protection 30. Wear hard hat / Avoid areas were overhead hazards exist. 31. Wear proper attire for weather conditions (sunscreen or protective clothing in sunlight, layers for cold weather) / Drink plenty of fluids to avoid dehydration / Takes breaks as necessary to avoid heat/cold stress 32. Wear safety glasses
Additional items.		
Additional Items identified while in the field. (Delete row if not needed.)		

Print Name	**Sign Name**	**Date**

Prepared by:		
Reviewed by:		

LANGAN	**Job Safety Analysis (JSA)** **Health and Safety**

JSA Title: **Field Sampling**

JSA Number: **JSA022-01**

A Job Safety Analysis (JSA) must identify all job steps required to complete the task, the potential hazards employees could be exposed to while performing the job step and the preventative/corrective actions required to reduce/mitigate the identified potential hazards. Employees must certify that they have either prepared the JSA or have reviewed the JSA and are aware of the potential hazards associated with this task and will follow the provided preventive/corrective actions.

PERSONAL PROTECTIVE EQUIPMENT (Required or to be worn as needed):

☒ Safety Shoes	☒ Long Sleeves	☐ Safety Vest (Class 2)	☒ Hard Hat	☒ Hearing Protection
☒ Safety Glasses	☐ Safety Goggles	☐ Face Shield	☒ Nitrile Gloves	☐ PVC Gloves
☒ Leather Gloves	☐ Cut Resist. Gloves	☐ Fall Protection	☐ Fire Resistant Clothing	☐ Rubber Boots
☐ Insect/Animal Repellent	☐ Ivy Blocker/Cleaner	☒ Traffic Cones/Signs	☐ Life Vest/Jacket	
☐ Other:				

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
21.Unpack/Transport equipment to work area.	11.Back Strains 12.Slip/Trips/Falls 13.Cuts/Abrasions from equipment 14.Contusions from dropped equipment	11. Use proper lifting techniques/Use wheeled transport 12. Minimize distance to work area/Unobstructed path to work area/follow good housekeeping procedures. Mark slip/trip/fall hazards with orange safety cones. 13. Wear proper PPE (leather gloves, long sleeves). 14. Wear proper PPE (Langan approved safety shoes).
22.Initial Site Arrival-Site Assessment	6. Traffic	3. Situational awareness (be alert of your surroundings). Secure area from through traffic.
23.Surface Water Sampling	6. Contaminated media. Skin/eye contact with biological agents and/or chemicals.	2. Wear appropriate PPE (Safety glasses, appropriate gloves). Review (M)SDS for all chemicals being.
24.Sampling from bridges	3. Struck by vehicles	6. Wear appropriate PPE (Safety Vest). Use buddy system and orange safety cones.
25. Icing of Samples/ Transporting coolers/equipment from work area.	25. Back Strains 26. Slips/Trips/Falls 27. Cuts/Abrasions from equipment 28. Pinch/Crushing Hazards.	33. Drain coolers of water. Use proper lifting techniques. Use wheeled transport. 34. Have unobstructed path from work area. Aware of surroundings. 35. Wear proper PPE (Leather gloves, long sleeves) 36. Wear proper PPE (Leather gloves, long sleeves)
26. Site Departure	1. Contaminated PPE/Vehicle	1. Contaminated PPE should be disposed of on-site. Remove boots and soiled clothing for secure storage in trunk. Wash hands promptly.
27. All activities	1. Slips/ Trips/ Falls 2. Hand injuries, cuts or lacerations during manual handling of materials 3. Foot injuries 4. Back injuries 29. Traffic	1. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards 2. Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery or dirty objects before handling / Wear leather/ cut-resistant gloves 3. Wear Langan approved safety shoes

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
	30. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.) 31. High Noise levels 32. Overhead hazards 33. Heat Stress/ Cold Stress 34. Eye Injuries	4. Use proper lifting techniques / Consider load location, task repetition, and load weigh when evaluating what is safe or unsafe to lift / Obtain assistance when possible 37. Wear high visibility clothing & vest / Use cones or signs to designate work area 38. Be aware of surroundings at all times, including the presence of wildlife/ Do not approach stray dogs / Carry/use dog/animal repellant / Use bug spray when needed 39. Wear hearing protection 40. Wear hard hat / Avoid areas were overhead hazards exist. 41. Wear proper attire for weather conditions (sunscreen or protective clothing in sunlight, layers for cold weather) / Drink plenty of fluids to avoid dehydration / Takes breaks as necessary to avoid heat/cold stress 42. Wear safety glasses
Additional items.		
Additional Items identified while in the field. (Delete row if not needed.)		

Print Name	Sign Name	Date
Prepared by:		
Reviewed by:		

LANGAN	Job Safety Analysis (JSA) Health and Safety

JSA Title: **Building Construction Oversight**

JSA Number: **JSA006-01**

A Job Safety Analysis (JSA) must identify all job steps required to complete the task, the potential hazards employees could be exposed to while performing the job step and the preventative/corrective actions required to reduce/mitigate the identified potential hazards. Employees must certify that they have either prepared the JSA or have reviewed the JSA and are aware of the potential hazards associated with this task and will follow the provided preventive/corrective actions.

PERSONAL PROTECTIVE EQUIPMENT (Required or to be worn as needed):				
☒ Safety Shoes	☒ Long Sleeves	☒ Safety Vest (Class 2)	☒ Hard Hat	☒ Hearing Protection
☒ Safety Glasses	☐ Safety Goggles	☒ Face Shield	☒ Nitrile Gloves	☐ PVC Gloves
☒ Leather Gloves	☐ Cut Resist. Gloves	☐ Fall Protection	☐ Fire Resistant Clothing	☐ Rubber Boots
☐ Insect/Animal Repellent	☐ Ivy Blocker/Cleaner	☒ Traffic Cones/Signs	☐ Life Vest/Jacket	
☐ Other:				

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
28. Transport equipment to work area	15. Back Strain 16. Slips/ Trips/ Falls 17. Traffic 18. Cuts/abrasions from equipment 19. Contusions from dropped equipment	1. Use proper lifting techniques / Use wheeled transport 2. Minimize distance to work area / Have unobstructed path to work area / Follow good housekeeping procedures 3. Wear proper PPE (high visibility vest or clothing) 4. Wear proper PPE (leather gloves, long sleeves) 5. Wear proper PPE (safety shoes)
29. Drilling/anchor bolt installation	7. Hazards associated with drilling, flying objects, heavy equipment, ground level hazards and dust 8. Slips/ Trips/ Falls 9. Hazards associated with concrete work	4. Maintain a safe distance from drilling operation / Wear proper PPE (hard hat, safety glasses, safety shoes, safety vest) 5. Be aware of potential trip hazards / Follow good housekeeping procedures / Mark significant below-grade hazards (i.e. holes, trenches) with safety cones or spray paint / Wear the proper PPE (safety shoes) 6. Maintain a safe distance from pouring operation
30. Steel building erection	7. Overhead hazards, falling objects 8. Pinching/crushing hazards	5. Wear proper PPE (hard had, safety glasses, safety vest) / Be aware of overhead hazards and maintain a safe distance of at least 10 ft. 6. All personnel should make others aware of moving objects or their inten to move objects / Avoid areas where pinching and crushing hazards are possible
31. All activities	35. Slips/ Trips/ Falls 36. Hand injuries, cuts or lacerations during manual handling of materials 37. Foot injuries 38. Back injuries 39. Traffic 40. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.) 41. High Noise levels 42. Overhead hazards	43. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards 44. Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery or dirty objects before handling / Wear leather/ cut-resistant gloves 45. Wear Langan approved safety shoes 46. Use proper lifting techniques / Consider load location, task repetition, and load weigh when evaluating what is safe or unsafe to lift / Obtain assistance when possible 47. Wear high visibility clothing & vest / Use cones or signs to designate work

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
4. All activities (cont'd)	43. Heat Stress/ Cold Stress 44. Eye Injuries	area 48. Be aware of surroundings at all times, including the presence of wildlife/ Do not approach stray dogs / Carry/use dog/animal repellant / Use bug spray when needed 49. Wear hearing protection 50. Wear hard hat / Avoid areas were overhead hazards exist. 51. Wear proper attire for weather conditions (sunscreen or protective clothing in sunlight, layers for cold weather) / Drink plenty of fluids to avoid dehydration / Takes breaks as necessary to avoid heat/cold stress 52. Wear safety glasses
Additional items.		
Additional Items identified while in the field. (Delete row if not needed.)		

Print Name	**Sign Name**	**Date**
Prepared by:		
Reviewed by:		

LANGAN	Job Safety Analysis (JSA) Health and Safety

JSA Title: **Equipment Transportation and Set-Up**

JSA Number: **JSA012-01**

A Job Safety Analysis (JSA) must identify all job steps required to complete the task, the potential hazards employees could be exposed to while performing the job step and the preventative/corrective actions required to reduce/mitigate the identified potential hazards. Employees must certify that they have either prepared the JSA or have reviewed the JSA and are aware of the potential hazards associated with this task and will follow the provided preventive/corrective actions.

PERSONAL PROTECTIVE EQUIPMENT (Required or to be worn as needed):				
☒ Safety Shoes	☒ Long Sleeves	☒ Safety Vest (Class 2)	☒ Hard Hat	☒ Hearing Protection
☒ Safety Glasses	☐ Safety Goggles	☐ Face Shield	☐ Nitrile Gloves	☐ PVC Gloves
☒ Leather Gloves	☐ Cut Resist. Gloves	☐ Fall Protection	☐ Fire Resistant Clothing	☐ Rubber Boots
☐ Insect/Animal Repellent	☐ Ivy Blocker/Cleaner	☐ Traffic Cones/Signs	☐ Life Vest/Jacket	
☐ Other:				

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
32. Transport equipment to work area	20. Back Strain 21. Slips/ Trips/ Falls 22. Traffic 23. Cuts/abrasions from equipment 24. Contusions from dropped equipment	6. Use proper lifting techniques / Use wheeled transport 7. Minimize distance to work area / Have unobstructed path to work area / Follow good housekeeping procedures 8. Wear proper PPE (high visibility vest or clothing) 9. Wear proper PPE (leather gloves, long sleeves) 10. Wear proper PPE (safety shoes)
33. Moving equipment to its planned location	10. Pinch Hazard 11. Slips/ Trips/ Falls	7. Wear proper PPE (leather gloves) 8. Be aware of potential trip hazards / Practice good housekeeping procedures / Mark significant below-grade hazards (i.e. holes, trenches) with safety cones or spray paint
34. Equipment Set-up	9. Pinch Hazard 10. Cuts/abrasions to knuckles/hands 11. Back Strain	7. Wear proper PPE (leather gloves) 8. Wear proper PPE (leather gloves) 9. Use proper lifting techniques / Use wheeled transport
35. All activities	45. Slips/ Trips/ Falls 46. Hand injuries, cuts or lacerations during manual handling of materials 47. Foot injuries 48. Back injuries 49. Traffic 50. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.) 51. High Noise levels 52. Overhead hazards 53. Heat Stress/ Cold Stress 54. Eye Injuries	53. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards 54. Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery or dirty objects before handling / Wear leather/ cut-resistant gloves 55. Wear Langan approved safety shoes 56. Use proper lifting techniques / Consider load location, task repetition, and load weigh when evaluating what is safe or unsafe to lift / Obtain assistance when possible 57. Wear high visibility clothing & vest / Use cones or signs to designate work area 58. Be aware of surroundings at all times, including the presence of wildlife/

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
10. All activities (cont'd)		Do not approach stray dogs / Carry/use dog/animal repellant / Use bug spray when needed 59. Wear hearing protection 60. Wear hard hat / Avoid areas were overhead hazards exist. 61. Wear proper attire for weather conditions (sunscreen or protective clothing in sunlight, layers for cold weather) / Drink plenty of fluids to avoid dehydration / Takes breaks as necessary to avoid heat/cold stress 62. Wear safety glasses
Additional items.		
Additional Items identified while in the field. (Delete row if not needed.)		

Print Name	Sign Name	Date
Prepared by:		
Reviewed by:		

LANGAN	**Job Safety Analysis (JSA)** **Health and Safety**

JSA Title: **General Construction Activities**

JSA Number: **JSA010-01**

A Job Safety Analysis (JSA) must identify all job steps required to complete the task, the potential hazards employees could be exposed to while performing the job step and the preventative/corrective actions required to reduce/mitigate the identified potential hazards. Employees must certify that they have either prepared the JSA or have reviewed the JSA and are aware of the potential hazards associated with this task and will follow the provided preventive/corrective actions.

PERSONAL PROTECTIVE EQUIPMENT (Required or to be worn as needed):				
☒ Safety Shoes	☒ Long Sleeves	☒ Safety Vest (Class 2)	☒ Hard Hat	☒ Hearing Protection
☒ Safety Glasses	☐ Safety Goggles	☒ Face Shield	☒ Nitrile Gloves	☐ PVC Gloves
☒ Leather Gloves	☐ Cut Resist. Gloves	☐ Fall Protection	☐ Fire Resistant Clothing	☐ Rubber Boots
☐ Insect/Animal Repellent	☐ Ivy Blocker/Cleaner	☒ Traffic Cones/Signs	☐ Life Vest/Jacket	
☐ Other:				

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
36.Transport equipment to work area	25.Back Strain 26.Slips/ Trips/ Falls 27.Traffic 28.Cuts/abrasions from equipment 29.Contusions from dropped equipment	11. Use proper lifting techniques / Use wheeled transport 12. Minimize distance to work area / Have unobstructed path to work area / Follow good housekeeping procedures 13. Wear proper PPE (high visibility vest or clothing) 14. Wear proper PPE (leather gloves, long sleeves) 15. Wear proper PPE (safety shoes)
37.Installation of piping from vapor wells to skid connections and from discharge pipping to effluent stack	12. Pinch fingers when connecting pipes 13.Slips/ Trips/ Falls 14.Machinery Hazards	9. Wear proper PPE (leather gloves) 10. Be aware of potential trip hazards / Practice good housekeeping procedures / Mark significant below-grade hazards (i.e. holes, trenches) with safety cones or spray paint 11. Wear proper PPE (safety vest) / Maintain safe distance from operating machinery
38.Remediation equipment installation	12. Back strain when lifting heavy equipment 13. Slips/ Trips/ Falls 14. Traffic	11. Use proper lifting techniques / Use wheeled transport / Minimize distance to vehicle 12. Be aware of potential trip hazards / Practice good housekeeping procedures / Mark significant below-grade hazards (i.e. holes, trenches) with safety cones or spray pain 13. Wear proper PPE (safety vest)
39. All activities	55. Slips/ Trips/ Falls 56. Hand injuries, cuts or lacerations during manual handling of materials 57. Foot injuries 58. Back injuries 59. Traffic 60. Wildlife: Stray dogs, Mice/rats, Vectors (i.e.	63. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards 64. Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery or dirty objects before handling / Wear leather/ cut-resistant gloves 65. Wear Langan approved safety shoes 66. Use proper lifting techniques / Consider load location, task repetition, and

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
4. All activities (cont'd)	mosquitoes, bees, etc.) 61. High Noise levels 62. Overhead hazards 63. Heat Stress/ Cold Stress 64. Eye Injuries	load weigh when evaluating what is safe or unsafe to lift / Obtain assistance when possible 67. Wear high visibility clothing & vest / Use cones or signs to designate work area 68. Be aware of surroundings at all times, including the presence of wildlife/ Do not approach stray dogs / Carry/use dog/animal repellant / Use bug spray when needed 69. Wear hearing protection 70. Wear hard hat / Avoid areas were overhead hazards exist. 71. Wear proper attire for weather conditions (sunscreen or protective clothing in sunlight, layers for cold weather) / Drink plenty of fluids to avoid dehydration / Takes breaks as necessary to avoid heat/cold stress 72. Wear safety glasses
Additional items.		
Additional Items identified while in the field. (Delete row if not needed.)		

Print Name	**Sign Name**	**Date**
Prepared by:		
Reviewed by:		

LANGAN	**Job Safety Analysis (JSA)** **Health and Safety**

JSA Title: Excavation Oversight

JSA Number: JSA041-01

A Job Safety Analysis (JSA) must identify all job steps required to complete the task, the potential hazards employees could be exposed to while performing the job step and the preventative/corrective actions required to reduce/mitigate the identified potential hazards. Employees must certify that they have either prepared the JSA or have reviewed the JSA and are aware of the potential hazards associated with this task and will follow the provided preventive/corrective actions.

PERSONAL PROTECTIVE EQUIPMENT (Required or to be worn as needed):				
☒ Safety Shoes	☒ Long Sleeves	☒ Safety Vest (Class 2)	☒ Hard Hat	☒ Hearing Protection
☒ Safety Glasses	☐ Safety Goggles	☐ Face Shield	☒ Nitrile Gloves	☐ PVC Gloves
☒ Leather Gloves	☒ Cut Resist. Gloves	☐ Fall Protection	☐ Fire Resistant Clothing	☐ Rubber Boots
☐ Insect/Animal Repellent	☐ Ivy Blocker/Cleaner	☐ Traffic Cones/Signs	☐ Life Vest/Jacket	
☐ Other:				

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
40. Transport equipment to work area	30. Back Strain 31. Slips/Trips/Falls 32. Traffic 33. Cuts/abrasions/contusions from equipment	15. Use proper lifting techniques / Use wheeled transport 16. Minimize distance to work area / Have unobstructed path to work area / Follow good housekeeping procedures 17. Wear proper PPE (high visibility vest or clothing) 18. Wear proper PPE (leather gloves, long sleeves, safety shoes)
41.Earth Moving Equipment	15. Equipment running over employee	4. Ensure you have direct line of sight with operator of equipment; don't walk behind equipment; maintain a safe distance away from equipment. 5. Wear proper PPE (high vis vest/clothing)
42.Excavation	15. Excavation collapse 16. Confined space 17. Soil	3. Use proper shoring/benching/sloping techniques; Ladder is properly situated in excavation; no water in excavation; competent person has inspected excavation prior to allow employees to enter. 4. Langan employees are not authorized to enter a confined space; 5. Soil and equipment is kept at least 2 feet from edge of excavation
43.Excavated soil	1. Hazardous substances	1. Use proper equipment to monitor excavated soil for contaminates; ensure levels do not exceed PEL's for contaminates; Wear proper PPE
44. All activities	65. Slips/ Trips/ Falls 66. Hand injuries, cuts or lacerations during manual handling of materials 67. Foot injuries 68. Back injuries 69. Traffic 70. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.) 71. High Noise levels 72. Overhead hazards 73. Heat Stress/ Cold Stress 74. Eye Injuries	73. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards 74. Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery or dirty objects before handling / Wear leather/ cut-resistant gloves 75. Wear proper PPE (Langan approved safety shoes) 76. Use proper lifting techniques / Consider load location, task repetition, and load weigh when evaluating what is safe or unsafe to lift / Obtain assistance when possible 77. Wear high visibility clothing & vest / Use cones or signs to designate work area 78. Be aware of surroundings at all times, including the presence of wildlife/

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
		Do not approach stray dogs / Carry/use dog/animal repellant / Use bug spray when needed 79. Wear hearing protection 80. Wear hard hat / Avoid areas were overhead hazards exist. 81. Wear proper attire for weather conditions (sunscreen or protective clothing in sunlight, layers for cold weather) / Drink plenty of fluids to avoid dehydration / Takes breaks as necessary to avoid heat/cold stress 82. Wear safety glasses
Additional items.		
Additional Items identified while in the field. (Delete row if not needed.)		

Print Name	**Sign Name**	**Date**
Prepared by:		
Reviewed by:		

LANGAN	Job Safety Analysis (JSA) Health and Safety

JSA Title: Site Inspection

JSA Number: JSA024-01

A Job Safety Analysis (JSA) must identify all job steps required to complete the task, the potential hazards employees could be exposed to while performing the job step and the preventative/corrective actions required to reduce/mitigate the identified potential hazards. Employees must certify that they have either prepared the JSA or have reviewed the JSA and are aware of the potential hazards associated with this task and will follow the provided preventive/corrective actions.

PERSONAL PROTECTIVE EQUIPMENT (Required or to be worn as needed):				
☒ Safety Shoes	☒ Long Sleeves	☒ Safety Vest (Class 2)	☒ Hard Hat	☒ Hearing Protection
☒ Safety Glasses	☐ Safety Goggles	☐ Face Shield	☒ Nitrile Gloves	☐ PVC Gloves
☒ Leather Gloves	☐ Cut Resist. Gloves	☐ Fall Protection	☐ Fire Resistant Clothing	☒ Rubber Boots
☒ Insect/Animal Repellent	☐ Ivy Blocker/Cleaner	☒ Traffic Cones/Signs	☐ Life Vest/Jacket	
☐ Other:				

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
45.Jobsite Pre-briefing	34.None	19. Review JSA, SOP's, and discuss hazards that may be present and control measures for present hazards while on-site.
2. Working near railroads	1. Passing Trains. 2. Slip/Trips/Falls.	1. Wear reflective vest/ Stay away from tracks/ Do not cross tracks within 10 ft. of train car or when there is a train within view/listen for train horn. 2. Be aware of tripping hazards/ Follow good housekeeping procedures/ Mark significant hazards with spray paint or cones.
3. Walking around site	4. Uneven terrain 5. Wildlife: Stray animals, mice/rats, vectors (i.e. mosquitoes, bees, etc.) 6. Weather: Heat/cold stress 7. Slip/Trips/Falls 8. Foot injuries 9. Eye injuries	7. Pay attention to surrounding area (puddles, wet, frozen, uneven areas); Mark with cones or spray paint. 8. Use bug spray/ Avoid stray animals/Use repellant when needed. 9. Dress for the correct weather situation/ Use sunscreen or protective clothing in sunlight, layers in cold weather/ Drink plenty of fluids/ Take breaks when needed. 4. Be aware of tripping hazards/ Follow good housekeeping procedures/ Mark significant hazards with spray paint or cones. 5. Wear proper PPE (Langan approved safety shoes)/ Change wet socks during cold weather. 6. Wear proper PPE (safety glasses/goggles).
4. Working near road	1. Passing vehicles 2. Slip/Trips/Falls	1. Wear reflective vest/ Stay away from roadway/ Use buddy system/ Place signage or cones when needed. 2. Be aware of tripping hazards/ Follow good housekeeping procedures/ Mark significant hazards with spray paint or cones.
5. All activities	75. Slips/ Trips/ Falls 76. Hand injuries, cuts or lacerations during manual handling of materials 77. Foot injuries 78. Back injuries	83. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards 84. Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery or dirty objects before handling / Wear leather/ cut-resistant gloves

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
	79. Traffic 80. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.) 81. High Noise levels 82. Overhead hazards 83. Heat Stress/ Cold Stress 84. Eye Injuries	85. Wear Langan approved safety shoes 86. Use proper lifting techniques / Consider load location, task repetition, and load weigh when evaluating what is safe or unsafe to lift / Obtain assistance when possible 87. Wear high visibility clothing & vest / Use cones or signs to designate work area 88. Be aware of surroundings at all times, including the presence of wildlife/ Do not approach stray dogs / Carry/use dog/animal repellant / Use bug spray when needed 89. Wear hearing protection 90. Wear hard hat / Avoid areas were overhead hazards exist. 91. Wear proper attire for weather conditions (sunscreen or protective clothing in sunlight, layers for cold weather) / Drink plenty of fluids to avoid dehydration / Takes breaks as necessary to avoid heat/cold stress 92. Wear safety glasses
Additional items.		
Additional Items identified while in the field. (Delete row if not needed.)		

Print Name	Sign Name	Date
Prepared by:		
Reviewed by:		

LANGAN	Job Safety Analysis (JSA) Health and Safety

JSA Title: **55-gallon Drum Sampling**

JSA Number: **JSA043-01**

A Job Safety Analysis (JSA) must identify all job steps required to complete the task, the potential hazards employees could be exposed to while performing the job step and the preventative/corrective actions required to reduce/mitigate the identified potential hazards. Employees must certify that they have either prepared the JSA or have reviewed the JSA and are aware of the potential hazards associated with this task and will follow the provided preventive/corrective actions.

PERSONAL PROTECTIVE EQUIPMENT (Required or to be worn as needed):

☒ Safety Shoes	☒ Long Sleeves	☒ Safety Vest (Class 2)	☒ Hard Hat	☐ Hearing Protection
☒ Safety Glasses	☒ Safety Goggles	☒ Face Shield	☒ Nitrile Gloves	☒ PVC Gloves
☒ Leather Gloves	☐ Cut Resist. Gloves	☐ Fall Protection	☐ Fire Resistant Clothing	☐ Rubber Boots
☐ Insect/Animal Repellent	☐ Ivy Blocker/Cleaner	☐ Traffic Cones/Signs	☐ Life Vest/Jacket	

☒ Other: All Drums are required to be labeled. Langan employees do not open or move undocumented drums or unlabeled drums without proper project manager authorization.

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
46. Unpack/Transport equipment to work area.	35. Back Strains 36. Slip/Trips/Falls 37. Cuts/Abrasions from equipment 4. Contusions from dropped equipment	20. Use proper lifting techniques/Use wheeled transport 21. Minimize distance to work area/Unobstructed path to work area/follow good housekeeping procedures. Mark slip/trip/fall hazards with orange safety cones. 22. Wear proper PPE (leather gloves, long sleeves). 4. Wear proper PPE (Langan approved safety shoes).
47. Open Drums	1. Hand Injuries, cuts or lacerations when untightening drum locking bolt, removing drum lid strap, or removing lid. 2. Pressure from drums.	1. Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery or dirty objects before handling / Wear leather/ cut-resistant gloves. Use non-metallic mallet and non-sparking tools/wrenches. 2. Open drum slowly to relieve pressure. Wear proper PPE: face shield and goggles; correct gloves; and over garments.
48. Collecting Soil/Fluid Sample	16. Irritation to eye from vapor, soil dust, or splashing 17. Irritation to exposed skin	6. Wear proper eye protection including safety glasses/ face shield/googles and when necessary, splash guard. If dust or vapor phase is present, wear appropriate safety breathing gear (1/2 mask or full face mask with correct filter) 7. Wear proper skin protection including nitrile gloves.
49. Closing Drums	1. Hand Injuries, cuts or lacerations when untightening drum locking bolt, removing drum lid strap, or removing lid.	6. Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery or dirty objects before handling / Wear leather/ cut-resistant gloves. Use non-metallic mallet and non-sparking tools/wrenches.
50. Moving Drums	10. Hand Injuries, cuts or lacerations when untightening drum locking bolt, removing drum lid strap, or removing lid. 11. Back Strains	10. Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery or dirty objects before handling / Wear leather/ cut-resistant gloves. Use non-metallic mallet and non-sparking tools/wrenches. 11. Use proper lifting techniques/Use wheeled transport

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
51. All activities	85. Slips/ Trips/ Falls 86. Hand injuries, cuts or lacerations during manual handling of materials 87. Foot injuries 88. Back injuries 89. Traffic 90. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.) 91. High Noise levels 92. Overhead hazards 93. Heat Stress/ Cold Stress 94. Eye Injuries	93. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards 94. Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery or dirty objects before handling / Wear leather/ cut-resistant gloves 95. Wear Langan approved safety shoes 96. Use proper lifting techniques / Consider load location, task repetition, and load weigh when evaluating what is safe or unsafe to lift / Obtain assistance when possible 97. Wear high visibility clothing & vest / Use cones or signs to designate work area 98. Be aware of surroundings at all times, including the presence of wildlife/ Do not approach stray dogs / Carry/use dog/animal repellant / Use bug spray when needed 99. Wear hearing protection 100. Wear hard hat / Avoid areas were overhead hazards exist. 101. Wear proper attire for weather conditions (sunscreen or protective clothing in sunlight, layers for cold weather) / Drink plenty of fluids to avoid dehydration / Takes breaks as necessary to avoid heat/cold stress 102. Wear safety glasses
Additional items.		
Additional Items identified while in the field. (Delete row if not needed.)		

Print Name	Sign Name	Date
Prepared by:		
Reviewed by:		

LANGAN

Job Safety Analysis (JSA)
Health and Safety

JSA Title: **ISCO Remediation Oversight**

JSA Number: **JSA038-01**

A Job Safety Analysis (JSA) must identify all job steps required to complete the task, the potential hazards employees could be exposed to while performing the job step and the preventative/corrective actions required to reduce/mitigate the identified potential hazards. Employees must certify that they have either prepared the JSA or have reviewed the JSA and are aware of the potential hazards associated with this task and will follow the provided preventive/corrective actions.

PERSONAL PROTECTIVE EQUIPMENT (Required or to be worn as needed):				
☒ Safety Shoes	☐ Long Sleeves	☐ Safety Vest (Class 2)	☒ Hard Hat	☒ Hearing Protection
☒ Safety Glasses	☒ Safety Goggles	☐ Face Shield	☒ Nitrile Gloves	☐ PVC Gloves
☐ Leather Gloves	☐ Cut Resist. Gloves	☐ Fall Protection	☐ Fire Resistant Clothing	☐ Rubber Boots
☐ Insect/Animal Repellent	☐ Ivy Blocker/Cleaner	☐ Traffic Cones/Signs	☐ Life Vest/Jacket	
☒ Other: As needed, full or half face, air purifying respirator, with NIOSH approved HEPA filter				

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
52. Mobilization/ Mobilization Oversight	38. Back strains 39. Slips/Trips/Falls 40. Traffic 41. Overturn of heavy equipment during unloading operations 42. Heavy Equipment Movement	23. Use proper lifting technique/ Get assistance as needed 24. Use proper lifting technique/ Get assistance as needed. Have unobstructed path to vehicle or collection point / Do not walk with boxes that are heavy/difficult to lift or create blind spots 25. Exercise caution/ Use buddy system 26. All unnecessary personnel should stay away from equipment being unloaded 27. All unnecessary personnel should stay clear of moving equipment
53. Excavation Oversight	18. Heavy Equipment Movement 19. Slips/Trips/Falls on Uneven terrain 20. Slope failure 21. Falling Objects (soil, tools, etc.)	8. All unnecessary personnel should stay clear of moving equipment 9. Be aware of potential tripping hazards/ Mark significant hazards 10. Contractor's competent person to determine need to sloping/benching/shoring measures 11. Wear proper PPE (safety shoes, hard hat, safety glasses)
54. ISCO Mixing Oversight	18. Heavy Equipment Movement 19. Splashing solutions/ soil-solution mixture 20. Falling Objects (soil, tools, etc.) 21. Vapors	7. All unnecessary personnel should stay clear of moving equipment 8. Wear proper PPE (safety glasses, Tyvek, nitrile gloves) 9. Wear proper PPE (safety glasses, hard hat, safety shoes) 10. Wear proper PPE, in accordance with the air monitoring plan
55. Performance Sampling/Monitoring	12. Contact with potentially contaminated or corrosive materials through dermal exposure	12. Wear proper PPE (safety glasses, nitrile gloves); Utilize trowels/shovels etc. for materials handling
56. All activities	95. Slips/ Trips/ Falls 96. Hand injuries, cuts or lacerations during manual handling of materials 97. Foot injuries 98. Back injuries 99. Traffic 100. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.)	103. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards 104. Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery or dirty objects before handling / Wear leather/ cut-resistant gloves 105. Wear Langan approved safety shoes 106. Use proper lifting techniques / Consider load location, task repetition, and load weigh when evaluating what is safe or unsafe to lift / Obtain

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
	101. High Noise levels 102. Overhead hazards 103. Heat Stress/ Cold Stress 104. Eye Injuries	assistance when possible 107. Wear high visibility clothing & vest / Use cones or signs to designate work area 108. Be aware of surroundings at all times, including the presence of wildlife/ Do not approach stray dogs / Carry/use dog/animal repellant / Use bug spray when needed 109. Wear hearing protection 110. Wear hard hat / Avoid areas were overhead hazards exist. 111. Wear proper attire for weather conditions (sunscreen or protective clothing in sunlight, layers for cold weather) / Drink plenty of fluids to avoid dehydration / Takes breaks as necessary to avoid heat/cold stress 112. Wear safety glasses
Additional items.		
Additional Items identified while in the field. (Delete row if not needed.)		

Print Name	Sign Name	Date
Prepared by:		
Reviewed by:		

ATTACHMENT H

TAILGATE SAFETY BRIEFING FORM

LANGAN TAILGATE SAFETY BRIEFING

Date:____________________________ Time: ____

Leader:_________________________________ Location:_____________________________________

Work Task: ____

SAFETY TOPICS (*provide some detail of discussion points*)

Chemical Exposure Hazards and Control:____
____

Physical Hazards and Control: ____

Air Monitoring: ____

PPE: ____
______

Communications:____

Safe Work Practices: ____
____

Emergency Response: ____

Hospital/Medical Center Location: ____

Phone Nos.: ____

Other: ____

FOR FOLLOW-UP (the issues, responsibilities, due dates, etc.)

____
____
____

ATTENDEES

PRINT NAME	COMPANY	SIGNATURE

APPENDIX F

COMMUNITY AIR MONITORING PLAN

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 G

QUALITY ASSURANCE PROJECT PLAN (QAPP)

QUALITY ASSURANCE PROJECT PLAN

for

43-30 24th Street
Long Island City, New York
NYSDEC BCP Site No. C241189

Prepared For:

CP VIII LIC Owner LLC
c/o Carmel Partners
510 Madison Ave, 8th Floor
New York, NY 10022

Prepared By:

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

December 2023
170362701

LANGAN

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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 CP VIII LIC Owner LLC (the "Volunteer"), for 43-30 24th Street ("the site") in Long Island City, New York. The site is enrolled in the New York State Brownfield Cleanup Program (BCP) as Site No. C241189. The Brownfield Cleanup Agreement (BCA), Index No. C241189-10-16, was initially executed by the New York State Department of Environmental Conservation (NYSDEC) and LICCD LLC, Long Island City Center LLC, and Long Island City Center II LLC (collectively, Stawski Partners) on December 8, 2016 for Queens Block 436, former Lot 1 and a part of former Lot 21. The BCA was subsequently amended on August 1, 2019 to reflect that former Lot 1 and a part of former Lot 21 were merged into the current Lot 1 configuration. On May 13, 2022, the BCA was again amended to reflect a real property transaction (which had occurred on March 16, 2022) to the sole new site owner, CP VIII LIC Owner, LLC, which was also substituted for Stawski Partners as the sole Volunteer. The site achieved a Track 2 Restricted-Residential cleanup and, after construction, will be improved with a 67-story residential and commercial building with a footprint area of about 56,500 square feet. This QAPP supports the Excavation Work Plan (EWP) included with the Site Management Plan (SMP), which provides additional site information and data collected previously by Langan.

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

1.2 Project Objectives

The Site Management Plan (SMP) includes an Excavation Work Plan (EWP) which covers soil sampling for import or reuse (if needed) at the Site. A Health and Safety Plan (HASP) and Community Air Monitoring Plan (CAMP) for the protection of on-site workers, the community, and the environment has been developed and will be implemented during any future remediation and sampling activities.

This QAPP addresses sampling and analytical methods that will be necessary in support of the SMP. 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 SMP and EWP. The SMP requires that if remaining contaminated material is to be disturbed, that all ground intrusive activities be completed in accordance with the EWP. According to the EWP, if any material is to be imported to or reused on site during ground intrusive activities, collection of soil samples for import or reuse is required.

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 objective is:

- To evaluate the quality of soil through the collection of soil 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 SMP and EWP will be overseen by Langan for CP VIII Owner LLC. If sampling is required per the EWP, 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 are not anticipated for implementation of the EWP; however, if they are required at a later date, they will be performed by approved data validation contractor(s).

For the required sampling as stated in the EWP, 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:

CP VIII Owner LLC	Colin McLean Telephone: (646) 237-4866
Langan Project Manager:	Jessica Friscia Telephone: (973) 560-4900
Langan Quality Assurance Officer (QAO):	Steve Ciambruschini Telephone: (973) 560-4900
Langan Remedial Engineer:	Jessica Friscia Telephone: (973) 560-4900
Program Quality Assurance Monitor:	Kaitlyn Gioia Telephone: (973) 560-4900
Data Validator:	Joseph Conboy Telephone: (215) 845-8985
Laboratory Representative:	York Analytical Laboratories, Inc. Phil Murphy Telephone: (203) 598-1371

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 NYSDEC Subpart 375-6 Soil Cleanup Objectives). 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 5.3.2.

5.0 SAMPLE COLLECTION AND FIELD DATA ACQUISITION PROCEDURES

Soil 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 were 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 boring logs, which will be used for geologic and drilling data during soil boring activities. Field data sheets will include the project-specific number and stored in the field project files when not in use. At the completion of the field activities, the field data sheets will be maintained 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 an 8 ounce high-density polyethylene (HDPE) container provided by the laboratory and analyzed by using USEPA Method 1633. The reporting limits for PFAS in soil are included in Attachment B. 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 PFAS Sampling Procedures

Soil sampling for PFAS analysis will be completed if such sampling is required per the SMP and EWP. 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. Acceptable materials for sampling include stainless steel, HDPE, PVC, silicone, acetate, and polypropylene. In general, PFAS-free pumps, tubing, interface probes, soil sampling equipment, and bottleware will be considered prior to the sampling event. It is not anticipated that groundwater samples will be collected for PFAS analysis; however, if required, 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.

When sampling for PFAS, no sampling equipment components or sample containers should come in to contact with aluminum foil, low density polyethylene, glass, or polytetrafluoroethylene (PTFE, Teflon™) materials including plumbers tape and sample bottle cap liners with a PTFE layer.

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 (PFBS), Perfluoropentanesulfonic acid (PFPeS), Perfluorohexanesulfonic acid (PFHxS), Perfluoroheptanesulfonic acid (PFHpS), Perfluorooctanesulfonic acid (PFOS), Perfluorononanesulfonic acid (PFNS), Perfluorodecanesulfonic acid (PFDS), Perfluorododecanesulfonic acid (PFDoS), Perfluorobutanoic acid (PFBA), Perfluoropentanoic acid (PFPeA), Perfluorohexanoic acid (PFHxA), Perfluoroheptanoic acid (PFHpA), Perfluorooctanoic acid (PFOA), Perfluorononanoic acid (PFNA), Perfluorodecanoic acid (PFDA), Perfluoroundecanoic acid (PFUnA), Perfluorododecanoic acid (PFDoA), Perfluorotridecanoic acid (PFTrDA), Perfluorotetradecanoic acid (PFTeDA), Hexafluoropropylene oxide dimer acid (HFPO-DA), 4,8-Dioxa-3H-perfluorononanoic acid (ADONA), Perfluoro-3-methoxypropanoic acid (PFMPA), Perfluoro-4-methoxybutanoic acid (PFMBA), Nonafluoro-3,6-dioxaheptanoic acid (NFDHA), 4:2 Fluorotelomer sulfonic acid (4:2-FTS), 6:2 Fluorotelomer sulfonic acid (6:2-FTS), 8:2 Fluorotelomer sulfonic acid (8:2-FTS), 3:3 Fluorotelomer carboxylic acid (3:3 FTCA), 5:3 Fluorotelomer carboxylic acid (5:3 FTCA), 7:3 Fluorotelomer carboxylic acid (7:3 FTCA), Perfluorooctane sulfonamide (PFOSA), N-methylperfluorooctane sulfonamide (NMeFOSA), N-ethylperfluorooctane sulfonamide (NEtFOSA), N-methylperfluorooctane sulfonamidoacetic acid (N-MeFOSAA), N-ethylperfluorooctane sulfonamidoacetic acid (N-EtFOSAA), N-methylperfluorooctane sulfonamidoethanol (NMeFOSE), N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE), 9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (F-53B Major) (9Cl-PF3ONS), 11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor) (11Cl-PF3OUdS), Perfluoro(2-ethoxyethane) sulfonic acid (PFEESA).

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. Sample containers, 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 regular ice only in Ziploc® bags (or equivalent) to maintain a temperature of 4°C±2° C.

Samples collected in the field for laboratory analysis will be placed directly into the laboratory-supplied sample containers. 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. Regular ice only 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 or Langan office 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 SMP and EWP. 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

Field sampling equipment that will be used for the collection of PFAS samples that is to be reused will be decontaminated in the field in accordance with the following procedures:

1. Laboratory-grade glassware detergent and clean, PFAS-free water scrub to remove visual contamination
2. Generous clean, PFAS-free 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 was 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

At this time, data validation is not anticipated during implementation of the EWP.

If data validation is required at a later date, data validation will be performed in accordance with the USEPA validation guidelines for organic and inorganic data review. Validation will include the following:

- Verification of the QC sample results,
- Verification of the identification of sample results (both positive hits and non-detects),
- Recalculation of 10 percent of all investigative sample results, and
- Preparation of Data Usability Summary Reports (DUSR).

A DUSR will be prepared and reviewed by the QAO before issuance. The DUSR will present the results of data validation, including a summary assessment of laboratory data packages, sample preservation and COC procedures, and a summary assessment of precision, accuracy, representativeness, comparability, and completeness for each analytical method. A detailed assessment of each SDG will follow. For each of the organic analytical methods, the following will be assessed:

- Holding times;
- Instrument tuning;
- Instrument calibrations;
- Blank results;
- System monitoring compounds or surrogate recovery compounds (as applicable);
- Internal standard recovery results;
- MS and MSD results;
- Target compound identification;
- Chromatogram quality;
- Pesticide cleanup (if applicable);

- Compound quantitation and reported detection limits;
- System performance; and
- Results verification.

For each of the inorganic compounds, the following will be assessed:

- Holding times;
- Calibrations;
- Blank results;
- Interference check sample;
- Laboratory check samples;
- Duplicates;
- Matrix Spike;
- Furnace atomic absorption analysis QC;
- Inductively couple plasma (ICP) serial dilutions; and
- Results verification and reported detection limits.

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;
- "N" – Tentative identification. Analyte is considered present in the sample;
- "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.

NYSDEC. Division of Environmental Remediation. Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances (PFAS) Under NYSDEC's Part 375 Remedial Programs, dated April 2023.

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

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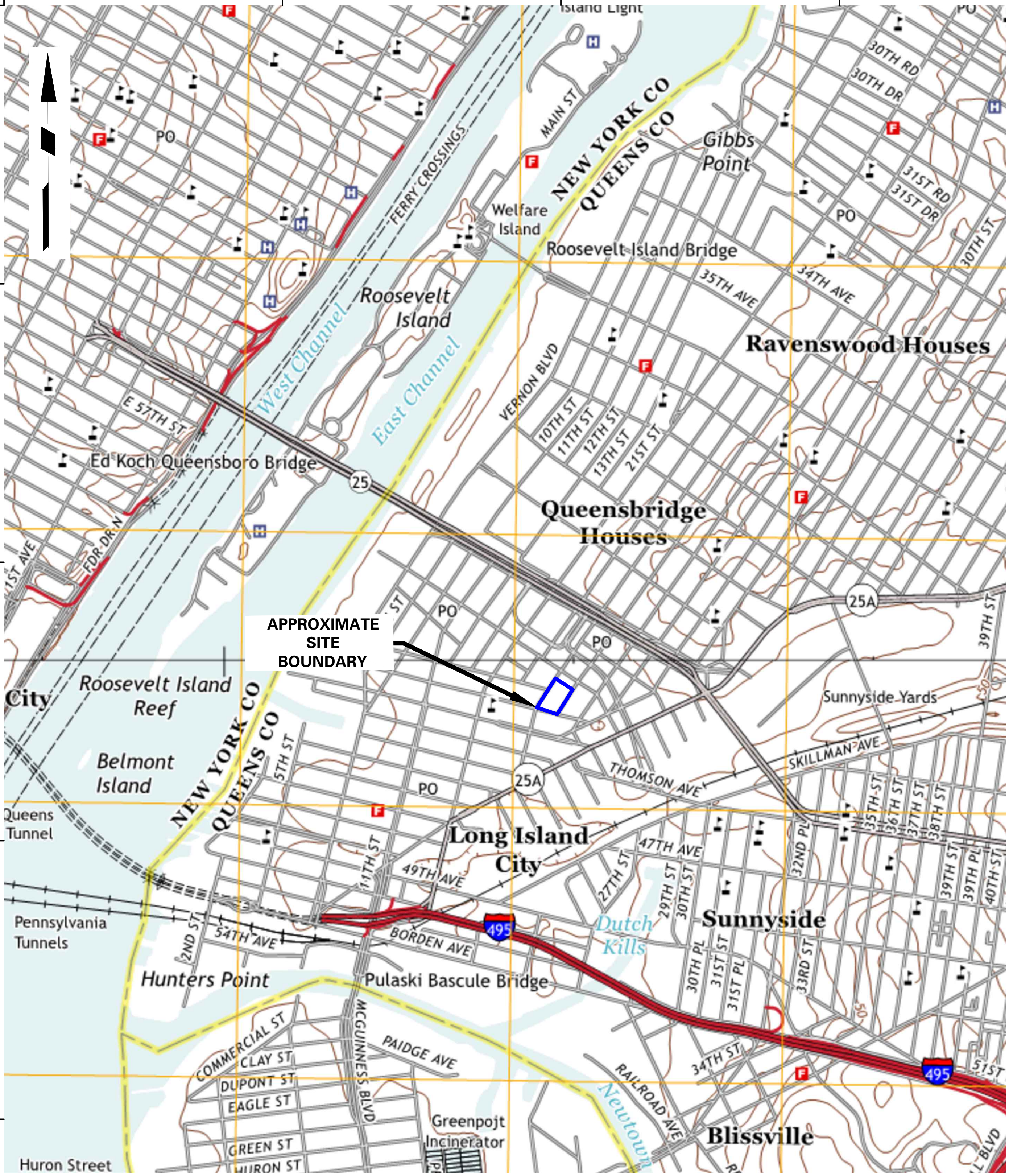

MAP REFERENCE: USGS 7.5-MINUTE TOPOGRAPHIC QUADRANGLE of BROOKLYN AND QUEENS, DATED 2016

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

Project	Figure Title	Project No.	Figure
43-30 24TH STREET BLOCK No. 436, LOT No. 1 LONG ISLAND CITY NEW YORK	SITE LOCATION MAP	170362702 Date: 11/17/2023 Scale: NTS Drawn By: KAG Checked By: JF Submission Date	1 Sheet 1 of 11

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Filename: \\langan.com\data\NYC\data7\170362701\Cadd Data - 170362701\SheetFiles\Environmental\BCP FER\SMP\Figure 1 - Site Location Map USGS_PAR.dwg Date: 12/18/2023 Time: 14:15 User: kgioia Style Table: Langan.stb Layout: ANSIA-BP

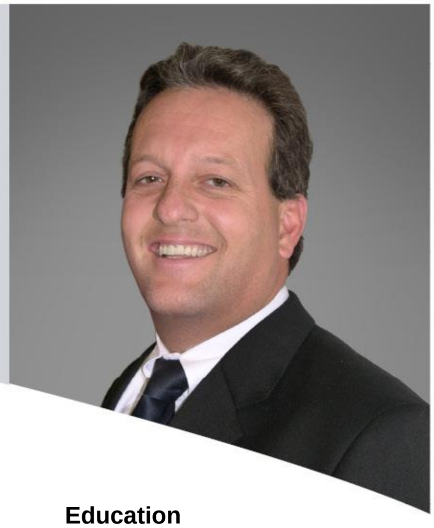
ATTACHMENT A

Resumes

Steven Ciambruschini, PG, LEP

Principal/Vice President

Environmental Site Assessments/Investigations, Brownfield Remediation, UST Management



33 years in the industry ~ 28 years with Langan

Mr. Ciambruschini has over 30 years of experience in hydrogeologic and environmental investigations including management of environmental and geotechnical investigations relating to petroleum and chlorinated solvent spill sites, underground storage tank sites, manufactured gas plant sites, landfills, wastewater treatment facilities and industrial/commercial sites. His experience includes managing environmental compliance audits, remedial investigation, pre-acquisition due diligence and permitting assessment, feasibility studies and design, construction and operation of complex innovative remediation systems to treat, contain and recover contaminated soil and groundwater. These projects are managed under various NJDEP, PADEP, NYDEC, NYCDEP and CTDEP programs. Mr. Ciambruschini provides consultation to a diverse group of clients including private developers, utilities, retail and industrial facilities and is expert in assessing remediation options and funding options under various state and federal grant, loan and tax reimbursement programs including Brownfield programs.

Selected Projects

- Brodson Property, Montville NJ, (RCRA, NJDEP ACO Cleanup)
- Carroll Gardens, Brooklyn, NY (NY Brownfield, EPA Superfund, OER E-designated Site)
- Con Edison Appendix B Spill Sites - Various Locations, NY
- Former MGP Site, Brooklyn, NY (VCP Site)
- Extell Development, Hudson Yards, New York, NY (NYC E-designated, NYS Brownfield Site)
- Pan Graphics, Bergen County, NJ (ISRA, LSRP)
- New Jersey Turnpike General Environmental Services Contract, Various Sites, NJ
- Liberty Science Center, Jersey City, NJ (EO 215)
- Blue Back Square, West Hartford, CT (UST, Transfer Act, Brownfield)
- Hershey, Act II Investigation (PA VCP)
- Hershey, Naugatuck, CT (CT Transfer Act)
- Halby Chemical Sites, Various Sites, DE (CERCLA)
- Unisys, Middletown CT, (CT Transfer Act, Brownfield)
- Ryder Rental, Various Sites in CT (CT Transfer Act)
- St. Marks Avenue, Brooklyn, NY (Vapor Mitigation)
- Pan Graphics, Lodi, NJ (Eco Risk Assessment, LSRP)

Education

M.S., Geology
Montclair State University

M.A., Environmental Science
Montclair University

B.S., Environmental Science
Cook College, Rutgers University

Professional Registration

Professional Geologist (PG) in NY, DE, KY

Licensed Environmental Professional (LEP) in CT

Underground Storage Tank License in NJ

Affiliations

National Ground Water Association

Association of Ground Water Scientists and Engineers

American Association of Petroleum Geologists

Environmental Professionals of Connecticut

American Bar Association (ABA)

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JESSICA FRISCIA, PE

PROJECT ENGINEER

ENVIRONMENTAL ENGINEERING

Ms. Friscia's experience includes field work and office work on environmental investigation and remediation projects across New Jersey and New York. Her field work experience includes soil, soil vapor, and groundwater sampling; drilling oversight; air monitoring; soil management; and remediation oversight, including excavation, zero-valent iron injections, air sparge/SVE system installation, MPE system installation, and SSDS installation. Her office work experience includes EQuIS database management, data evaluation, remedial design, and report work, including, but not limited to, Phase I ESAs, Preliminary Assessment/Site Investigations, Remedial Investigation Reports, Remedial Action Work Plans, and Remedial Action Reports.

SELECTED PROJECTS

- Former Penick Corporation Facility RCRA Site, Montville, NJ
- Bond Street Brownfields Redevelopment Site, Brooklyn, NY
- CPS/Madison Industries Superfund Site, Old Bridge, NJ
- Rossville Avenue Brownfields Site, Staten Island, NY
- Surf Avenue Brownfields Site, Brooklyn, NY
- St. Felix Street Brownfields Site, Brooklyn, NY
- 42-50 24th Street E-Designated / VCP Site, Long Island City, NY
- 1538 Stillwell Avenue E-Designated / VCP Site, Bronx, NY
- 1905 Surf Avenue E-Designated Site, Brooklyn, NY
- Shrewsbury Avenue LSRP Site, Tinton Falls, NJ
- Church Road LSRP Site, Cherry Hill, NJ
- Former Pan Graphics Facility, Garfield, NJ
- Former Flintkote Company Facility Site, East Rutherford, NJ
- Former Agricultural Research Facility, West Windsor, NJ
- Liberty Plaza VCP Site, Randallstown, MD
- Consolidated Edison Site, New York, NY
- Kent Avenue Site, Brooklyn, NY
- 505 West 19th Street NYCOER E-Designated Site, New York, NY
- 401 Washington Street NYCOER E-Designated Site, New York, NY
- 400 Park Avenue South Site NYCOER E-Designated Site, New York, NY
- Phase I Environmental Site Assessments and Due Diligence Investigations, Various Sites, NY/NJ

EDUCATION

M.E., Environmental and Water Quality Engineering
Massachusetts Institute of Technology

B.E., Civil Engineering
The Cooper Union for the Advancement of Science and Art

PROFESSIONAL REGISTRATION

Professional Engineer (PE) in NY

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

AFFILIATIONS

Beverly Willis Architecture Foundation Emerging Leaders Program

CREW

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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.*

KAITLYN GIOIA

SENIOR STAFF SCIENTIST

ENVIRONMENTAL ENGINEERING

Ms. Gioia is an Environmental Scientist with the New York City team. Ms. Gioia graduated in 2016 from Adelphi University with a B.A. in Environmental Studies. Ms. Gioia's experiences include project management, leading field work, exposure to an assortment of environmental pollutants, remedial action procedures, and Phase I and Phase II Environmental Assessments. Ms. Gioia has performed Asbestos Hazard and Emergency Response Act (AHERA) inspections and evaluations in schools and State Pollutant Discharge Elimination System (SPDES) sampling for power plants and commercial facilities.

SELECTED PROJECTS

- 80-100 Flatbush Avenue, Brooklyn, NY
- 250 Water Street, New York, NY
- 35-01 & 35-09 Northern Boulevard, Long Island City, NY
- 23-15 44th Road, Long Island City, NY
- South Randalls Due Diligence, New York, NY
- 595-647 Smith Street, Brooklyn, NY
- Willets Point Redevelopment, Flushing, NY
- President Street Properties, Brooklyn, NY
- 475 Bay Street, Staten Island, NY
- Confidential Project, Queens, NY
- 137 Kings Highway, Brooklyn, NY
- 111 Willow Avenue, Bronx, NY
- 560 Degraw Street, Brooklyn, NY
- 122 Fifth Avenue, New York, NY
- Insurance Claim Oversight, White Plains, NY*
- Subrogation Potential Investigation, Lindenhurst, NY*
- Brookhaven National Lab, Brookhaven, NY*
- Far Rockaway Vault Sampling, Far Rockaway, NY*
- East Islip School District AHERA Inspection, East Islip, NY*
- UPRS SPDES Sampling, Uniondale, NY*
- 550 Stewart Avenue Phase I and II, Garden City, NY*
- Riverhead to Canal Cable Expansion, Riverhead, NY*
- Noise Dosimetry Study, Queens, NY*
- School District Lead in Water Sampling, Yonkers, Kings Park, and Baldwin, NY*
- Potable Water Sampling, New York, NY*
- DCF Remediation Oversight, Malverne, West Hempstead, and Port Washington, NY*
- AOP Pilot Testing, Garden City Park, Franklin Square, and Port Washington, NY*

EDUCATION

B.A., Environmental Studies
Adelphi University

PROFESSIONAL REGISTRATION

OSHA 40-Hour

OSHA10-Hour

NYS Department of Labor, Asbestos Inspector License

USEPA Lead Based Paint Inspector License

NYSDEC Class A/B Operator of Underground Storage Tank Systems

NYSDEC 4-Hour Erosion and Sediment Control Contractor Training 2021

**Projects represent experience with a previous firm*

SELECTED PUBLICATIONS, REPORTS, AND PRESENTATIONS

“Fecundity and Embryonic Development of Spiny Dogfish in the Northwest Atlantic Ocean” Transactions of the American Fisheries Society 2019.

Dutton J., Fisher NS., Gioia KA., Madigan DJ., “Tissue Distribution of Mercury in Female Spiny Dogfish (Squalus Acanthias)” Society of Environmental Toxicology and Chemistry South-Central Regional Meeting 2016, Fort Worth, TX.

Dutton J., Fisher NS., Gioia KA., Madigan DJ., “Maternal Transfer of Mercury in Spiny Dogfish” 12th International Congress on The Biology of Fish 2016, San Marcos, TX.

Dutton J., Fisher NS., Gioia KA., Madigan DJ., “Mercury Bioaccumulation and Maternal Transfer in Spiny Dogfish (Squalus Acanthias)” 33rd Annual Meeting of The American Elasmobranch Society/Joint Meeting of Ichthyologists and Herpetologists 2017, Austin, TX.

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	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

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

ATTACHMENT B

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

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

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

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

ATTACHMENT B

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

ATTACHMENT B

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

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

Appendix 1 – Target Compound Reporting Limits

Target Compoud	Soil MDL/LOD µg/kg	Soil RL/LOQ µg/kg	Water MDL/LOD ng/L	Water RL/LOQ ng/L
Perfluorobutanesulfonic acid (PFBS)	0.111	0.177	0.47	1.77
Perfluorohexanoic acid (PFHxA)	0.053	0.200	0.35	2.00
Perfluoroheptanoic acid (PFHpA)	0.105	0.200	0.71	2.00
Perfluorohexanesulfonic acid (PFHxS)	0.179	0.183	0.68	1.83
Perfluorooctanoic acid (PFOA)	0.172	0.200	0.42	2.00
Perfluorooctanesulfonic acid (PFOS)	0.167	0.186	0.82	1.86
Perfluorononanoic acid (PFNA)	0.189	0.200	0.52	2.00
Perfluorodecanoic acid (PFDA)	0.191	0.200	0.75	2.00
Perfluoroundecanoic acid (PFUnA)	0.198	0.200	1.13	2.00
Perfluorododecanoic acid (PFDoA)	0.163	0.200	0.88	2.00
Perfluorotridecanoic acid (PFTrDA)	0.125	0.200	0.74	2.00
Perfluorotetradecanoic acid (PFTA)	0.103	0.200	0.69	2.00
N-MeFOSAA	0.148	0.200	0.79	2.00
N-EtFOSAA	0.194	0.200	1.03	2.00
Perfluoropentanoic acid (PFPeA)	0.109	0.400	0.23	4.00
Perfluoro-1-octanesulfonamide (FOSA)	0.146	0.200	0.88	2.00
Perfluoro-1-heptanesulfonic acid (PFHpS)	0.155	0.200	0.91	1.91
Perfluoro-1-decanesulfonic acid (PFDS)	0.191	0.193	1.32	1.93
1H,1H,2H,2H-Perfluorooctanesulfonic acid (6:2 FTS)	0.595	0.760	1.06	7.60
1H,1H,2H,2H-Perfluorodecanesulfonic acid (8:2 FTS)	0.755	0.768	2.05	7.68
Perfluoro-n-butanoic acid (PFBA)	0.109	0.800	0.33	8.00
Perfluoro(2-ethoxyethane)sulfonic acid (PFEESA)	0.139	0.356	0.50	3.56
Perfluoro-3,6-dioxaheptanoic acid (NFDHA)	0.193	0.400	2.14	4.00
Perfluoro-4-oxapentanoic acid (PFMPA)	0.062	0.400	0.25	4.00
Perfluoro-5-oxahexanoic acid (PFMBA)	0.096	0.400	0.37	4.00
Perfluoro-1-pentanesulfonate (PFPeS)	0.157	0.188	0.76	1.88
1H,1H,2H,2H-Perfluorohexanesulfonic acid (4:2 FTS)	0.595	0.750	1.79	7.50
HFPO-DA (Gen-X)	0.608	0.800	3.23	8.00
11CL-PF3OUdS	0.311	0.756	1.38	7.56
9CL-PF3ONS	0.246	0.748	0.70	7.48
ADONA	0.174	0.756	0.53	7.56
Perfluorododecanesulfonic acid (PFDoS)	0.169	0.194	0.93	1.94
Perfluoro-1-nonanesulfonic acid (PFNS)	0.124	0.192	0.86	1.92
3-Perfluoropropyl propanoic acid (FPrPA or 3:3FTCA)	0.634	1.000	2.03	5.00
3-Perfluoropentyl propanoic acid (FPePA or 5:3 FTCA)	2.098	5.000	7.33	25.00
3-Perfluoroheptyl propanoic acid (FHpPA or 7:3FTCA)	1.500	5.000	9.47	25.00
N-MeFOSE	0.611	2.000	3.99	20.00
N-MeFOSA	0.180	0.200	1.58	2.00
N-EtFOSE	0.697	2.000	3.99	20.00
N-EtFOSA	0.198	0.200	1.80	2.00

ATTACHMENT C

Analytical Methods / Quality Assurance Summary Table

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	TBD, as necessary	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 1633	Cool to 4°C	8 ounce HDPE container	90 days						
		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						

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 the expanded PFAS Analyte 40-list under the EPA's Draft Method 1633.

ATTACHMENT D

Sample Nomenclature

Requirements for Sample Nomenclature

The recommendations for sample nomenclature outlined below provide for consistency between sample events and projects but, most importantly, establish unique sample IDs that will avoid confusion months or years after the sample has been collected. Furthermore, unique sample IDs are required for any data submitted to the NYSDEC in EDD format or being uploaded to an EQuIS database.

Soil and Sediment Samples

SBxx_y-y

Sample Location + Number (two digits minimum)

Sampling Interval (y-y)

Sample Type	Sample Location	Sample Depth (feet bgs)	Sample Name
Phase II/Remedial Investigation			
Grab	SB01	2 to 4	**SB01_2-4**
	SB02	4	**SB02_4**
Waste Characterization			
Grab	WC01	2 to 4	**WC01_2-4**
	WC02	4	**WC02_4**
Composite	WC01 + WC02	0 to 10	**COMP01_0-10**
Endpoint Sampling			
Grab	EPSW01_N	5	**EPSW01_N_5**
	EPSW01_S	5	**EPSW01_S_5**
	EPSW01_E	5	**EPSW01_E_5**
	EPSW01_W	5	**EPSW01_W_5**
	EPB01	6	**EPB01_6**

- Boring ID (**SB01**_0-0.5) is a sequential number (starting with 01) and should be a minimum of two digits. Any additional characters do not count as part of the 2-digit minimum (SB01**A**, not SB1A).
- Sample Interval (SB01_**0-0.5**) is separated from the boring ID with an underscore, and the top and bottom interval with a dash. Soil and sediment sample intervals should always be in feet.

Groundwater and Surface Water Samples

MWxx_MMDDYY

Sample Location + Number (two digits minimum)

Sample Date (MMDDYY)

Sample Type	Sample Location	Sample Date	Sample Name
Groundwater Sample	MW01	02/21/2013	**MW01_022113**
Surface Water Sample	SW01	02/21/2013	**SW01_022113**

- Well ID or surface water gauge ID (**MW01**_022113) is the common well name and should be a minimum of two digits. Any additional characters do not count as part of the 2-digit minimum (MW01**A**, not MW1A).
- Sample date (MW01_**022113**) is separated from the well ID (or gauge location) with an underscore and should be provided in MMDDYY format [the date can not contain "/" or "-"].
- If groundwater samples are collected from multiple intervals within one well, you may assign a letter designation (in lower case) to the well ID to differentiate between intervals (i.e., MW01a_022113, MW01b_022113, and MW01c_022113). The letter "a" would indicate the shallowest interval and "c" the deepest. The actual depth intervals should be documented in the project field book or field sheets and the letter designations should be used consistently between sampling events.

Vapor Investigation Samples

IAxx_MMDDYY

Sample Location + Number (two digits minimum)

Sample Date (MMDDYY)

Sample Type	Sample Location	Sample Date	Sample Name
Ambient Air Sample	AA01	02/21/2013	**AA01_022113**
Air Sample	IA01	02/21/2013	**IA01_022113**
Soil Vapor Sample	SV01	02/21/2013	**SV01_022113**
Vapor Extraction Well Sample	SVE01 (Inlet/Midpoint/Outlet)	02/21/2013	**SVE01_IN_022113** **SVE01_ MID_022113** **SVE01_ OUT_022113**

- Sample number (**IA01**_022113) should be separated from the sample date by an underscore. Sample numbers should be sequential in order and be a minimum of two digits. Any additional characters do not count as part of the 2-digit minimum (IA01**A**, not IA1A). The location of each sequential sample number should be documented/ illustrated in project field books or field sheets.
- Sample date (IA01_**022113**) is separated from the sample number with an underscore and should be provided in MMDDYY format [the date can not contain "/" or "-"].
- Ambient air samples also need their own unique sample location name. If you revisit a previous ambient air sample location, you can reuse the location name with the new sample date appended to the end.

Duplicate Samples

Sample Type	Parent Sample Code	Date	Sample Name
Groundwater Duplicate Sample (DUP)	MW01_022113	02/21/2013	**DUP01_022113**

Field Blanks and Trip Blanks

Sample Type	Date	Sample Name
Equipment Blank (EB)	02/21/2013	**EB01_022113**
Field Blank (FB)	02/21/2013	**FB01_022113**
Trip Blank (TB)	02/21/2013	**TB01_022113**

Matrix Spike/Matrix Spike Duplicate (MS/MSD)

Sample Type	Sample Location	Parent Sample Name	Sample Name
Matrix Spike (MS)	SB01	SB01_2-4	**SB01_2-4MS**
Matrix Spike Duplicate (MSD)	SB01	SB01_2-4	**SB01_2-4MSD**

NOTES

1. Spaces should not be used in sample names.
2. Special characters should not be used in report naming with the exception of – and _.
3. Letter designations should be used consistently between sampling events.
4. According to USEPA's Contract Laboratory Program (CLP) Guidance for Field Samplers (January 2011), field duplicate samples should remain "blind" to the laboratory (i.e., they should have separate CLP Sample numbers). Assign two separate (unique) CLP sample numbers (i.e., one number to the field sample and one to the duplicate). Submit blind to the laboratory.

ATTACHMENT E

Laboratory Standard Operating Procedures for PFAS Analysis

LANGAN

Standard Operating Procedure

Determination of Target Per- and Polyfluoroalkyl Substances (PFAS) in Aqueous and Solid matrices by Isotope Dilution Analysis by HPLC/MS-MS According to EPA Method 1633 Draft 3

Approvals

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Controlled Copy No. PFAS_LCMSMS1633, Rev 1.2-____

Issued to: NA

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1. SCOPE AND APPLICATION

This method is used to identify and quantitate specific PFAS compounds in extracts of non-potable water and solid (soil/sediment) samples using HPLC/MS-MS (High Pressure Liquid Chromatography/Tandem Mass Spectrometry). Currently the compounds (40) that are measured by this methodology are listed in Table 1.0 below.

Table 1.0-Target PFAS

Perfluoroalkyl carboxylic acids		
Perfluorobutanoic acid	PFBA	375-22-4
Perfluoropentanoic acid	PFPeA	2706-90-3
Perfluorohexanoic acid	PFHxA	307-24-4
Perfluoroheptanoic acid	PFHpA	375-85-9
Perfluorooctanoic acid	PFOA	335-67-1
Perfluorononanoic acid	PFNA	375-95-1
Perfluorodecanoic acid	PFDA	335-76-2
Perfluoroundecanoic acid	PFUnA	2058-94-8
Perfluorododecanoic acid	PFDoA	307-55-1
Perfluorotridecanoic acid	PFTrDA	72629-94-8
Perfluorotetradecanoic acid	PFTeDA	376-06-7
Perfluoroalkyl sulfonic acids Acid Form		
Perfluorobutanesulfonic acid	PFBS	375-73-5
Perfluoropentansulfonic acid	PFPeS	2706-91-4
Perfluorohexanesulfonic acid	PFHxS	355-46-4
Perfluoroheptanesulfonic acid	PFHpS	375-92-8
Perfluorooctanesulfonic acid	PFOS	1763-23-1
Perfluorononanesulfonic acid	PFNS	68259-12-1
Perfluorodecanesulfonic acid	PFDS	335-77-3
Perfluorododecanesulfonic acid	PFDoS	79780-39-5
Fluorotelomer sulfonic acids		
1*H*,1*H*, 2*H*, 2*H*-Perfluorohexane sulfonic acid	4:2FTS	757124-72-4
1*H*,1*H*, 2*H*, 2*H*-Perfluorooctane sulfonic acid	6:2FTS	27619-97-2
1*H*,1*H*, 2*H*, 2*H*-Perfluorodecane sulfonic acid	8:2FTS	39108-34-4
Perfluorooctane sulfonamides		
Perfluorooctanesulfonamide	PFOSA	754-91-6
N-methyl perfluorooctanesulfonamide	NMeFOSA	31506-32-8
N-ethyl perfluorooctanesulfonamide	NEtFOSA	4151-50-2
Perfluorooctane sulfonamidoacetic acids		
N-methyl perfluorooctanesulfonamidoacetic acid	NMeFOSAA	2355-31-9
N-ethyl perfluorooctanesulfonamidoacetic acid	NEtFOSAA	2991-50-6
Perfluorooctane sulfonamide ethanols		
N-methyl perfluorooctanesulfonamidoethanol	NMeFOSE	24448-09-7
N-ethyl perfluorooctanesulfonamidoethanol	NEtFOSE	1691-99-2
Per- and Polyfluoroether carboxylic acids		
Hexafluoropropylene oxide dimer acid	HFPO-DA	13252-13-6
4,8-Dioxa-3*H*-perfluorononanoic acid	ADONA	919005-14-4
Perfluoro-3-methoxypropanoic acid	PFMPA	377-73-1
Perfluoro-4-methoxybutanoic acid	PFMBA	863090-89-5
Nonafluoro-3,6-dioxaheptanoic acid	NFDHA	151772-58-6
Ether sulfonic acids		
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid	9Cl-PF3ONS	756426-58-1
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid	11Cl-PF3OUdS	763051-92-9
Perfluoro(2-ethoxyethane)sulfonic acid	PFEESA	113507-82-7

Fluorotelomer carboxylic acids		
3-Perfluoropropyl propanoic acid	3:3FTCA	356-02-5
2*H*,2*H*,3*H*,3*H*-Perfluorooctanoic acid	5:3FTCA	914637-49-3
3-Perfluoroheptyl propanoic acid	7:3FTCA	812-70-4

The estimated reporting limits (MRL) based upon the preparation/analysis parameters herein at the time of this revision are approximately 2.0 - 25.0 ng/L (ppt) for aqueous samples and 0.5 - 5.0 µg/kg for solids. The linear range for these PFAS can be extended by dilution. These MRLs are based upon a volume of 250 mL - 500 mL extracted for aqueous samples and 2 - 5 g for solids. Please refer to *Appendix 1: Target Compound Reporting Limits* for limits of detection and quantitation based on a 5 g extract and 500 mL extract for soils and waters, respectively. Please note, MDL/LOD values are based on the initial November 2022 study and are subject to change based on ongoing study data. The most up-to-date study data will be kept on file by the Quality Department and readily available in the test code section(s) of Element LIMS.

This method is "performance-based," which means that modifications may be made without additional EPA review to improve performance (e.g., overcome interferences, or improve the sensitivity, accuracy, or precision of the results) *provided that all* performance criteria in this method are met. Requirements for establishing equivalency are in Section 9.1.2 and include 9.1.2.2c. For Clean Water Act (CWA) uses, additional flexibility is described at 40 CFR 136.6. Changes in performance, sensitivity, selectivity, precision, recovery, etc., that result from modifications within the scope of 40 CFR Part 136.6, and Section 9.0 of this method must be documented, as well as how these modifications compare to the specifications in this method. Changes outside the scope of 40 CFR Part 136.6 and Section 9.0 of this method may require prior review or approval.

2. SUMMARY

Environmental samples are prepared and extracted using method-specific procedures. Sample extracts are subjected to cleanup procedures designed to remove interferences. Analyses of the sample extracts are conducted by HPLC-MS/MS in the multiple reaction monitoring (MRM) mode. Sample concentrations are determined by isotope dilution or extracted internal standard quantification (see Section 10.3) using isotopically labeled compounds added to the samples before extraction.

2.1 Extraction

2.1.1 Aqueous samples are spiked with isotopically labeled standards, extracted using solid-phase extraction (SPE) cartridges and undergo cleanup using carbon before analysis.

2.1.2 Solid samples are spiked with isotopically labeled standards, extracted into basic methanol, and cleaned up by carbon and SPE cartridges before analysis.

2.2 Analysis

2.2.1 Extracts are analyzed by HPLC-MS/MS in MRM mode. Extracts contain Non-extracted Internal Standards (NIS) to monitor instrument performance and are used for quantitative analysis.

2.2.2 Individual PFAS analytes are identified through peak analysis of the quantification and confirmation ions (Precursor and product ions) where applicable.

2.2.3 The concentration of each analyte is calculated using the isotope dilution technique. This approach corrects the target analyte concentration based on recovery of isotopic analogues and essentially behave like extracted internal standards (EIS). For QC purposes, the percent recoveries of the isotope dilution analogues are calculated using the integrated peak areas of isotope performance standards, which are added to the final extract and function as traditional internal standards (non-extracted internal standards), exclusively applied to the isotope dilution analogues.

3. DEFINITIONS

3.1 ANALYTICAL SEQUENCE – A set of samples that are analyzed on the same instrument continuously over a period, typically a 24 hours. An analytical sequence may consist of multiple extraction batches and various matrices and is bracketed by method specific quality control analyses.

3.2 CALIBRATION STANDARD (CAL) – A solution of the method analytes, isotope dilution analogues, and isotope performance standards (Internal standards) prepared from primary dilution and stock standards. The calibration standards are used to calibrate the instrument response with respect to analyte concentration.

3.3 CONTINUING CALIBRATION VERIFICATION (CCV) – A calibration standard containing target compounds, isotopic analogues, and internal standards. The CCV is analyzed periodically to verify the accuracy of an existing calibration.

3.4 EXTRACTION BATCH – A set of up to 20 Field Samples (not including quality control samples) extracted together by the same person(s) during a workday using the same lot of standards and reagents.

3.5 FIELD DUPLICATES – Separate samples collected at the same time and sampling location, shipped, and stored under identical conditions. Method precision, including the contribution from sample collection procedures, is estimated from the analysis of Field Duplicates. Field Duplicates may be used to prepare duplicate QC samples.

3.6 FIELD BLANK (FB) – An aliquot of reagent water free of constituents of concern that is placed in a sample container in the during field sampling and treated as a sample in all respects. This includes shipment to the sampling site, exposure to sampling site conditions, storage, preservation, and all analytical procedures. The purpose of the FB is to determine if method analytes or other interferences are introduced to the sample from shipping, storage, and the field environment.

3.7 ISOTOPE DILUTION ANALOGUES - Isotopically labeled analogues of the method analytes that are added to the sample prior to extraction in a known amount. Note: Not all target PFAS currently have an isotopically labeled analogue. In these cases, an alternate isotopically labeled analogue is used as detailed in this SOP and reference method.

3.8 ISOTOPE DILUTION TECHNIQUE - An analytical technique for measuring analyte concentration using the ratio of the peak area of a native analyte to that of an isotopically labeled analogue. The analogue is added to a sample in a known amount and carried through the entire analytical procedure. The ration is used to determine a correction factor that is applied to the native compound's result.

3.9 ISOTOPE PERFORMANCE STANDARDS (Internal Standards) - Quality control compounds that are added to all standard solutions and extracts in a known amount and used to measure the relative response of the isotopically labelled analogues that are components of the same solution. For this method, the isotope performance standards are three isotopically labeled analogues of the method analytes. The isotope performance standards are indicators of instrument performance and are used to calculate the recovery of the isotope dilution analogues through the extraction procedure. In this method, the isotope performance standards are not used in the calculation of the recovery of the native analytes.

3.10 METHOD BLANK – An aliquot of reagent water to which known quantities of the method analytes and isotope dilution analogues are added. The results of the MBLK verify method performance in the absence of sample matrix.

3.11 MATRIX SPIKE/MATRIX SPIKE DUPLICATE (MS/MSD) – Aliquots of field samples that have been fortified with a known concentration of target compounds, prior to sample preparation and extraction, and analyzed to measure the effect of matrix interferences. The use of MS/MSD samples is generally not required in isotope dilution methods because the labeled compounds added to every sample provide more performance data than spiking a single sample in each preparation batch.

3.11 SAMPLE DUPLICATE (DUP) – A duplicate aliquot of a field sample analyzed in the same manner as a parent sample to measure reproducibility.

3.12 LIMIT OF QUANTITATION (LOQ) – The smallest concentration that produces a quantitative result with known and recorded precision and bias. The LOQ shall be set at or above the concentration of the lowest initial calibration standard (the lowest calibration standard must fall within the linear range). Determined by matrix through the entire preparation and analysis process.

3.13 METHOD DETECTION LIMIT (MDL) – The minimum measured concentration of a substance that can be reported with 99% confidence that the measured analyte concentration is distinguishable from method blank results (40 CFR 136, Appendix B).

3.14 MINIMUM LEVEL OF QUANTITATION (ML) – The lowest level at which the entire analytical system must give a recognizable signal and acceptable calibration point for the analyte. The ML represents the lowest concentration at which an analyte can be measured with a known level of confidence. It may be equivalent to the concentration of the lowest calibration standard, assuming that all method-specified sample weights, volumes, and cleanup procedures have been employed. Alternatively, the ML may be established by multiplying the MDL (pooled or not pooled, as appropriate) by 3.18 and rounding the result to the number nearest to 1, 2, or 5 x 10n, where n is zero or an integer (see 68 FR 11770).

3.15 PRECURSOR ION – For the purpose of this method, the precursor ion is the deprotonated molecule ($[M\text{-}H]^-$) of the method analyte (except for HFPO-DA, in which the precursor ion is formed by decarboxylation). In MS/MS, the precursor ion is mass selected and fragmented by collisionally activated dissociation to produce distinctive product ions of smaller *m/z*.

3.16 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.

3.17 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.

3.18 INITIAL CALIBRATION VERIFICATION (ICV) – A calibration standard prepared independently from the primary calibration solutions. For this method, the ICV is a repeat of the entire dilution scheme starting with the same stock materials (neat compounds or purchased stock solutions) used to prepare the primary calibration solutions. Independent sources and separate lots of the starting materials are not required, provided the laboratory has obtained the purest form of the starting materials commercially available. The purpose of the ICV is to verify the integrity of the primary calibration standards.

3.19 QUANTITATIVE STANDARD - A quantitative standard of assayed concentration and purity traceable to a Certificate of Analysis.

3.20 STOCK STANDARD SOLUTION - A concentrated solution containing one or more method analytes prepared in the laboratory using assayed reference materials or purchased from a reputable commercial source with a Certificate of Analysis.

3.21 TECHNICAL GRADE STANDARD – As defined for this method, a technical-grade standard includes a mixture of the branched and linear isomers of a method analyte. For the purposes of this method, technical-grade standards are used to identify retention times of branched and linear isomers of method analytes.

3.22 ANALYTE – A PFAS compound included in this method. The analytes are listed in Table 1.

3.23 CALIBRATION STANDARD (CS) – A solution prepared from a secondary standard and/or stock solutions and used to calibrate the response of the LC-MS/MS instrument.

3.24 CONTINUING CALIBRATION VERIFICATION (CCV) STANDARD – The mid-point calibration standard that is used to verify calibration.

3.25 CFR – Code of Federal Regulations

3.26 EXTRACTED INTERNAL STANDARD (EIS) QUANTIFICATION – The response of the target compound is compared to the response of the labeled analog of another compound in the same LOC.

3.27 INSTRUMENT SENSITIVITY CHECK – solution used to check the sensitivity of the instrument. The solution contains the native compounds at the concentration of the LOQ.

3.28 IPR – INITIAL PRECISION AND RECOVERY; four aliquots of a reference matrix spiked with the analytes of interest and labeled compounds and analyzed to establish the ability of the laboratory to generate acceptable precision and recovery. An IPR is performed prior to the first time this method is used and any time the method or instrumentation is modified.

3.29 OPR - ONGOING PRECISION AND RECOVERY- – Ongoing precision and recovery standard (OPR); a method blank spiked with known quantities of analytes. The OPR is analyzed exactly like a sample. Its purpose is to ensure that the results produced by the laboratory remain within the limits specified in this method for precision and recovery. Applies to OPR and LLOPR (low level OPR at **2x** the LOQ level).

3.30 SPE – SOLID PHASE EXTRACTION; a technique in which an analyte is extracted from an aqueous solution or a solid extract by passage over or through a material capable of reversibly adsorbing an analyte. Also termed liquid-solid extraction.

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 or polyolefin 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, then recap with polyolefin caps for storage.

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.

4.3.3 Aqueous samples should not come in contact with any glass containers or pipettes as PFAS analytes can potentially adsorb to glass surfaces. Standards dissolved in organic solvent may be purchased in glass ampoules. These standards in organic solvent are acceptable and subsequent transfers may be performed using glass syringes and pipets. Following extraction, the eluate must be collected in a polypropylene tube prior to concentration to dryness. Concentration to dryness in glass tubes may cause poor recovery.

4.4 LC/MS grade methanol must be used for all steps where methanol is used in this method. HPLC grade methanol has been demonstrated to be acceptable if tested prior to use.

4.5 Matrix interferences may be caused by contaminants that are co-extracted from a sample. The extent of matrix interferences will vary considerably from source to source, depending upon the nature of the sample.

4.5.1 Co-extracted Organic Material - Under normal HPLC conditions matrix effects due to co-extracted organic material enhanced the ionization of 4:2 FTS appreciably. Total organic carbon (TOC) is a good indicator of humic content of the sample.

4.5.2 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. SPE cartridges should be sealed while in storage to prevent ambient contamination of the SPE sorbent.

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, and PFBS, based upon scientific literature. We have also seen branched isomers for PFHpA, NMeFOSAA, NEtFOSAA and PFNA. If multiple isomers are present for one of these PFAS they likely are 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. Some available branched and linear reference standards of the technical mixtures for these specific PFAS are used to ensure that all appropriate peaks are included during peak integration. These species currently include PFOA, PFHxS, NMeFOSAA, and NEtFOSAA. These branched isomers elute before the linear isomer and are integrated and reported as total for those species. Others are also included at this time such as those listed in section 7.3.4.

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** - samples are collected by our clients in 250 or 500ml HDPE bottles with unlined HDPE or polypropylene caps and filled to the neck. Each sample submitted should be submitted in triplicate-with one used for determination of Suspended solids and possible pre-screening. Sub-sampling should be avoided whenever possible. When historical data are available indicating high levels of PFAS, sub-sampling may be an advisable option.

5.2 **Soil Samples** – samples are collected in wide mouth 125- or 250-mL HDPE bottles with PP unlined caps.

5.3 SAMPLE SHIPMENT AND STORAGE/HOLDING TIMES – Maintain all aqueous samples protected from light at 0 - 6 ºC from the time of collection until shipped to the laboratory. Samples must be shipped as soon as practical with sufficient ice to maintain the sample temperature below 6 ºC during transport. Samples are to be received by the laboratory within 48 hours of collection. The laboratory must confirm that the sample temperature is 0 - 6 ºC upon receipt. Once received by the laboratory, the samples may be stored at ≤ -20 ºC, or at 0 - 6 ºC, until sample preparation. However, the allowable holding time for samples depends on the storage temperature, as described below:

5.3.1 Aqueous samples may be held in the laboratory for up to 90 days from collection, when stored at ≤ -20 ºC and protected from the light. When stored at 0 - 6 ºC and protected from the light, aqueous samples may be held for up to **28 days**, with the caveat that issues were observed with certain perfluorooctane sulfonamide ethanols and perfluorooctane sulfonamidoacetic acids after **7 days**. These issues are more likely to elevate the observed concentrations of other PFAS compounds via the transformation of these precursors if they are present in the sample.

5.3.2 Solid samples (soils and sediments) may be held for up to 90 days, if stored in the dark at either 0 - 6 ºC or ≤ -20 ºC, with the caveat that samples may need to be extracted as soon as possible (within 7 days) if NFDHA is designated as an important analyte by the customer.

5.4 **SAMPLE EXTRACT HOLDING TIMES** – Store sample extracts in the dark at less than 0 - 4 ºC until analyzed. If stored in the dark at less than 0 - 4 ºC, sample extracts may be stored for up to 90 days, with the caveat that issues were observed for some ether sulfonates after 28 days. These issues may elevate the observed concentrations of the ether sulfonates in the extract over time. Samples may need to be extracted as soon as possible if NFDHA is an important analyte.

6. APPARATUS AND MATERIALS (as listed or demonstrated equivalents)

6.1 250 - 500 mL polypropylene bottles with polypropylene caps. VWR Scientific or equivalent: Part no. 414004-125, 12 pk. Alternate: White PP unlined lid L238WH and 16oz. 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 concentrators: Organomation Model N-EVAP 112, 24 position concentrator with water batch control and nitrogen supply controls or equivalent

6.6 3.1 Micron in-line filters, Promochrom only

6.7 1.0-2.0 mL polypropylene snap cap vials, Agilent part no. 5182-0567 or equivalent

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

6.9 Solid Phase Extraction Tubes: for EPA 1633: WAX (weak anion exchange mixed mode polymeric sorbent – Phenomenex No. 8B-S038-HCH 200 mg or Waters Oasis 150 mg Cat. # 186002493. Must have a pKa > 8 to remain positively charged during the extraction. Alternate is Agilent Bond Elute WAX 200 mg-cat. No. 5610-2151

6.10 Syringes, Hamilton or equivalent 5.0 µL, 10 µL 25 µL, 100 µL, 250 µL, 500 µL, 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 with 3.1 um in line PP filters.

6.12 Nitrogen Evaporation System- TurboVap nitrogen evaporation system operated at less than 55C.

6.13 LC/MS-MS system- Agilent 1260 or 1290 HPLC system interfaced to an Agilent 6470A or 6460C 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 or 1290 Infinity II

6.13.1.1 The Agilent 1260 or 1290 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 or equivalent.

6.13.1.3 The analytical column is a Restek Raptor C18 part no. 9304252 50mm x 2.1 mm ID, 1.8 u particle size or equivalent.

6.13.2 Agilent LC/MS-MS- Agilent 6470AAR/6460C

6.14.2.1 Agilent model 6470AAR/6460C triple Quadrupole 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 Variable Speed shaker table, 18” x 12”- Orbital Shaker- Jiangau Tenlin Instr. Co., Ltd., Model no. TLSK-III 20-230 RPM, 0-999 min, or equivalent

6.16 Centrifuge, 50 mL, Premiere Model XC-2450 Series Centrifuge 6 x 50 mL, 3500 RPM max., or equivalent

6.17 Mechanical Pipettors- 10-100 µL; 100-1000 µL; 1000-5000 µL-4 E’S Scientific or equivalent, calibrated quarterly.

6.18 Vortex Mixer- Benchmark Industries or equivalent

6.19 pH paper, short range 6-8 and full range with 0.5 pH readability- VWR Scientific or equivalent

6.20 15 mL PP or HDPE Centrifuge tubes, Corning Part no. 430791

6.21 3 mL Disposable Transfer pipets, PE, VWR part no. 16001-176

6.22 1.0 mL polypropylene snap cap vials, Agilent part no. 5182-0567

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

6.24 2mL self-standing PP microcentrifuge snap cap tubes, SKS Scientific part no. 0747-17

6.25 Collection tubes, 15 mL graduated PP or HDPE Centrifuge tubes, Corning Part no. 430791

6.26 Disposable 10 mg scoops, PP

6.27 Ultrasonic mixer

6.28 10 mL disposable syringes, PP or HDPE, luer fitting

6.29 13mm or 25 mm 0.2 um Nylon membrane filters, PALL Acrodisc or equivalent

7. REAGENTS AND STANDARDS (as listed or demonstrated equivalents)

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

7.2 SOLVENTS and REAGENTS-all as listed or equivalents

7.2.1 Methanol, hypergrade for LC/MS. (Merck) from Sigma Aldrich Part no. 1060354000 or equivalent (HPLC Plus grade is an acceptable alternate)

7.2.2 Water, hypergrade for LC/MS. (Merck) from Sigma Aldrich Part no. 1153334000 or equivalent (HPLC plus grade is an acceptable alternate). Alternatively, York PFAS free water demonstrated ion and PFAS free can be used.

7.2.3 Acetic Acid, glacial. ACS grade or equivalent.

7.2.4 Ammonium Hydroxide, conc. Cert. ACS grade, 28-30% in water, Sigma Aldrich part no.1054231000, or equivalent

7.2.5 Methanolic Potassium Hydroxide (0.05 M) – add 3.3 g of KOH to 1L MeOH.

7.2.6 Sodium Hydroxide, pellets, ACS grade- Sigma Aldrich part no. 221465-500G, or equivalent

7.2.7 Potassium Hydroxide, pellets, ACS grade

7.2.8 Ammonium Acetate – ACS grade or better, Ammonium Acetate, HPLC or cert. ACS grade. Sigma Aldrich Part no. 73594-100-G-F or equivalent.

7.2.9 Ammonium Acetate 5 mM for HPLC in aqueous solution: HPLC gradient A-- Weigh 0.3854 g (+ 0.0005) Ammonium Acetate and add to 1-liter hypergrade Water. Mix until dissolved then sonicate for 5 mins. To remove air bubbles. Stability - 2 weeks.

7.2.10 **Methanolic Ammonium Hydroxide 0.3 %** - take 2.5 mL of conc. ammonium hydroxide into 247 mL MeOH (measure the 247 mL in a PP graduated cylinder-they are under QQ1 somewhere). Use a mechanical pippetor to add the 2.5 mL (not strictly quantitative FYI)-**Make 4 bottles of this**. *Used for soil extractions*. - 1 month shelf life.

7.2.11 **Methanolic Ammonium Hydroxide 1.0 %** - take 8.25 mL of conc. ammonium hydroxide into 242 mL MeOH (measure the 242 mL in a PP graduated cylinder-they are under QQ1 somewhere). Use a mechanical pipet to add the 8.25 mL (not strictly quantitative FYI)- **Make 4 bottles of this -***used in Promochrom-*1 month life.

7.2.12 **Aqueous Ammonium Hydroxide 3%-** take 24.8 mL of ammonium hydroxide and add 242 mL PFAS free water. 3-month life- *used for pH adjustment*

7.2.13 **Methanol with 4% water, 1% ammonium hydroxide and 0.625% acetic acid** – add ammonium hydroxide (3.3 mL, 30%), reagent water (1.7 mL) and acetic acid (0.625 mL) to methanol (92 mL), store at room temperature, replace after 1 month. **This solution is used to prepare the instrument blank, calibration standards, and is used to dilute the extracts of samples that exceed the calibration range.**

7.2.14 **Formic Acid 0.1M-aqueous** – add 873 µL formic acid into 250 mL PFAS free water- **Make 2 bottles of this-***used to prepare 7.2.16 below.* 2-year life

7.2.15 **Formic Acid, 0.3M**-aqueous- add 2.62 mL (2619 µL) into 250 mL PFAS free water- **Make 4 bottles of this -***used in Promochrom-*2 year life

7.2.16 **Formic Acid methanolic 1:1, 0.1M formic acid**- mix equal volumes of Methanol and 0.1 M formic acid- **Make 4 bottles of this -***used in Promochrom-*2 year life

7.2.17 **Formic Acid 5% aqueous**- add 12.5 mL Formic acid into 250 mL PFAS free water. *Used for pH adjustment.* 2-year shelf life

7.3 Stock Standards

Stock Standards are purchased in mid to high concentration levels from Wellington Laboratories, Inc. Guelph, ONT, CA. Currently, Wellington is the preferred supplier of these materials. As a second source verification, prepare a mid-level from the stock independently from the preparation used for initial calibration. Document this preparation in Element. See Attachments 1,2, and 3 for detailed information.

7.3.1 Internal Standards (7-Non-Extracted –NIS)) used for the method are MPFOA, MPFOS, M3PFBA, MPFDA, MPFHxA, MPFHxS and MPFNA. These are purchased at 250 - 1000 ng/mL depending upon the ISTD in a mixture. This mixture is purchased from Wellington Labs in 1.2 mL volumes with the following **<u>part no.: MPFAC-HIF-IS</u>**. Stored at 4C or less unopened this solution has a 5-year shelf life. Once opened, the life is one year from open date.

7.3.2 Isotopic Surrogate Analogs (24 isotopes) are purchased for the method described from Wellington Labs at 250-5000 ng/mL levels, depending upon the isotope. Part no. is **<u>MPFAC-HIF-ES</u>**.

7.3.3 Stock Standard mixtures of both linear and branched isomers of the EPA 1633 40 compound list are purchased from Wellington Labs at varying concentrations in 5 different mixtures under part nos. PFAC-MXJ, PFAS-MXI, PFAC-MXH, PFAC-MXG, PFAC-MXF.

7.3.4 Second source standard mixture of both linear and branched isomers of the EPA 1633 40 compound list is purchased from Absolute Standards at 2 µg/mL under part no. 65735.

7.3.5 <u>Qualitative branched isomers mix</u>- individual available branched and linear mixes for the following PFAS are used daily to allow for qualitative knowledge of the PFAS branched isomers so they are integrated/included in quantitative analysis: T-PFOA, lp-PFNA, br-FOSA, br-NEtFOSA, br-NMeFOSA, br-NEtFOSE and br-NMeFOSE. These are purchased at 50,000 ng/mL levels from Wellington Labs-the names above are the Catalogue nos. These have a 5-year life at stock concentrations.

Make a 100 ng/mL Intermediate mix by adding 2.0 µL of the individual stocks up to 1.0 mL with MeOH.

Make a working solution by taking 200 µL of the 100 ng/mL intermediate into 750 µL of cal matrix solution (7.2.13) and add 50 µL of 1:10 EIS mix.

Transfer 300 µL to an autosampler vials, add 3 µL of ISTD working mix, cap vortex, and store until needed. Shelf life is 1 year.

The summary below details the procurement requirements for this method - All from Wellington Laboratories, Inc. except the second source from Absolute Standards:

Description	Part nos.	Comes in
40 Compound Target 1633 list targets	PFAC-MXJ PFAS-MXI PFAC-MXH PFAC-MXG PFAC-MXF	4 Days – 1.2 mL
Isotopic Surrogates-24	MPFAC-HIF-ES	4 Days – 1.2 mL
EPA 1633 – 7 Internal Std.	MPFAC-HIF-IS	4 Days – 1.2 mL
Method 1633 PFCs – Cal Std.	65735	2 days – 1.2 mL

7.4 Preparation of Standards

7.4.1 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 µg/mL levels. This insures their stability with respect to potential loss due to esterification. The basic solution ensures 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 level standards, the dilution must be prepared in alkaline methanol to prevent the above from occurring.

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. <u>This has a 2-week life</u>.

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

For intermediate standards prepared to a final volume of 1.0 mL. add 10 µL of the 5.0 mM NaOH/MeOH.

For working calibration standards/CCV/SCV made to 500 µL final volume, using the mixture detailed in section 7.1.13 (MeOH/Water/acetic acid/ammonium hydroxide). This approximates the matrix of the final extracts for analysis.

7.4.2 Storage and Handling of Standards

All working standards should be stored at either room temperature or 4 °C provided the containers are sealed properly.

Stock Standards may be stored at 4 - 10 °C but before using must sit to allow equilibration to room temperature followed by either vigorous vortex mixing or sonication for 3-5 mins.

7.4.3 Detailed Standards Preparation Procedure-EPA 1633

7.4.4 Internal Standards-*See Attachment 1*

Internal Standards are purchased as a **stock mixture** at 250-1000 ng/mL.

These as transferred to a snap cap vial that has been pre-rinsed with 5 mM NaOH/MeOH then allowed to dry.

7.4.4.1 Working level of Non-Extracted Internal Standard (NIS) – make a 1:1 dilution of the stock by taking 500 µL of the Stock and adding 500 µL MeOH.

Use as is by adding 3 µL to 300 µL volumes for QC samples, or calibration.

7.4.5 Isotopic Surrogates (Extracted Internal Standards)- *See Attachment 2*

7.4.5.1 Stock Surrogates are purchased as a mixture at 250-5000 ng/mL. These are transferred to a snap cap vial that has been pre-rinsed with 5 mM NaOH/MeOH then allowed to dry.

Option 1- Use Stock as received and add 25 µL to all samples/QC to be extracted.

Option 2- Prepare **2** mL of Working EIS by preparing a 1:2 dilution to yield 125-2500 ng/mL for use as follows:

Take 1000 µL of the Surrogate Stock, plus 25 µL of 5 mM NaOH/MeOH and 975 µL MeOH to give 2.0 mL final volume**. 50 µL are added to ALL preparation blanks, samples, and QC**. This is sufficient for approx. 40 x 50 µL additions to all blanks, QC, and samples.

This corresponds to adding 5 to 100 ng of EIS compounds to the initial samples and QC. The final volume of extractions will typically be 5.0 ml so this yields 1-20 ng/mL of the isotope EISs in the final extract for analysis.

For calibration, the Stock mix at 250-5000 ng/mL is used by adding 100 uL up to 1.0 mL final volume to yield 25/500 ng/mL in each calibration level as directed in the calibration section 7.4.7.1.

7.4.6 Target Analytes- EPA 1633- *See Attachment 3*

The target analytes for this method are purchased commercially from Wellington Labs using the five part numbers described in Section 7.3.3. They contain the method target analytes only at varying concentrations. These mixtures are transferred from their glass ampules to snap cap vials that have 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 are listed in the documentation and are reflected in both Mass Hunter and Element.

Preparation of a 1.0 mL volume of a 10x intermediate of each of the 5 mixes for Calibration. Some of the higher levels on the curve use aliquots of the stock as shown in Figure 2.

Scale the volume accordingly if less is desired. Note that the EPA 1633 mixes come 1.2 mL per vial so this recipe may consume one vial quickly.

7.4.6.1 OPR and LLOPR - these are a mid-level blank spike and low-level blank spike (at 2x the LOQ). These are prepared as follows from the EPA 1633 Target mixtures (5 components) by taking 200 µL of each STOCK into a snap cap vial giving 1.0 mL final volume.

1. Element ID Y22B199 - PFAC-MXF mix 200 µL.
2. Element ID Y22B200 - PFAC-MXG mix 200 µL.
3. Element ID Y22B201 - PFAC-MXH mix 200 µL.
4. Element ID Y22B204 - PFAC-MXI mix 200 µL.
5. Element ID Y22B205 - PFAC-MXJ mix 200 µL.

For OPR (BS) at mid-level add 100 µL to each matrix for the batch OPR and for the **LLOPR add 20 µL** of the spike mix and process through all steps of the specific matrix preparation.

7.4.7 Second Source Standard

The Second Source intermediate standard is prepared in a similar manner to Target Analytes detailed in the previous section whereby a 10x intermediate is prepared by diluting 100 µL of stock obtained from Absolute Standards (2 µg/mL) in 1.0 mL of solvent. The final concentration of this standard is nominally 200 ng/mL.

7.4.8 Calibration

Calibration of the LC-MSMS systems is done by an eight-level calibration covering the range 0.2 to 1650 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. Six to eight levels are prepared depending upon the analyte. These levels are prepared as directed below using the internal standards, surrogates, and target analytes from above.
This is made to a final volume of 1000 µL in the matrix described in section 7.1.13 (MeOH/Water/acetic acid/ammonium hydroxide)

This preparation excludes the ISTD in the initial preparation. After preparation as directed, withdraw 300 µL of each level into a 500 µL PP vial and add 3 µL of ISTD before analysis, cap, and vortex to mix.
These are stored at <10C and are stable for 6 months when prepared as directed.

7.4.7.1 Calibration Curve Preparation - Based upon a final volume of 1.0 mL in CAL Matrix Solution*

See Attachment 4 for details.

EPA 1633 Calibration Standard Preparation
Rev 1.,0 10/03/22

For Final volume of 1.0 mL
Recipe uses both a 1:10 intermediate for some levels AND the Stock for other points as indicated
All standards in Stds refrig. Adjacent to QQQ1 N2 generator in box labeled EPA 1633 standards- all are opened, labeled and good to use.

Level	*Stock: Y22B201* **1633 MXH Targets Intermediate @10x * uL of MXH 10x Interm.**	*Stock: Y22B200* **1633 MXG Targets Intermediate at 10x* ul of MXG interm.**	*Stock: Y22B199* **1633 MXF Targets Intermediate at 10x* ul of MXF interm.**	*Stock: Y22B204* **1633 MXI Targets Intermediate at 10x* ul of MXI interm.**	*Stock: Y22B205* **1633 MXJ Targets Intermediate at 10x* ul of MXJ interm.**	*Stock: Y22B198* **1633 EIS isotope Mix Intermediate at 10x uL of EIS Interm.**
1	2	2	4	2	2.5	50
2	5	5	10	5	6.25	50
3	12.5	12.5	25	12.5	15.6	50
4	25	25	50	25	31.3	50
5	50	50	100	50	62.5	50
6	125	125	250	125	15.6 of Stock	50
7	25 of Stock	25 of Stock	50 of Stock	25 of Stock	31.2 of Stock	50
8	62.5 of STOCK	62.5 of STOCK	125 of STOCK	62.5 of STOCK	78.0 of Stock	50

* 100 uL up to 1 mL in MeOH

*CAL MATRIX: Methanol with 4% water, 1% ammonium hydroxide and 0.625% acetic acid – Prepared by adding ammonium hydroxide (3.3 mL, 30%), reagent water (1.7 mL) and acetic acid (0.625 mL) to methanol (92 mL), store at room temperature, replace after 1 month. This solution is used to prepare the instrument blank <u>and is used to dilute the extracts of samples that exceed the calibration range</u>.

Amount of CAL Matrix to make up to 1.0 mL Final volumes:

CAL LEVEL	µL of CAL Matrix
1	937.5
2	918.8
3	871.9
4 *	793.7
5	637.5
6	309.0
7	843.8
8	609.5

INTERNAL STANDARD MIX (non-extracted IS-NIS). Mix 500 µL of STOCK ISTD at 250-1000 ng/mL with 500 µL of Methanol. This results in 125-500 ng/mL Intermediate ISTD. See 7.4.4.1.

Add 3.0 µL to 300 µL of each level 1-8 in a 500 µL PP autosampler vials and cap with polyolefin cap, vortex to mix and run. Add 3 µL to 300 µL of all sample/QC extracts before analysis.

*Level 4 is also used as the CCV for each analysis sequence run initially, then after every 10 samples and at the end of the sequence. Multiple vials should be prepared for this level.

7.4.9 Checking the Efficacy of the Surrogate/Spike Mixes

On a monthly basis the surrogate (EIS) and spike mixes from the vials used for spiking are assayed to ensure stability. These are prepared for the analysis by taking 3.0 µL of the surrogate (EIS) mix and 3 µL of the Spike mix into 294 µL MeOH/Water/Acetic Acid/Ammonium hydroxide from 7.1.13, then add 3 µL of NIS (ISTD). This yields a 1:100 dilution of the EIS and Spike mixes. Use 100 as the dilution factor in the Mass Hunter worklist.

7.4.10 Second Source - Initial Calibration Verification (ICV)

The initial calibration verification is prepared in a similar manner to calibration standards whereby 50 µL of intermediate stock is diluted in 1.0 mL of solvent. The final concentration of this standard is nominally 10 ng/mL.

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.

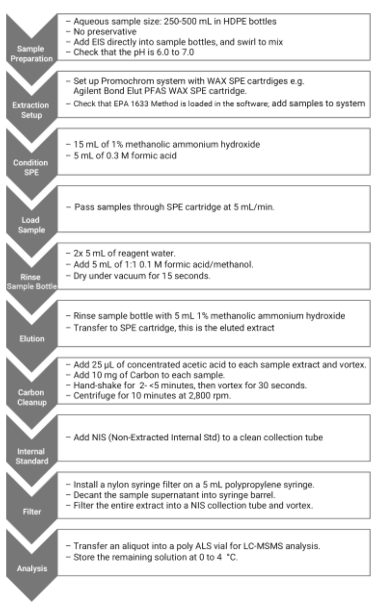
8.2 Sample Preparation (Extraction, Clean-up and Concentration)-Aqueous Matrices

A summary of the steps for the steps related to aqueous samples are shown in Figure 1.0 and in the summary below.

1. Determine % Suspended Solids – 10.0 mL $\pm$ 0.02 mL through a tared 0.2 um PP filter. Dry filter $\geq$ 12 hours @ 105C, cool in desiccator. Calc % TSS.
2. Check pH with short range pH paper to insure pH = 6.5 $\pm$ 0.5. Adjust as necessary with either 5% aqueous formic acid to lower pH or with 3% aqueous ammonium hydroxide to raise pH.
3. Weigh sample bottle as is to $\pm$ 0.1 g.-remove cap first since that will not be weighed later since autosampler caps are used.
4. Homogenize sample by inversion 3-4 x-place full volume on Promochrom System using WAX SPE cartridges.
5. Set up MBLK, OPR at 2x LOQ (low LCS) and mid-level OPR (mid-level LCS)-spike with 10 µL of Spike mix for LLOPR and 100 µL of spike mix for mid-OPR.
6. Spike all with 25 µL EIS solution (isotopic surrogates)

7. Follow Promochrom method for EPA 1633
8. Initiate SPE program EPA1633AQ on the Promochrom system
9. Once the program is finished there will be 5 ml in the collection tube. If less, make up to exactly 5.0 mL with MeOH.
10. Remove the sample bottle from the Promochrom system and weigh the empty bottle. That will determine the weight (volume for water) assume 1 g = 1.0 mL. Enter this value into the element bench sheet and the initial volume.
11. Add 25 µL of concentrated acetic acid to each collection tube and vortex to mix.
12. Add 10 mg of activated carbon to all samples and QC. Hand mix and vortex mix for no more than 2 minutes.
13. Centrifuge at 2800 rpm for approx. 10 minutes.
14. Filter the final volume through 0.2 um nylon filter using a syringe.
15. If the client provides only 250 mL of sample, in order to meet reporting limits, it may be required to concentrate the unfiltered extract by a factor of at least 2 on a TurboVap at 1.2 Liters/min with nitrogen at <55 ^{o}C. For example, if the final volume is 5.0 mL, concentrate to 2.0 mL final volume (2.5 x concentration). If 500 mL is provided, skip this step.
16. Enter the final volume achieved into the bench sheet in Element.
17. Transfer a portion of the final extract to a 2 mL snap cap, labeled.
18. Take a 300 µL portion of the extract into a 500 µL PP autosampler vial, add 3 µL of NIS (non-extracted internal std.). Cap, vortex, store at <6 ^{o}C.
19. Sample is ready for analysis.

Figure 1.0 Aqueous Sample Preparation Steps



8.2.1 To measure sample initial volume for aqueous samples, remove the cap and weight the bottle and record the weight in the sample weight. For MBLK, LLOPR and OPR use 250-500 mL volumes). After SPE processing, be sure the empty bottle is dry and weight to determine the amount of sample in grams (essentially equal to volume in mL). Use that number for the initial volume in Element LIMS.

8.2.2 For every 20 field samples (Field blanks are considered field samples in as they are treated as such), a blank (MBLK), blank spikes, (2 levels-LLOPR and OPR as BS1 and BS2 respectively. A matrix spike is not necessary since isotope dilution is used. If an MS/MSD is required by a specific project, spike 100 µL of the mid-level BS mix (OPR).

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

8.2.4 Add 25 µL of EIS (isotopic surrogates) (250/5000 ng/mL) to each sample and QC sample, recap, and invert to mix well.

8.2.5 Add, 20 µl (low level spike), 100 µL (mid-level spike)

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 or equivalent are full. Prime all lines and align all components.

8.2.7. Load in the EPA1633 method and adjust the sample volume to 10 mL more than the highest volume container measured by visual comparison to a calibrated bottle of the same size. Please refer to *Appendix 2: Promochrom Method* detailing the automated SPE extraction method on the Promochrom system.

8.2.8 The SPE method solvents for extractions are as follows:

- Solvent 1 = MeOH
- Solvent 2 = H_2O
- Solvent 3 = 0.3 M Formic acid,
- Solvent 4 = 1:1 0.1M Formic Acid/MeOH,
- Solvent 5 = MeOH with 1% ammonium hydroxide (“Basic MeOH”)
  W1 = Aqueous waste, W2 = Organic waste

8.2.9 Place labeled 15 mL graduated 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 Connect the bottles to the automated system.

8.2.12 Initiate the EPA1633Aq SPE Extraction Program. Each run is approximately 1 hour 45 minutes.

8.2.13 **Evaporation Options** - Aqueous Samples

N-EVAP systems

8.2.13.1 The resulting 5 mL extracts are not further concentrated unless Work Plan reporting limits need to be lower than standard RLs. When this is required by the Work Plan, the extracts and QC are transferred to the N-EVAP concentrator systems operated at 50-55 degrees C (never more than 55C) in their original collection vials. The nitrogen flow is initiated at 1.2 ml/min and adjusted on each individual sample to provide a gentle stream causing a slight disturbance at the surface of the methanol extracts.

8.2.13.2 As this evaporation proceeds the walls of each vessel are rinsed with methanol when the volume is approximately 2.5 mL and then again when the volume is reduced to just below 2.0 mL. Then Bring up the final volume to 2.5 mL. This is a 2x concentration when needed.

8.2.14 Swirl final extract, make up to 2.0 mL with methanol. Using a disposable polypropylene pipet, carefully transfer to a 2 mL PP snap cap vial.

8.2.15 Withdraw an aliquot of 300 µL into a 500 µL autosampler vial (PP) and add 3.0 µL of ISTD (NIS) mix.

8.2.16 Cap with polyolefin flexible caps and vortex to mix.

8.2.17 Store Extracts at <6ºC until analysis.

8.3 Sample Preparation (Extraction, Clean-up, and Concentration) - Soil Matrices

1. Determine % solids: use 5 grams; dry at 110C $\geq$ 12 hours.
2. Mix sample with a stainless-steel spatula to homogenize-exclude Sticks, vegetation, rocks and the like.
3. Remove 5.0 g. from the homogenized sample container. Add to a tared 50 mL centrifuge tube. Determine the weight $\pm$ 0.01 g.
4. Prepare QC using clean matrix (Ottawa Sand) wetted with 1 mL PFAS free water in 50 mL centrifuge tubes.
5. For all samples, QC blanks and LCSs (LLOPR and ML OPR) and a 25 µL aliquot of EIS onto the soil. The current Element standard ID is Y22J305. For the OPRs add

appropriate amount of spike solution (20 µL for LLOPR and 100 µL for OPR. The current Element Std ID is Y22J304.

6. Swirl the samples to mix then let sit for 30 minutes.
7. Add 10 mL of 0.3% methanolic ammonium hydroxide to each centrifuge tube.
8. Vortex to mix then shake on the shaker table for 30 minutes.
9. Next, centrifuge at 3500 rpm for 5 minutes or 2800 rpm for 10 minutes.
10. Transfer the supernatant liquid to a clean 50 mL centrifuge tube
11. Add 15 mL of 0.3% methanolic ammonium hydroxide to each of the original centrifuge tubes.
12. Vortex to mix then shake on the shaker table for 30 minutes.
13. Next, centrifuge at 3500 rpm for 5 minutes or 2800 rpm for 10 minutes.
14. Transfer the supernatant liquid to the centrifuge tubes from 10.0 above.
15. Add another 5 mL of 0.3% methanolic ammonium hydroxide to each of the original centrifuge tubes.
16. Vortex to mix then shake on shaker table for 30 minutes.
17. Next, centrifuge at 3500 rpm for 5 minutes or 2800 rpm for 10 minutes.
18. Transfer the supernatant liquid to the centrifuge tubes from 10.0 above.
19. Add 10 mg of activated carbon to the combined extract using a 10 mg scoop and hand swirl for 2 minutes (never more than 5 minutes of losses of Target PFAS will occur)
20. Centrifuge at 3500 rpm for 5 minutes or 2800 rpm for 10 minutes
21. Immediately Decant into a 50 mL centrifuge tube.
22. Place in TurboVap or on the N-EVAP system and concentrate at 55 deg. C to a final volume of approx. 7 mL at a nitrogen flow of 1.2 mL/min.
23. Add 35-40 mL of PFAS free water to the tube and vortex to mix.
24. Check the pH= 6.5 $\pm$ 0.5 if not adjust accordingly using 5% formic acid to lower pH or 3% aqueous ammonium hydroxide to raise pH to within this range.
25. Set up the soil EPA 1633 method on the Promochrom be sure volume is set to 50 ml for sample size. Please refer to *Appendix 2: Promochrom Method* detailing the automated SPE extraction method on the Promochrom system.
26. Place samples and QC centrifuge tubes on the autosampler
27. Once the program is finished, note the final volume and use that in the Element bench sheet as final volume. Should be 5.0 mL. If less make up to 5.0 mL with MeOH.
28. Add 25 µL of concentrated acetic acid to each collection tube and vortex to mix.
29. Add 10 mg of carbon to all samples and QC and mix for 2 minutes (no more than 5 minutes).
30. Immediately centrifuge at 2800 rpm for 10 minutes.

31. Filter the extract through a 0.2 um nylon membrane using a syringe and filter into a 2 mL snap cap vial.
32. When ready for analysis, remove 300 µL of extract and transfer to a 500 µL autosampler vial. Add 3 µL of NIS (internal standard), vortex to mix. Cap with polyolefin flexible caps and vortex to mix.
33. Store Extracts at <6^{o}C until analysis
34. Samples/QC are now ready for analysis.

8.4 Sample Analysis--Running Samples/QC - Acquisition Method

The acquisition method is detailed in Attachment 4 (HPLC) and Attachment 5 (MS/MS) of this SOP. The method is an 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.

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 or M-COOH for HFPO-DA.

8.3.2 The MS/MS is checked for tuning on a weekly basis (if necessary) before analysis using the Tune context by selecting the CHECKTUNE radio button. This is done only in negative ion mode since that is what we are operating under. If the Checktune fails, run the Autotune program-note: this takes approx. 45 mins. in negative mode. After autotune or any tuning adjustment, a re-calibration of the instrument is required.

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 a blank, a primer (5 ng/mL) followed by a blank with ISTD to establish system cleanliness.

8.3.5 After a successful initial calibration has been completed, the analytical sequence for a batch of samples analyzed during the same time period is as follows. Standards and sample extracts must be brought to room temperature and vortexed prior to aliquoting into an instrument vial in order to ensure homogeneity of the extract.

8.3.6 **Analysis Sequence**

1. Instrument Blank *
2. Instrument Sensitivity Check –**LOQ Standard Level (SEQ-CAL 1) S/N > 3:1**
3. Calibration Verification Standard (CCV)
4. Qualitative Identification Standards –Branched PFAS
   PFOA, PFNA, PFOSA, NMeFOSA, NEtFOSA, NEtFOSE, and NMeFOSE.
5. Instrument Blank (SEQ-CCB) *
6. Method Blank (Batchxxxx-BLK1)
7. Low-level OPR (LLOPR) (Batchxxxx-BS1)
8. OPR (Batchxxxx-BS2)
9. Field Samples (10 or fewer)
10. Calibration Verification Standard (SEQ-CCVn)
11. Instrument Blank (SEQ-CCBn) *
12. Field Samples (10 or fewer)
13. Calibration Verification Standard (SEQ-CCVn)
14. Instrument Blank (SEQ-CCBn) *

* Contains solvent system for calibration, NIS, and EIS

8.3.7 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 300 µl aliquot of sample extract containing 3 µL of internal standards into a PP auto-sampler vial. Apply Polyolefin 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 (0.25-0.5 ng/mL), then at a mid-level and high level rotating every ten samples (5, 25 ng/mL) and ending with a mid-level CCV.
- Enter the Worklist (<u>injection sequence</u>) into the instrument software and load samples onto the auto-sampler in the order shown above in Section 8.3.6

8.5 Data Review

The Agilent Mass Hunter Quantitation program is used to review all data. All identifications are based upon retention time (RT) of the transition of the precursor to product ion represented by a peak. Retention times should not vary more than ± 0.5 minutes as compared to the initial CCV analyzed for an analytical sequence. All positive detections of target PFAS must be less than the high point concentration of the calibration curve.

8.5.1 Since certain PFAS species are manufactured by different processes the presence of branched as well as linear isomers may be found. To properly quantitate these species, the analyst must sum the related branched and linear isomers. This affects the following species: PFOS, PFHxS, PFOA, PFNA, PFOSA, NMeFOSA, NEtFOSA, NEtFOSE, and NMeFOSE.

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 0.20 ng/mL to 1560 ng/mL nominal conc. or higher depending upon the linearity of the PFAS species. After acquisition, the data are quantitated in Mass Hunter and the default calibration model for target compounds is generated using Quadratic regression, FORCED through the origin where applicable. All same level species (EIS) used average response factor model. 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. Average Response Factor (RF) or Relative Standard Deviation (RSD) should be $\leq$ 20% where used.

9.1.1 The calibration levels as shown in Section 7.4.7 use 8 levels. All points are included in the calibration with the exception of some species that saturate at levels 7 and 8.

9.2 Calibration Verification

9.2.1 Relative Standard Error (RSE): For calibrations using an average RF curve fit, the relative standard deviation (RSD) is the measure of relative error. However, if a quadratic regression is used RSE should be calculated for calibration curve. RSE is calculated by the Mass Hunter software. The RSE for all method analytes should be ≤ 20% to establish instrument linearity.

9.2.2 An independently prepared 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) and prepared from a separate preparation as that of the calibration. Unless project-specific data quality objectives are required, the values from the second-source check should be ± 30% of the expected concentration.

9.2.2.1 **Corrective Action**: Quantitative sample analyses should not proceed for a failing ICV. Recalibrate and re-run the ICV if necessary.

An independently prepared 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) and prepared from a separate preparation as that of the calibration. Unless project-specific data quality objectives are required, the values from the second-source check should be ± 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 is at a mid-level and analyzed every 10 client samples including a closing CCV.

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 of 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)

10.1.1 The initial demonstration requirement of EPA 1633 must be acceptable before analysis of samples may begin. To establish the ability to generate acceptable precision and recovery, the laboratory must perform the following operations for each sample matrix type to which the method will be applied by that laboratory.

The IDOC includes the following key elements:

- Initial Demonstration of Precision and Recovery (IPR)
- MDL determination

10.1.2 Initial Demonstration of Precision and Recovery-IPR

- Extract, concentrate, and analyze four aliquots of aqueous and soil matrices spiked with 100 µL of the native spike solution OPR Mix Y22J304, 50 µL of the EIS solution no. Y22J305. At least one method blank, matching the matrix being analyzed, must be prepared with the IPR batches by matrix. All sample processing steps that are used for processing samples, including preparation and extractions, cleanup and concentration, must be included in this test.

- Using results of the set of four analyses, compute the average percent recovery (R) of the extracts and the relative standard deviation (RSD) of the concentration for each target and EIS compound.
- For each native and isotopically labeled compound, compare RSD and % recovery with the corresponding limits for initial precision and recovery in Table 5. If RSD and R for all compounds meet the acceptance criteria, system performance is acceptable, and analysis of blanks and samples may begin. *Note these acceptance criteria are not finalized and are based upon a single lab validation. Data for this table is derived from the single-laboratory validation study and are only provided as examples for this draft method. The data will be updated to reflect the inter-laboratory study results in a subsequent revision. Therefore, these criteria will change after inter-laboratory validation. Several sections of this method state that Table 5 criteria are required, this is standard language that will be applicable when the method is finalized.*

10.1.3 MDL Determination

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).

The levels extracted represent approx. 3-5 x the expected LOQ.

Once extracted, the analyses are conducted on 3 separate days 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 MDL_b (MDL based on method blanks-LRBs) as follows:

- If none of the blanks give numerical results, then the MDL_b does not apply.
- If only some of the blanks (but not all) give a result, set the MDL_b to the highest result found.
- If ALL method blanks show a detection, then use the following calculation to determine MDL_b:

MDL_b = Average of Blank Detections + (3.143 x Std. Dev.)

Calculate the final MDL by selecting the greater of MDL_s or MDL_b.

10.2 On-going QC Requirements

Preparation 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.

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 may contain a matrix spike/matrix spike duplicate (MS/MSD), two laboratory control samples (LCS-LLOPR and OPR) and a method blank. Laboratory generated QC samples (Blank, LLOPR, OPR, 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.

10.2.1 <u>METHOD BLANK</u> - One method blank must be extracted with every prep batch of similar matrix, not to exceed twenty (20) samples. For aqueous samples the matrix is Lab reagent water. For Soils the method blank matrix is

Ottawa sand. Criteria:

- The method blank must not contain any analyte at or above 1/2 the LOQ (Reporting Limit).

- Re-extraction and reanalysis of samples associated with an unacceptable method blank is required when reportable concentrations are determined in the samples.

10.2.2 LABORATORY CONTROL SAMPLES (LCS- also called OPR and LLOPR) 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 spiked with analytes of known identity and concentration and isotopic surrogate analogs. The OPRs must be processed in the same manner and at the same time as the associated samples. Recovery for Aqueous low level OPR target analytes are 40-150% until more data are derived. For all other Aqueous OPR levels recovery targets are 50-150%. These data are based upon EPA 1633 draft ranges that will change and are not used for acceptance/rejection but are reported until such time that fully validated acceptance ranges are provided in the final version of the method.

10.2.3 Matrix spike/Matrix spike duplicate (MS/MSD or MS/MSD). These are not typically required since each sample contains isotopic PFAS analogues that correct for any matrix effects. If the client requests them, then they are processed accordingly but are not a requirement of this method. If done they are by 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 Laboratory control limits are flagged accordingly. Until enough statistical data per matrix is available, no criteria are offered. If a specific QA Project Plan has required limits, this is preempted. Any outliers must be qualified accordingly.

10.2.4 Initial calibration verification (ICV) –A second source standard is not required for this method. A second independently prepared mid-level standard is prepared and used for this purpose and analyzed after the ICAL. The concentration should be at the mid-range of the curve and must recover within 70-130 % 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.

10.2.5 Internal Standard- The Non-extracted Internal Standard (NIS) is added to each field and QC sample prior to analysis. The IS response (peak area) must not deviate by more than 50-200% from the mean response (peak area) of the initial calibration. If the areas are low for all the field samples and QC samples in the batch, it suggests a loss of instrument sensitivity, while low areas in only some field or QC samples suggests a possible bad injection.

Corrective action includes:

- Reinject the questionable samples.
- Verifying the CCV NIS areas are compliant with the range, if so, this suggests either matrix effects or may require a small dilution to mitigate interference if only some of the NIS compounds are affected.
- Qualify affected data.

10.3 Initial Demonstration of Capability (IDC)

Initial Demonstration of Capability involves the following processes listed ion Table 1.0 as follows.

Table 1.0 - Initial Demonstration of Capability (IDC)

Requirement	Specification and Frequency	Acceptance Criteria
Initial Demonstration of Precision and Recovery (IPR)	Extract, concentrate, and analyze four aliquots of the matrix (aqueous and soil) spiked with target native standard solution, EIS solution and finally the NIS (ISTD). Extract a method blank of each matrix with each matrix IPR batch. All steps that are used for processing samples, including preparation and extraction must be included.	Using results of the set of four analyses, compute the average percent recovery (R) of the extracts and the relative standard deviation (RSD) of the concentration for each target and EIS compound.
		For each native and isotopically labeled compound, compare RSD and % recovery with the corresponding limits for initial precision and recovery in Table 5. If RSD and R for all compounds meet the acceptance criteria, system performance is acceptable, and analysis of blanks and samples may begin.
Method Detection Limit (MDL)	Method detection limit (MDL) - Each laboratory must also establish MDLs for all the analytes using the MDL procedure at 40 CFR Part 136, Appendix B. An MDL determination must be performed for all target compounds.	The minimum level of quantification (ML) can be calculated by multiplying the MDL by 3.18 and rounding to the nearest integer

Calibration Verification (ICV or SCV) *Section 9.1.5*	Analyze a mid-level ICV, each time a new calibration is performed or at a minimum, quarterly. The ICV must be an independent dilution beginning with the common starting materials used for ICAL. No 2nd source is required due to availability.	Results must be 70-130% of true value.

10.4 **QC Requirements**

Ongoing QC requirements are detailed in Table 3.0 as follows.

Table 3.0 QC Requirements

Summary of Quality Control Method Reference	**Requirement**	**Specification and Frequency**
Section 10.1	Mass Calibration	Annually and on as-needed basis
Section 10.1.7	Mass Calibration Verification	After mass calibration
Section 10.3	Initial Calibration (ICAL)	Minimum 6 calibration standards for linear models and 7 calibration standards for non-linear models.
Sections 10.2.2, 14.4	Retention Time (RT) window	After ICAL and at the beginning of analytical sequence
Sections 7.3.1, 9.4	Extracted Internal Standard (EIS) Analytes	All CAL standards, batch QC and field samples
Sections 7.3.2	Non-extracted Internal Standards (NIS)	All CAL standards, batch QC and field samples
Sections 7.3.4, 10.3.1, 13.3	Instrument Sensitivity Check (ISC)	Daily, prior to analysis
Section 14.2	Calibration Verification (CV) (CCV)	At the beginning and every 10 samples and at the end
Section 14.6	Instrument Blank	Daily prior to analysis and after high standards
Sections 9.1.3, 9.5, 14.7	Method Blank (MB)	One per preparation batch
Section 14.5	Ongoing Precision Recovery (OPR)	One per preparation batch
Section 11.0	Limit of Quantitation Verification (LLOPR)	Prior to analyzing samples
Section 11.0	Matrix Spike (MS/MSD)	One per preparation batch (if required) Normally not needed, since Isotope dilution is employed

11.0 DATA REVIEW, CALCULATIONS AND REPORTING

Samples concentrations are determined using either 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. 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 considering 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.

11.3 All Data are uploaded into Element LIMS and all final concentration calculations and associated recoveries are detailed. All pdfs of Mass Hunter Quant reports are uploaded to the Element Raw Data drive for association with ICALs and all batch and analysis sequence runs. Data are set to Analyzed status once uploaded and initially reviewed, then locked.

11.4 The Data is then evaluated using the York Qualinator ™ data review tool which evaluates all data CCVs, QC, ISTDS, Recoveries, etc. and automatically assigns outlier qualifiers for review and acceptance by the reviewer. The accepted data are then uploaded to Element and final reviewed in Laboratory Data Entry/Review module. Once reviewed, the status is set to Reviewed indicating the data are ready to be Reported by the Reporting Group.

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 a 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 always be worn 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	-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.
Acetic Acid, Glacial	-Flammable liquid and vapor. -Irritation	10 ppm TWA; 25 mg/m3 TWA	**Eye:** Causes severe eye irritation. Contact with liquid or vapor causes severe burns and possible irreversible eye damage. **Skin:** Causes skin burns. May be harmful if absorbed through the skin. Contact with the skin may cause blackening and hyperkeratosis of the skin of the hands. **Ingestion:** May cause severe and permanent damage to the digestive tract. Causes severe pain, nausea, vomiting, diarrhea, and shock. May cause polyuria, oliguria (excretion of a diminished amount of urine in relation to the fluid intake) and anuria (complete suppression of urination). Rapidly absorbed from the gastrointestinal tract. **Inhalation:** Effects may be delayed. Causes chemical burns to the respiratory tract. Exposure may lead to bronchitis, pharyngitis, and dental erosion. May be absorbed through the lungs. **Chronic:** Chronic exposure to acetic acid may cause erosion of dental enamel, bronchitis, eye irritation, darkening of the skin, and chronic inflammation of the respiratory tract. Acetic acid can cause occupational asthma. One case of a delayed asthmatic response to glacial acetic acid has been reported in a person with bronchial asthma. Skin sensitization to acetic acid is rare, but has
Ammonium Hydroxide, conc. 28-30%	- Inhalation hazard - Skin Corrosion -Eye Damage and Irritation	OSHA PEL: 35 mg/m3 ; 50 ppm OSHA TWA: 18 mg/m3; 25 ppm	Ammonia is an irritant and corrosive to the skin, eyes, respiratory tract and mucous membranes. May cause severe chemical burns to the eyes, lungs and skin. Skin and respiratory related diseases could be aggravated by exposure. The extent of injury produced by exposure to ammonia depends on the duration of the exposure, the concentration of the liquid or vapor and the depth of inhalation. Exposure Routes: Inhalation (vapors), skin and/or eye contact (vapors, liquid), ingestion (liquid).

Formic Acid, conc.	-Flammable liquid and vapor -Harmful if swallowed -Causes severe skin burns and eye damage -Toxic if inhaled -May cause respiratory irritation	OSHA TWA: 5 ppm or 9 mg/m3 OSHA PEL: 10 ppm	Formic acid is an irritant and corrosive to the skin, eyes, respiratory tract and mucous membranes. May cause severe chemical burns to the eyes, lungs and skin. Skin and respiratory related diseases could be aggravated by exposure. The extent of injury produced by exposure to ammonia depends on the duration of the exposure, the concentration of the liquid or vapor and the depth of inhalation. Exposure Routes: Inhalation (vapors), skin and/or eye contact (vapors, liquid), ingestion (liquid).

13. WASTE MANAGEMENT/POLLUTION PREVENTION

<u>Neat Materials</u>

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.

<u>Solvents</u>

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.

<u>Acids and Bases</u>

The acids and bases used for this procedure include Acetic Acid and Formic Acid. The bases used are Ammonium hydroxide, sodium hydroxide and potassium hydroxide. Store concentrated base and acids separately whether waste or neat material.

<u>Samples</u>

Unused or remaining water samples are returned to the sample control room for continued storage for proper disposal by the sample control group.

14. REFERENCES

1. EPA METHOD 1633 Draft 3 December, 2022- Analysis of Per- and Polyfluoroalkyl Substances (PFAS) in Aqueous, Solid, Biosolids, and Tissue Samples by LC-MS/MS; EPA 821-D-22-001

15. REVISION HISTORY

Revision 1.0	10/24/2022	First issue.
Revision 1.1	02/10/2023	Modified LLOPR in Section 7.4.6.1 to reflect 2x the MRL
Revision 1.2	06/23/2023	Added *Appendix 1: Target Compound Reporting Limits*. Updated Section 9.2 to add acceptable limits for ICAL RSE. Described the Promochrom extraction method in Sections 8.2, 8.3, and added *Appendix 2: Promochrom Method*. Redefined analytical batch as analytical sequence. Updated Reference to EPA 1633 Draft 3. Added reference to and preparation procedures for a second source standard in Section 7. Revised qualitative identification requirements for analytes in Section 8. Minor formatting edits.

Appendix 1 – Target Compound Reporting Limits

Target Compoud	Soil		Water	
	MDL/LOD µg/kg	RL/LOQ µg/kg	MDL/LOD ng/L	RL/LOQ ng/L
Perfluorobutanesulfonic acid (PFBS)	0.111	0.177	0.47	1.77
Perfluorohexanoic acid (PFHxA)	0.053	0.200	0.35	2.00
Perfluoroheptanoic acid (PFHpA)	0.105	0.200	0.71	2.00
Perfluorohexanesulfonic acid (PFHxS)	0.179	0.183	0.68	1.83
Perfluorooctanoic acid (PFOA)	0.172	0.200	0.42	2.00
Perfluorooctanesulfonic acid (PFOS)	0.167	0.186	0.82	1.86
Perfluorononanoic acid (PFNA)	0.189	0.200	0.52	2.00
Perfluorodecanoic acid (PFDA)	0.191	0.200	0.75	2.00
Perfluoroundecanoic acid (PFUnA)	0.198	0.200	1.13	2.00
Perfluorododecanoic acid (PFDoA)	0.163	0.200	0.88	2.00
Perfluorotridecanoic acid (PFTrDA)	0.125	0.200	0.74	2.00
Perfluorotetradecanoic acid (PFTA)	0.103	0.200	0.69	2.00
N-MeFOSAA	0.148	0.200	0.79	2.00
N-EtFOSAA	0.194	0.200	1.03	2.00
Perfluoropentanoic acid (PFPeA)	0.109	0.400	0.23	4.00
Perfluoro-1-octanesulfonamide (FOSA)	0.146	0.200	0.88	2.00
Perfluoro-1-heptanesulfonic acid (PFHpS)	0.155	0.200	0.91	1.91
Perfluoro-1-decanesulfonic acid (PFDS)	0.191	0.193	1.32	1.93
1H,1H,2H,2H-Perfluorooctanesulfonic acid (6:2 FTS)	0.595	0.760	1.06	7.60
1H,1H,2H,2H-Perfluorodecanesulfonic acid (8:2 FTS)	0.755	0.768	2.05	7.68
Perfluoro-n-butanoic acid (PFBA)	0.109	0.800	0.33	8.00
Perfluoro(2-ethoxyethane)sulfonic acid (PFEESA)	0.139	0.356	0.50	3.56
Perfluoro-3,6-dioxaheptanoic acid (NFDHA)	0.193	0.400	2.14	4.00
Perfluoro-4-oxapentanoic acid (PFMPA)	0.062	0.400	0.25	4.00
Perfluoro-5-oxahexanoic acid (PFMBA)	0.096	0.400	0.37	4.00
Perfluoro-1-pentanesulfonate (PFPeS)	0.157	0.188	0.76	1.88
1H,1H,2H,2H-Perfluorohexanesulfonic acid (4:2 FTS)	0.595	0.750	1.79	7.50
HFPO-DA (Gen-X)	0.608	0.800	3.23	8.00
11CL-PF3OUdS	0.311	0.756	1.38	7.56
9CL-PF3ONS	0.246	0.748	0.70	7.48
ADONA	0.174	0.756	0.53	7.56
Perfluorododecanesulfonic acid (PFDoS)	0.169	0.194	0.93	1.94
Perfluoro-1-nonanesulfonic acid (PFNS)	0.124	0.192	0.86	1.92
3-Perfluoropropyl propanoic acid (FPrPA or 3:3FTCA)	0.634	1.000	2.03	5.00
3-Perfluoropentyl propanoic acid (FPePA or 5:3 FTCA)	2.098	5.000	7.33	25.00
3-Perfluoroheptyl propanoic acid (FHpPA or 7:3FTCA)	1.500	5.000	9.47	25.00
N-MeFOSE	0.611	2.000	3.99	20.00
N-MeFOSA	0.180	0.200	1.58	2.00
N-EtFOSE	0.697	2.000	3.99	20.00
N-EtFOSA	0.198	0.200	1.80	2.00

Appendix 2: Promochrom Method

Step	Action	Inlet 1	Inlet 2	Flow (mL/min)	Volume (mL)	Target
1	Elute	1% Basic Methanol	-	8	15	Waste
2	Elute	0.3M Formic Acid	-	8	5	Waste
3	Add Sample	Sample Inlet	-	10	60 or 510*	Waste
4	Rinse Sample	Water	Air (20%)	70	2.5	Sample Container
5	Add Sample	Sample Inlet	-	5	5	Waste
6	Rinse Sample	Water	Air (20%)	70	5	Sample Container
7	Add Sample	Sample Inlet	-	5	5	Waste
8	Rinse Sample	Water	Air (20%)	70	5	Sample Container
9	Add Sample	Sample Inlet	-	5	5	Waste
10	Rinse Sample	1:1 0.1M Formic Acid/Methanol	Air (20%)	70	1.3	Sample Container
11	Add Sample	Sample Inlet	-	5	3	Waste
12	Rinse Sample	1:1 0.1M Formic Acid/Methanol	Air (20%)	70	5	Sample Container
13	Add Sample	Sample Inlet	-	5	5	Waste
14	Air Purge	SPE Cartridge	-	5	5 Minutes	
15	Add Sample	Sample Inlet	-	5	5	Waste
16	Blow N2	Sample Inlet	-	5	1 Minute	
17	Rinse Sample	1% Basic Methanol	Air (20%)	70	1.3	Sample Container
18	Collect	Sample Inlet	-	5	3	Centrifuge Tube
19	Rinse Sample	1% Basic Methanol	Air (20%)	70	5	Sample Container
20	Collect	Sample Inlet	-	5	5	Centrifuge Tube
21	Collect	Sample Inlet	-	5	5	Centrifuge Tube

*60 mL is used for soil matrices and 510 mL is used for aqueous matrices.

Attachment 1 – Non-Extracted Internal Standards (NIS)

YORK
ANALYTICAL LABORATORIES, INC.

Analytical Standard Record

Standard ID: **Y22B197**

Description:	MPFAC-HIF-IS-EPA 1633 ISTD STOCK	Prepared:	02/16/2022
Standard Type:	Other	Expires:	09/07/2026
Solvent:	Methanol/Water (<1%)	Prepared By:	Robert Q. Bradley
Final Volume (mls):	1	Department:	PFAS
Vials:	1	Lot No.:	MPFACHIFIS0921
Vendor:	Wellington Laboratories		

Comments: Stock ISTD for EPA method 1633

Analyte	CAS Number	Concentration	Units
M3PFBA		1	ug/mL
MPFDA		0.25	ug/mL
MPFHxA		0.5	ug/mL
MPFHxS		0.474	ug/mL
MPFNA		0.25	ug/mL
MPFOA		0.5	ug/mL
MPFOS		0.479	ug/mL

WELLINGTON LABORATORIES

CERTIFICATE OF ANALYSIS DOCUMENTATION

MPFAC-HIF-IS

Mass-Labelled Perfluoroalkyl Substance Injection Standard Solution/Mixture

PRODUCT CODE:	MPFAC-HIF-IS
LOT NUMBER:	MPFACHIFIS0921
SOLVENT(S):	Methanol/Water (<1%)
DATE PREPARED: (mm/dd/yyyy)	09/07/2021
LAST TESTED: (mm/dd/yyyy)	09/07/2021
EXPIRY DATE: (mm/dd/yyyy)	09/07/2026
RECOMMENDED STORAGE:	Store ampoule in a cool, dark place

DESCRIPTION:

MPFAC-HIF-IS is a solution/mixture of five mass-labelled (^{13}C) perfluoroalkylcarboxylic acids (C_4, C_6, C_8-C_{10}) and two mass-labelled (^{18}O and ^{13}C) perfluoroalkanesulfonates (C_6 and C_8). The components and their concentrations are given in Table A.

The individual mass-labelled perfluoroalkylcarboxylic acids and mass-labelled perfluoroalkanesulfonates all have chemical purities of >98% and isotopic purities of $\geq$99% per ^{13}C or >94% per ^{18}O.

DOCUMENTATION/ DATA ATTACHED:

Table A: Components and Concentrations of the Solution/Mixture
Figure 1: LC/MS Data (SIR)
Figure 2: LC/MS/MS Data (Selected MRM Transitions)

ADDITIONAL INFORMATION:

- See page 2 for further details.
- Contains 4 mole eq. of NaOH to prevent conversion of the carboxylic acids to their respective methyl esters.

FOR LABORATORY USE ONLY: NOT FOR HUMAN OR DRUG USE

Wellington Laboratories Inc., 345 Southgate Dr. Guelph ON N1G 3M5 CANADA
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INTENDED USE:

The products prepared by Wellington Laboratories Inc. are for laboratory use only. This certified reference material (CRM) was designed to be used as a standard for the identification and/or quantification of the specific chemical compounds it contains.

HANDLING:

This product should only be used by qualified personnel familiar with its potential hazards and trained in the handling of hazardous chemicals. Due care should be exercised to prevent unnecessary human contact or ingestion. All procedures should be carried out in a well-functioning fume hood and suitable gloves, eye protection, and clothing should be worn at all times. Waste should be disposed of according to national and regional regulations. Safety Data Sheets (SDSs) are available upon request.

SYNTHESIS / CHARACTERIZATION:

Our products are synthesized using single-product unambiguous routes whenever possible. They are then characterized, and their structures and purities confirmed, using a combination of the most relevant techniques, such as NMR, GC/MS, LC/MS/MS, SFC/UV/MS/MS, x-ray crystallography, and melting point. Isotopic purities of mass-labelled compounds are also confirmed using HRGC/HRMS and/or LC/MS/MS.

HOMOGENEITY:

Prior to solution preparation, crystalline material is tested for homogeneity using a variety of techniques (as stated above) and its solubility in a given diluent is taken into consideration. Duplicate solutions of a new product are prepared from the same crystalline lot and, after the addition of an appropriate internal standard, they are compared by GC/MS, LC/MS/MS, and/or SFC/UV/MS/MS. The relative response factors of the analyte of interest in each solution are required to be <5% RSD. New solution lots of existing products, as well as mixtures and calibration solutions, are compared to older lots in a similar manner. This further confirms the homogeneity of the crystalline material as well as the stability and homogeneity of the solutions in the storage containers. In order to maintain the integrity of the assigned value(s), and associated uncertainty, the dilution or injection of a subsample of this product should be performed using calibrated measuring equipment.

UNCERTAINTY:

The maximum combined relative standard uncertainty of our reference standard solutions is calculated using the following equation:

The combined relative standard uncertainty, $u_c(y)$, of a value y and the uncertainty of the independent parameters $x_1, x_2, ... x_n$ on which it depends is:

$$u_c(y(x_1, x_2, ... x_n)) = \sqrt{\sum_{i=1}^{n} u(y, x_i)^2}$$

where x is expressed as a relative standard uncertainty of the individual parameter.

The individual uncertainties taken into account include those associated with weights (calibration of the balance) and volumes (calibration of the volumetric glassware). An expanded maximum combined percent relative uncertainty of ±5% (calculated with a coverage factor of 2 and a level of confidence of 95%) is stated on the Certificate of Analysis for all of our products.

TRACEABILITY:

All reference standard solutions are traceable to specific crystalline lots. The microbalances used for solution preparation are regularly calibrated by an external ISO/IEC 17025 accredited laboratory. In addition, their calibration is verified prior to each weighing using calibrated external weights traceable to an ISO/IEC 17025 accredited laboratory. All volumetric glassware used is calibrated, of Class A tolerance, and traceable to an ISO/IEC 17025 accredited laboratory. For certain products, traceability to international interlaboratory studies has also been established.

EXPIRY DATE / PERIOD OF VALIDITY:

Ongoing stability studies of this product have demonstrated stability in its composition and concentration, until the specified expiry date, in the unopened ampoule. Monitoring for any degradation or change in concentration of the listed analyte(s) is performed on a routine basis.

LIMITED WARRANTY:

At the time of shipment, all products are warranted to be free of defects in material and workmanship and to conform to the stated technical and purity specifications.

QUALITY MANAGEMENT:

This product was produced using a Quality Management System registered to the latest versions of ISO 9001 by SAI Global, ISO/IEC 17025 by the Canadian Association for Laboratory Accreditation Inc. (CALA; A1226), and ISO 17034 by ANSI National Accreditation Board (ANAB; AR-1523).

CALA Testing Accreditation No. A1226

ANAB ANSI National Accreditation Board ACCREDITED ISO 17034 REFERENCE MATERIAL PRODUCER

For additional information or assistance concerning this or any other products from Wellington Laboratories Inc., please visit our website at www.well-labs.com or contact us directly at info@well-labs.com

Table A: **MPFAC-HIF-IS; Components and Concentrations (ng/mL, ± 5% in methanol/water (<1%))**

Compound	Acronym	Concentration (ng/mL)		Peak Assignment in Figure 1
Perfluoro-n-(2,3,4-$^{13}C_3$)butanoic acid	M3PFBA	1000		1
Perfluoro-n-(1,2-$^{13}C_2$)hexanoic acid	MPFHxA	500		2
Perfluoro-n-(1,2,3,4-$^{13}C_4$)octanoic acid	MPFOA	500		4
Perfluoro-n-(1,2,3,4,5-$^{13}C_5$)nonanoic acid	MPFNA	250		5
Perfluoro-n-(1,2-$^{13}C_2$)decanoic acid	MPFDA	250		7
Compound	**Acronym**	**Concentration* (ng/mL)**		**Peak Assignment in Figure 1**
		as the salt	**as the acid**	
Sodium perfluoro-1-hexane($^{18}O_2$)sulfonate	MPFHxS	500	474	3
Sodium perfluoro-1-(1,2,3,4-$^{13}C_4$)octanesulfonate	MPFOS	500	479	6

* Concentrations have been rounded to three significant figures.

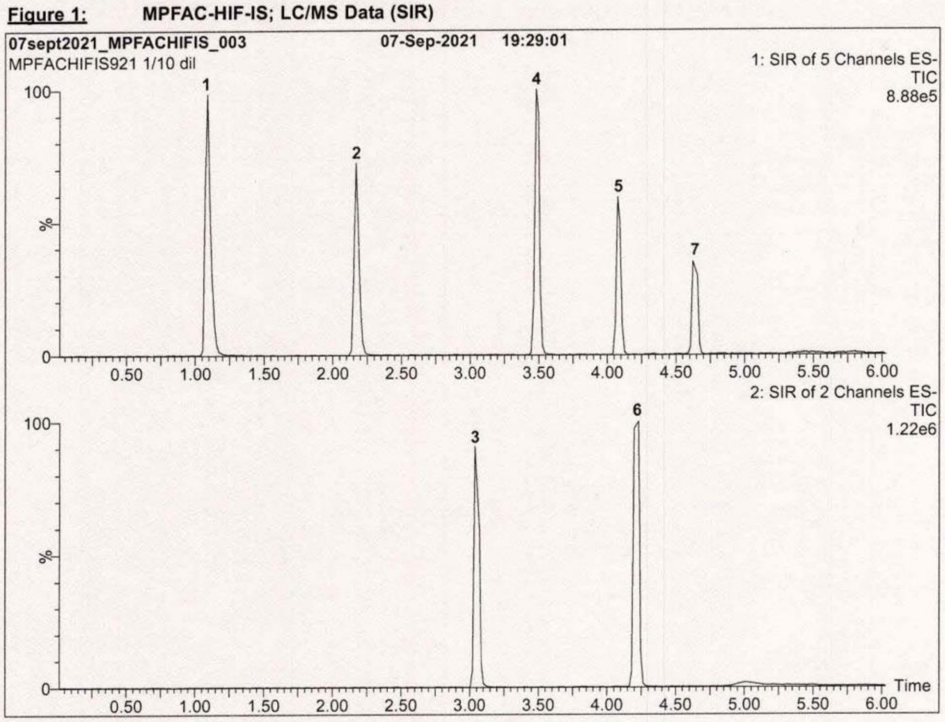
Certified By: ____________ **Date:** 10/13/2021
(mm/dd/yyyy)

B.G. Chittim, General Manager

Form#:13, Issued 2004-11-10
Revision#:9, Revised 2020-12-23

MPFACHIFIS0921 (3 of 5)
rev1

Figure 1: **MPFAC-HIF-IS; LC/MS Data (SIR)**



Conditions for Figure 1:

Waters Acquity Ultra Performance LC
Waters Xevo TQ-S micro MS

Chromatographic Conditions:

Column: Acquity UPLC BEH Shield RP_{18}
1.7 µm, 2.1 x 100 mm

Mobile phase: Gradient
Start: 50% H_2O / 50% (80:20 MeOH:ACN)
(both with 10 mM NH_4OAc buffer)
Ramp to 90% organic over 9 min and hold for
2 min before returning to initial conditions in 1 min.
Time: 15 min

Flow: 300 µL/min

MS Parameters:

Experiment: SIR

Source: Electrospray (negative)
Capillary Voltage (kV) = 2.00
Cone Voltage (V) = variable (2-6)
Desolvation Temperature (°C) = 350
Desolvation Gas Flow (L/hr) = 1000

Form#:13, Issued 2004-11-10
Revision#:9, Revised 2020-12-23

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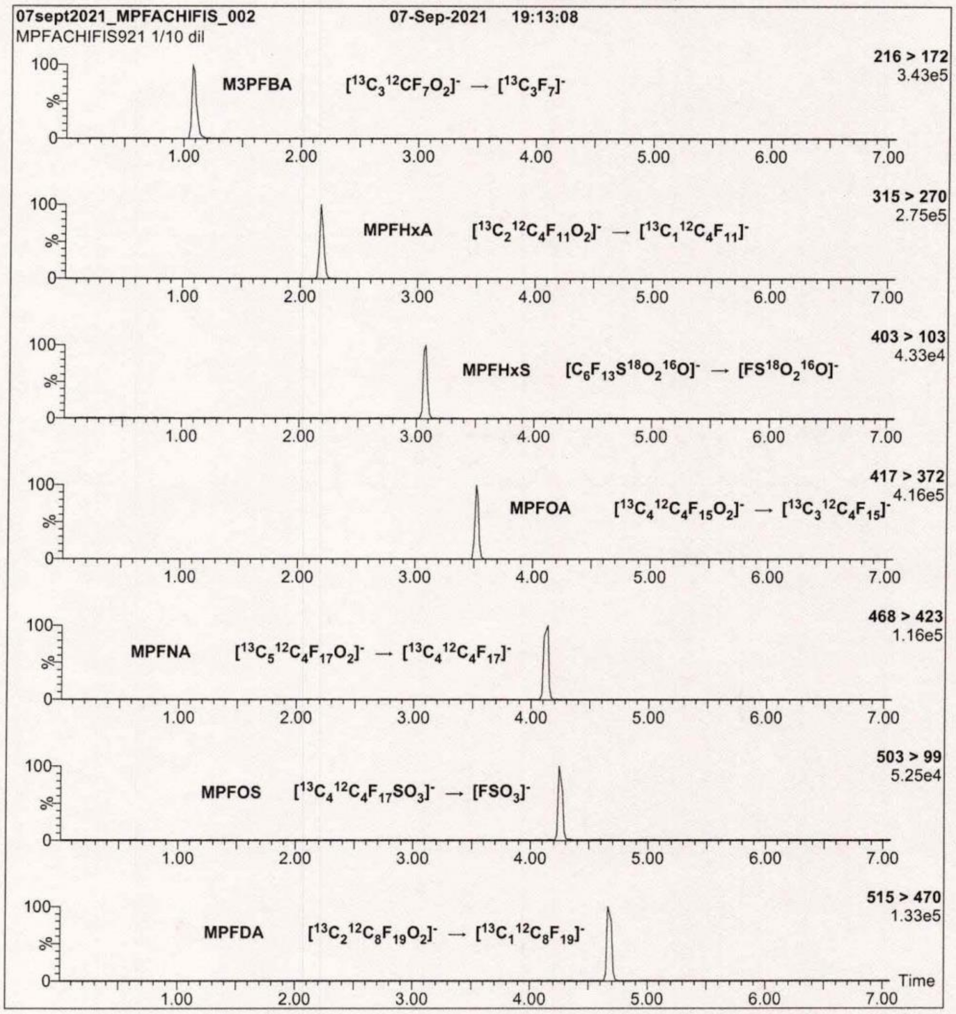
Figure 2: **MPFAC-HIF-IS; LC/MS/MS Data (Selected MRM Transitions)**



Conditions for Figure 2:

Injection: On-column (MPFAC-HIF-IS)

Mobile phase: Same as Figure 1

Flow: 300 µL/min

MS Parameters:

Collision Gas (mbar) = 3.18e-3
Collision Energy (eV) = 4-64 (variable)

Form#:13, Issued 2004-11-10
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rev1

Attachment 2 – Extracted Internal Standards (EIS)

YORK
ANALYTICAL LABORATORIES, INC.

Analytical Standard Record

Standard ID: **Y22B198**

Description:	MPFAC-HIF-ES-EPA 1633 STOCK EIS mix	Prepared:	02/17/2022
Standard Type:	Other	Expires:	08/06/2024
Solvent:	MeOH/IPA/1% H2O	Prepared By:	Robert Q. Bradley
Final Volume (mls):	1	Department:	PFAS
Vials:	1	Lot No.:	MPFACHIFES0821
Vendor:	Wellington Laboratories		

Comments:

Analyte	CAS Number	Concentration	Units
d3-N-MeFOSAA		1	ug/mL
d5-N-EtFOSAA		1	ug/mL
d7-N-MeFOSE		5	ug/mL
d9-N-EtFOSE		5	ug/mL
d-N-EtFOSA		0.5	ug/mL
d-N-MeFOSA		0.5	ug/mL
M2-4:2FTS		0.938	ug/mL
M2-6:2FTS		0.951	ug/mL
M2-8:2FTS		0.96	ug/mL
M2PFTeDA		0.25	ug/mL
M3HFPO-DA		2	ug/mL
M3PFBS		0.466	ug/mL
M3PFHxS		0.474	ug/mL
M4PFHpA		0.5	ug/mL
M5PFHxA		0.5	ug/mL
M5PFPeA		1	ug/mL
M6PFDA		0.25	ug/mL
M7PFUdA		0.25	ug/mL
M8FOSA		0.5	ug/mL
M8PFOA		0.5	ug/mL
M8PFOS		0.479	ug/mL
M9PFNA		0.25	ug/mL
MPFBA		2	ug/mL
MPFDoA		0.25	ug/mL

WELLINGTON LABORATORIES

CERTIFICATE OF ANALYSIS DOCUMENTATION

MPFAC-HIF-ES

Mass-Labelled Per- and Poly-fluoroalkyl Substance Extraction Standard Solution/Mixture

PRODUCT CODE:	MPFAC-HIF-ES
LOT NUMBER:	MPFACHIFES0821
SOLVENT(S):	Methanol/Isopropanol (1%)/Water (<1%)
DATE PREPARED: (mm/dd/yyyy)	08/05/2021
LAST TESTED: (mm/dd/yyyy)	08/16/2021
EXPIRY DATE: (mm/dd/yyyy)	08/16/2024
RECOMMENDED STORAGE:	Refrigerate ampoule

DESCRIPTION:

MPFAC-HIF-ES is a solution/mixture of ten mass-labelled (^{13}C) perfluoroalkylcarboxylic acids (C_4-C_{12}, C_{14}), three mass-labelled (^{13}C) perfluoroalkanesulfonates (C_4, C_6, and C_8), three mass-labelled (one ^{13}C and two ^2H) perfluoro-1-octanesulfonamides, three mass-labelled (^{13}C) fluorotelomer sulfonates (4:2, 6:2, and 8:2), two mass-labelled (^2H) perfluorooctanesulfonamidoacetic acids, two mass-labelled (^2H) perfluorooctane-sulfonamidoethanols, and mass-labelled (^{13}C) hexafluoropropylene oxide dimer acid. The components and their concentrations are given in Table A.

The individual mass-labelled perfluoroalkylcarboxylic acids, mass-labelled perfluoroalkanesulfonates, mass-labelled fluorotelomer sulfonates, perfluoro-1-($^{13}C_8$)octanesulfonamide, and mass-labelled hexafluoropropylene oxide dimer acid all have chemical purities of >98% and isotopic purities of ≥99%. The individual mass-labelled perfluorooctanesulfonamidoacetic acids, mass-labelled perfluorooctanesulfon-amidoethanols, and two mass-labelled (^2H) perfluoro-1-octanesulfonamides all have chemical purities of >98% and isotopic purities of ≥98%.

DOCUMENTATION/ DATA ATTACHED:

Table A: Components and Concentrations of the Solution/Mixture
Figure 1: LC/MS Data (SIR)
Figure 2: LC/MS/MS Data (Selected MRM Transitions)

ADDITIONAL INFORMATION:

- See page 2 for further details.
- Contains 4 mole eq. of NaOH to prevent conversion of the carboxylic acids to their respective methyl esters.

FOR LABORATORY USE ONLY: NOT FOR HUMAN OR DRUG USE

Wellington Laboratories Inc., 345 Southgate Dr. Guelph ON N1G 3M5 CANADA
519-822-2436 • Fax: 519-822-2849 • info@well-labs.com

INTENDED USE:

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HANDLING:

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SYNTHESIS / CHARACTERIZATION:

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HOMOGENEITY:

Prior to solution preparation, crystalline material is tested for homogeneity using a variety of techniques (as stated above) and its solubility in a given diluent is taken into consideration. Duplicate solutions of a new product are prepared from the same crystalline lot and, after the addition of an appropriate internal standard, they are compared by GC/MS, LC/MS/MS, and/or SFC/UV/MS/MS. The relative response factors of the analyte of interest in each solution are required to be <5% RSD. New solution lots of existing products, as well as mixtures and calibration solutions, are compared to older lots in a similar manner. This further confirms the homogeneity of the crystalline material as well as the stability and homogeneity of the solutions in the storage containers. In order to maintain the integrity of the assigned value(s), and associated uncertainty, the dilution or injection of a subsample of this product should be performed using calibrated measuring equipment.

UNCERTAINTY:

The maximum combined relative standard uncertainty of our reference standard solutions is calculated using the following equation:

The combined relative standard uncertainty, $u_c(y)$, of a value y and the uncertainty of the independent parameters $x_1, x_2,...x_n$ on which it depends is:

$$u_c(y(x_1, x_2, ...x_n)) = \sqrt{\sum_{i=1}^{n} u(y, x_i)^2}$$

where x is expressed as a relative standard uncertainty of the individual parameter.

The individual uncertainties taken into account include those associated with weights (calibration of the balance) and volumes (calibration of the volumetric glassware). An expanded maximum combined percent relative uncertainty of ±5% (calculated with a coverage factor of 2 and a level of confidence of 95%) is stated on the Certificate of Analysis for all of our products.

TRACEABILITY:

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EXPIRY DATE / PERIOD OF VALIDITY:

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LIMITED WARRANTY:

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QUALITY MANAGEMENT:

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CALA Testing Accreditation No. A1226

ANAB ANSI National Accreditation Board ACCREDITED ISO 17034 REFERENCE MATERIAL PRODUCER

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Form#:13, Issued 2004-11-10
Revision#:9, Revised 2020-12-23

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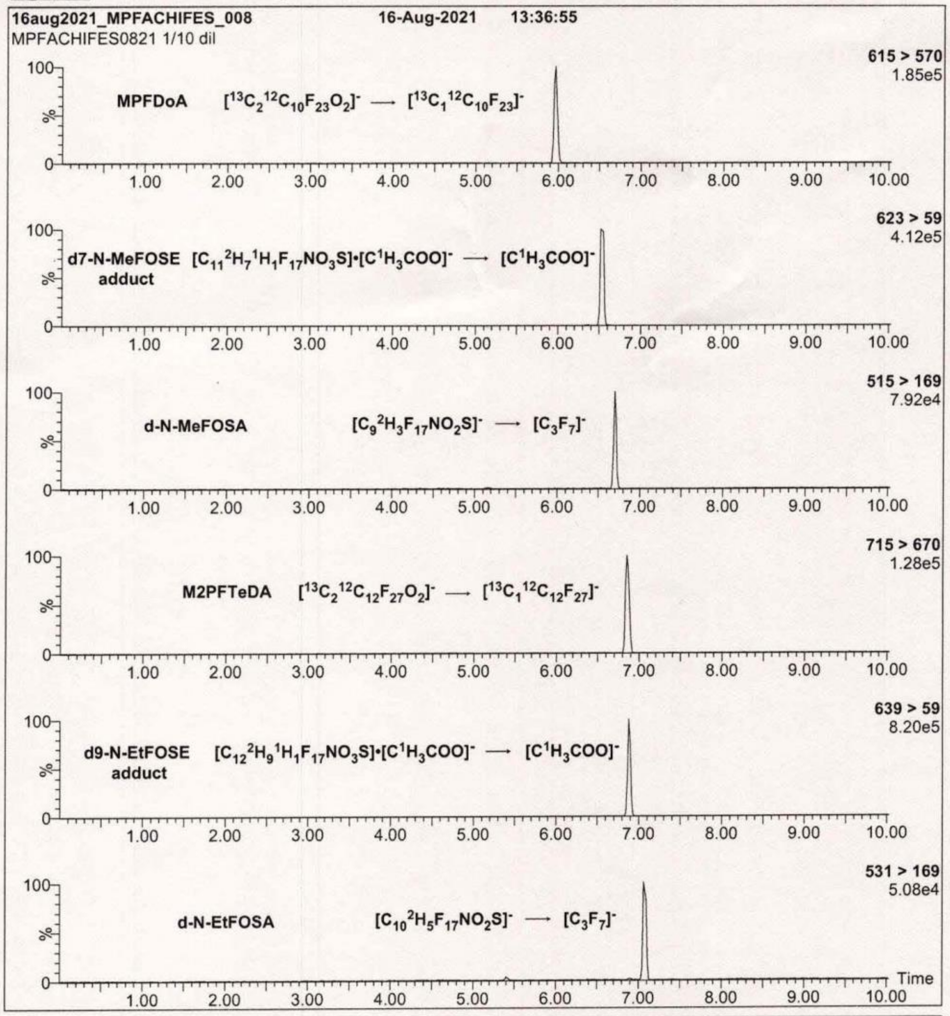
rev1

Figure 2: **MPFAC-HIF-ES; LC/MS/MS Data (Selected MRM Transitions)**



Conditions for Figure 2:

Injection: On-column (MPFAC-HIF-ES)

Mobile phase: Same as Figure 1

Flow: 300 μL/min

MS Parameters:

Collision Gas (mbar) = 3.41e-3
Collision Energy (eV) = 4-64 (variable)

Form#:13, Issued 2004-11-10
Revision#:9, Revised 2020-12-23

MPFACHIFES0821 (7 of 7)
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Table A: **MPFAC-HIF-ES; Components and Concentrations (ng/mL, ± 5% in Methanol/Isopropanol (1%)/Water (<1%))**

Compound	Acronym	Concentration (ng/mL)	Peak Assignment in Figure 1
Perfluoro-n-($^{13}C_4$)butanoic acid	MPFBA	2000	1
Perfluoro-n-($^{13}C_5$)pentanoic acid	M5PFPeA	1000	2
Perfluoro-n-(1,2,3,4,6-$^{13}C_5$)hexanoic acid	M5PFHxA	500	5
Perfluoro-n-(1,2,3,4-$^{13}C_4$)heptanoic acid	M4PFHpA	500	7
Perfluoro-n-($^{13}C_8$)octanoic acid	M8PFOA	500	10
Perfluoro-n-($^{13}C_9$)nonanoic acid	M9PFNA	250	11
Perfluoro-n-(1,2,3,4,5,6-$^{13}C_6$)decanoic acid	M6PFDA	250	14
Perfluoro-n-(1,2,3,4,5,6,7-$^{13}C_7$)undecanoic acid	M7PFUdA	250	17
Perfluoro-n-(1,2-$^{13}C_2$)dodecanoic acid	MPFDoA	250	19
Perfluoro-n-(1,2-$^{13}C_2$)tetradecanoic acid	M2PFTeDA	250	22
Perfluoro-1-($^{13}C_8$)octanesulfonamide	M8FOSA	500	18
N-methyl-d_3-perfluoro-1-octanesulfonamide	d-N-MeFOSA	500	21
N-ethyl-d_5-perfluoro-1-octanesulfonamide	d-N-EtFOSA	500	24
N-methyl-d_3-perfluoro-1-octanesulfonamidoacetic acid	d3-N-MeFOSAA	1000	15
N-ethyl-d_5-perfluoro-1-octanesulfonamidoacetic acid	d5-N-EtFOSAA	1000	16
2-(N-methyl-d_3-perfluoro-1-octanesulfonamido)ethan-d_4-ol	d7-N-MeFOSE	5000	20
2-(N-ethyl-d_5-perfluoro-1-octanesulfonamido)ethan-d_4-ol	d9-N-EtFOSE	5000	23
2,3,3,3-Tetrafluoro-2-(1,1,2,2,3,3,3-heptafluoropropoxy)($^{13}C_3$)propanoic acid	M3HFPO-DA	2000	6

Compound	Acronym	Concentration* (ng/mL)		Peak Assignment in Figure 1
		as the salt	as the acid	
Sodium perfluoro-1-(2,3,4-$^{13}C_3$)butanesulfonate	M3PFBS	500	466	3
Sodium perfluoro-1-(1,2,3-$^{13}C_3$)hexanesulfonate	M3PFHxS	500	474	8
Sodium perfluoro-1-($^{13}C_8$)octanesulfonate	M8PFOS	500	479	12
Sodium 1H,1H,2H,2H-perfluoro-(1,2-$^{13}C_2$)hexanesulfonate	M2-4:2FTS	1000	938	4
Sodium 1H,1H,2H,2H-perfluoro-(1,2-$^{13}C_2$)octanesulfonate	M2-6:2FTS	1000	951	9
Sodium 1H,1H,2H,2H-perfluoro-(1,2-$^{13}C_2$)decanesulfonate	M2-8:2FTS	1000	960	13

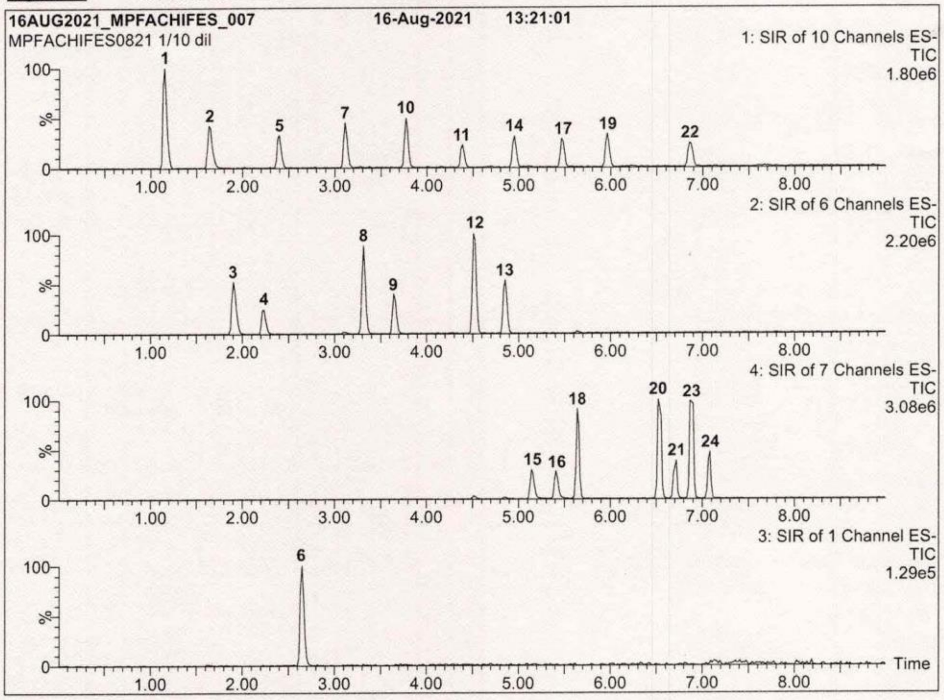
* Concentrations have been rounded to three significant figures.

Certified By: ______________ **Date:** 10/13/2021
B.G. Chittim, General Manager (mm/dd/yyyy)

Form#:13, Issued 2004-11-10
Revision#:9, Revised 2020-12-23

MPFACHIFES0821 (3 of 7)
rev1

Figure 1: **MPFAC-HIF-ES; LC/MS Data (SIR)**



Conditions for Figure 1:

Waters Acquity Ultra Performance LC
Waters Xevo TQ-S micro MS

Chromatographic Conditions:

Column: Acquity UPLC BEH Shield RP_{18}
1.7 µm, 2.1 x 100 mm

Mobile phase: Gradient
Start: 50% H_2O / 50% (80:20 MeOH:ACN)
(both with 10 mM NH_4OAc buffer)
Ramp to 90% organic over 9 min and hold for
2 min before returning to initial conditions in 1 min.
Time: 15 min

Flow: 300 µL/min

MS Parameters:

Experiment: SIR

Source: Electrospray (negative)
Capillary Voltage (kV) = 2.00
Cone Voltage (V) = variable (2-44)
Desolvation Temperature (°C) = 350
Desolvation Gas Flow (L/hr) = 1000

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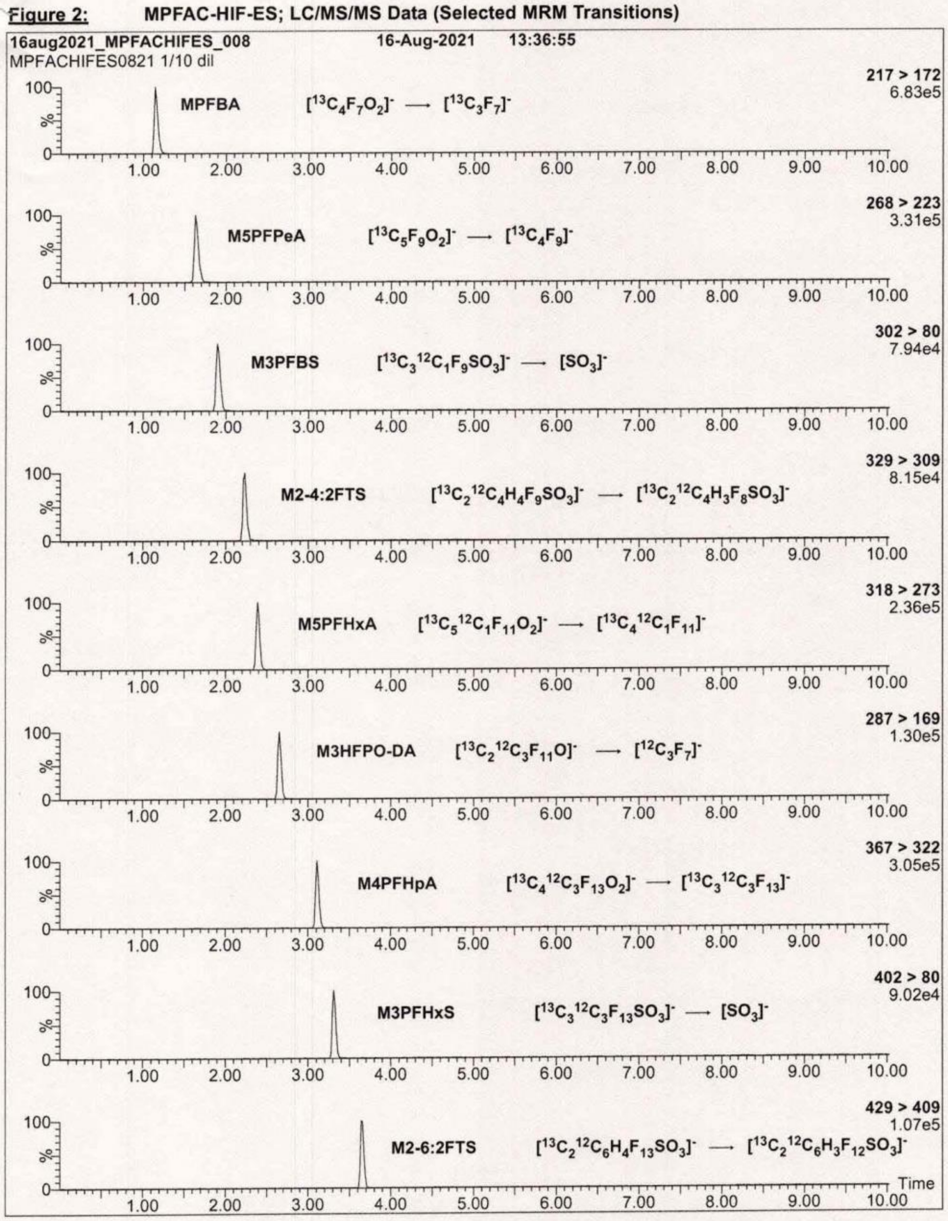
Revision#:9, Revised 2020-12-23

MPFACHIFES0821 (4 of 7)
rev1

Figure 2: **MPFAC-HIF-ES; LC/MS/MS Data (Selected MRM Transitions)**



Form#:13, Issued 2004-11-10
Revision#:9, Revised 2020-12-23

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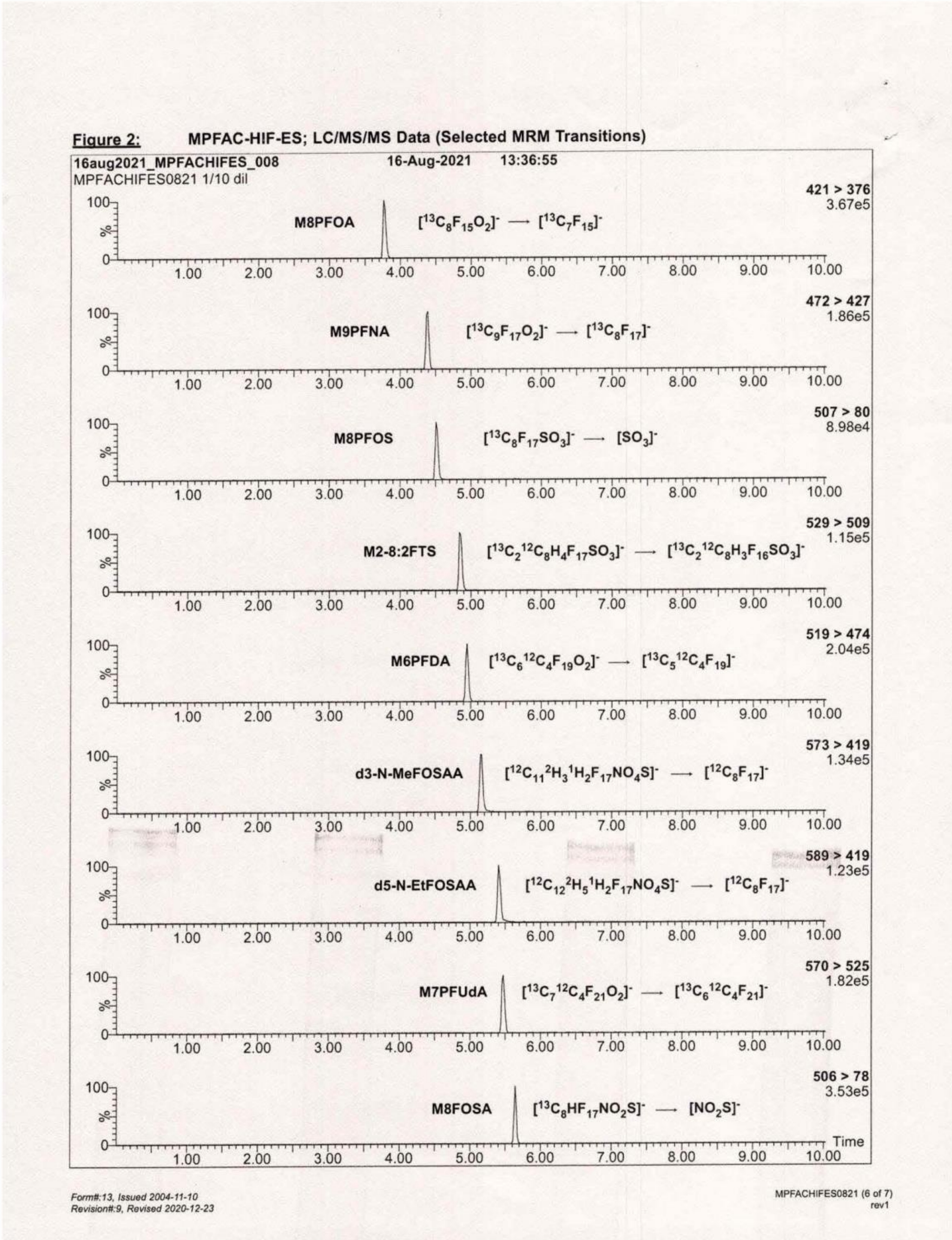
Figure 2: MPFAC-HIF-ES; LC/MS/MS Data (Selected MRM Transitions)
16aug2021_MPFACHIFES_008 16-Aug-2021 13:36:55
MPFACHIFES0821 1/10 dil
M8PFOA
421 > 376
3.67e5
M9PFNA
472 > 427
1.86e5
M8PFOS
507 > 80
8.98e4
M2-8:2FTS
529 > 509
1.15e5
M6PFDA
519 > 474
2.04e5
d3-N-MeFOSAA
573 > 419
1.34e5
d5-N-EtFOSAA
589 > 419
1.23e5
M7PFUdA
570 > 525
1.82e5
M8FOSA
506 > 78
3.53e5
Time
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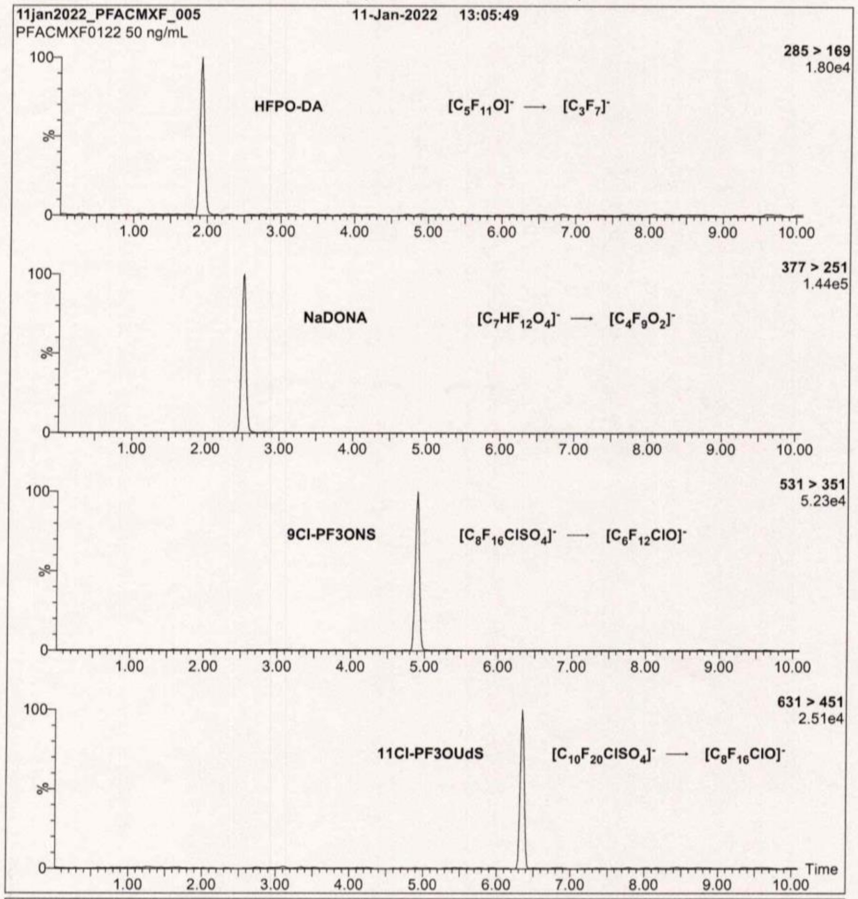
MPFACHIFES0821 (6 of 7)
rev1

Attachment 3 – Target Analyte Mixtures

Figure 2: PFAC-MXF; LC/MS/MS Data (Selected MRM Transitions)



Conditions for Figure 2:

Injection: On-column (PFAC-MXF)

Mobile phase: Same as Figure 1

Flow: 300 µL/min

MS Parameters:
Collision Gas (mbar) = 3.43e-3
Collision Energy (eV) = 6-60 (variable)

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CALA Testing Accreditation No. A1226

ANAB ANSI National Accreditation Board ACCREDITED ISO 17034 REFERENCE MATERIAL PRODUCER

For additional information or assistance concerning this or any other products from Wellington Laboratories Inc., please visit our website at www.well-labs.com or contact us directly at info@well-labs.com

Form#:13, Issued 2004-11-10
Revision#:9, Revised 2020-12-23

PFACMXF0122 (2 of 5)
rev0

Table A: **PFAC-MXF; Components and Concentrations (ng/mL; ± 5% in Methanol/Water (<1%))**

Compound	Acronym	Concentration* (ng/ml)		Peak Assignment in Figure 1
2,3,3,3-Tetrafluoro-2-(1,1,2,2,3,3,3-heptafluoropropoxy)-propanoic acid	HFPO-DA	2000		A
Compound	**Acronym**	**Concentration* (ng/mL) as the salt**	**as the acid**	**Peak Assignment in Figure 1**
Sodium dodecafluoro-3H-4,8-dioxanonanoate	NaDONA	2000	1890	B
Potassium 9-chlorohexadecafluoro-3-oxanonane-1-sulfonate	9Cl-PF3ONS	2000	1870	C
Potassium 11-chloroeicosafluoro-3-oxaundecane-1-sulfonate	11Cl-PF3OUdS	2000	1890	D

* Concentrations have been rounded to three significant figures.

Certified By: ________________ B.G. Chittim, General Manager **Date:** 01/12/2022 (mm/dd/yyyy)

Form#:13, Issued 2004-11-10
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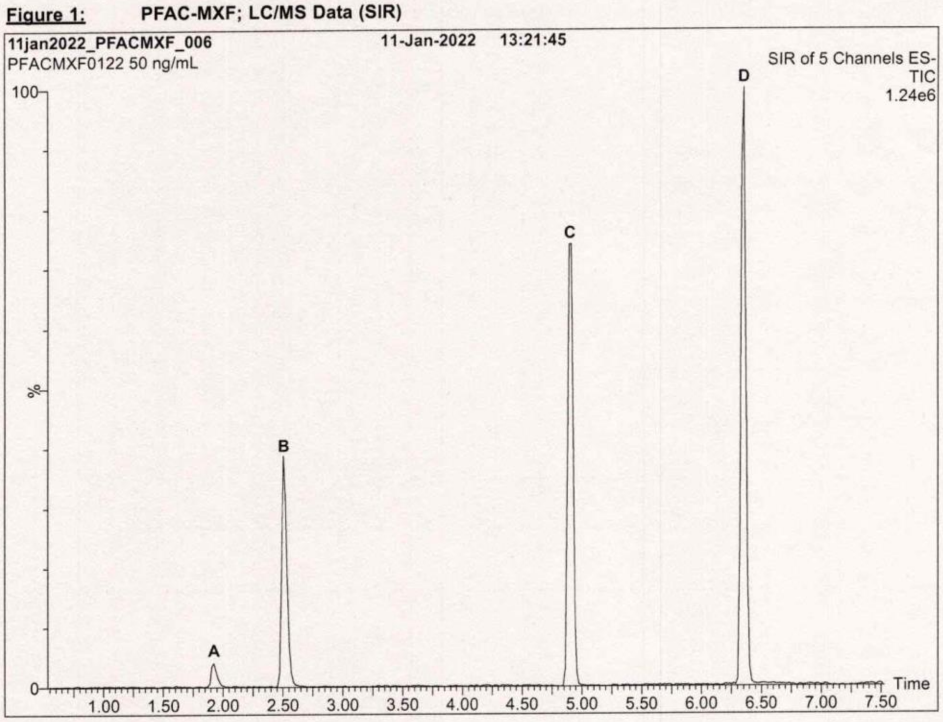
rev0

Figure 1: **PFAC-MXF; LC/MS Data (SIR)**



Conditions for Figure 1:

Waters Acquity Ultra Performance LC
Waters Xevo TQ-S micro MS

Chromatographic Conditions:

Column: Acquity UPLC BEH Shield RP_{18}
1.7 µm, 2.1 x 100 mm

Mobile phase: Gradient
Start: 45% H_2O / 55% (80:20 MeOH:ACN)
(both with 10 mM NH_4OAc buffer)
Ramp to 90% organic over 8 min and hold for 2 min before returning to initial conditions in 0.75 min.
Time: 12 min

Flow: 300 µL/min

MS Parameters:

Experiment: SIR

Source: Electrospray (negative)
Capillary Voltage (kV) = 2.00
Cone Voltage (V) = variable (15-74)
Desolvation Temperature (°C) = 325
Desolvation Gas Flow (L/hr) = 1000

Form#:13, Issued 2004-11-10
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PFACMXF0122 (4 of 5)
rev0

Analytical Standard Record

Standard ID: **Y22B199**

Description:	PFAC-MXF-Native Repl.STOCK EPA 1633 PFAS	Prepared:	02/17/2022
Standard Type:	Other	**Expires:**	**01/11/2025**
Solvent:	MeOH/H20	Prepared By:	Robert Q. Bradley
Final Volume (mls):	1	Department:	PFAS
Vials:	1	Lot No.:	PFACMXF0122
Vendor:	Wellington Laboratories		

Comments:

Analyte	CAS Number	Concentration	Units
11CL-PF3OUdS	763051-92-9	1.89	ug/mL
9CL-PF3ONS	756426-58-1	1.87	ug/mL
ADONA	919005-14-4	1.89	ug/mL
HFPO-DA (Gen-X)	13252-13-6	2	ug/mL

Reviewed By Date

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WELLINGTON LABORATORIES

CERTIFICATE OF ANALYSIS DOCUMENTATION

PFAC-MXF

Native Replacement PFAS Solution/Mixture

PRODUCT CODE:	PFAC-MXF
LOT NUMBER:	PFACMXF0122
SOLVENT(S):	Methanol / Water (<1%)
DATE PREPARED: (mm/dd/yyyy)	01/10/2022
LAST TESTED: (mm/dd/yyyy)	01/11/2022
EXPIRY DATE: (mm/dd/yyyy)	01/11/2025
RECOMMENDED STORAGE:	Refrigerate ampoule

DESCRIPTION:

PFAC-MXF is a solution/mixture of sodium dodecafluoro-3H-4,8-dioxanonanoate (NaDONA), the major and minor components of F-53B (9Cl-PF3ONS and 11Cl-PF3OUdS), and GenX (HFPO-DA). The components and their concentrations are given in Table A.

The individual native components of this mixture all have chemical purities of >98%.

DOCUMENTATION/ DATA ATTACHED:

Table A: Components and Concentrations of the Solution/Mixture
Figure 1: LC/MS Data (SIR)
Figure 2: LC/MS/MS Data (Selected MRM Transitions)

ADDITIONAL INFORMATION:

- See page 2 for further details.
- Contains 4 mole eq. of NaOH to prevent conversion of the carboxylic acid to the methyl ester.

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Table A: **PFAC-MXI; Components and Concentrations (µg/mL; ± 5% in methanol)**

Compound	Acronym	Concentration (µg/mL)	Peak Assignment in Figure 1
N-methylperfluoro-1-octanesulfonamide	N-MeFOSA	1.00	B
N-ethylperfluoro-1-octanesulfonamide	N-EtFOSA	1.00	D
2-(N-methylperfluoro-1-octanesulfonamido)-ethanol	N-MeFOSE	10.0	A
2-(N-ethylperfluoro-1-octanesulfonamido)-ethanol	N-EtFOSE	10.0	C

Certified By: ____________ B.G. Chittim, General Manager **Date:** 09/23/2021 (mm/dd/yyyy)

Form#:13, Issued 2004-11-10
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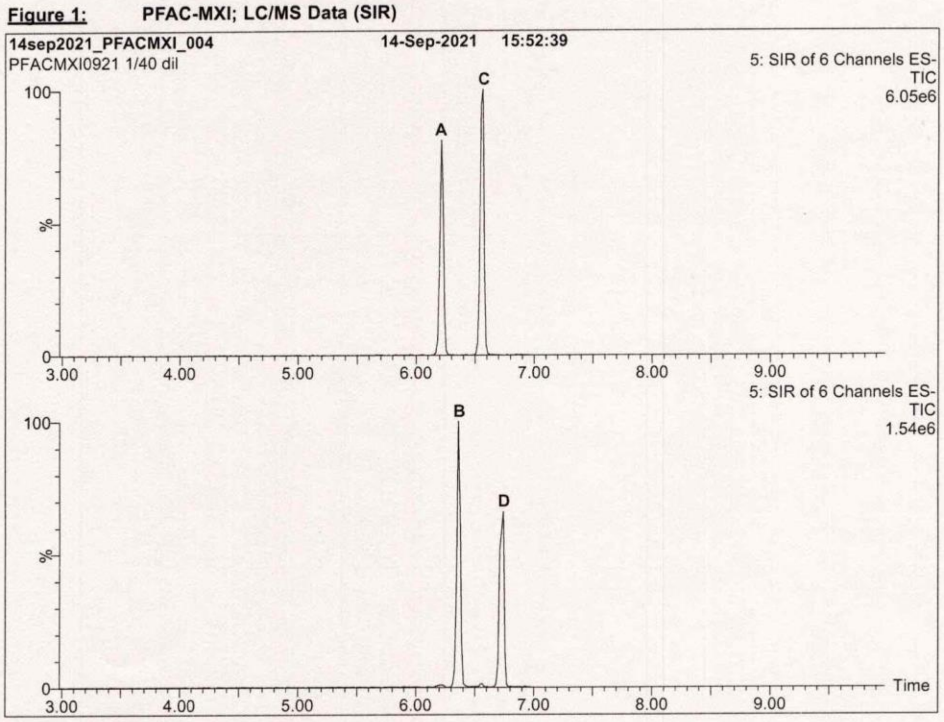
rev0

Figure 1: **PFAC-MXI; LC/MS Data (SIR)**



Conditions for Figure 1:

Waters Acquity Ultra Performance LC
Waters Xevo TQ-S micro MS

Chromatographic Conditions:

Column: Acquity UPLC BEH Shield RP_{18}
1.7 µm, 2.1 x 100 mm

Mobile phase: Gradient
Start: 50% H_2O / 50% (80:20 MeOH:ACN)
(both with 10 mM NH_4OAc buffer)
Ramp to 90% organic over 9 min and hold for
2 min before returning to initial conditions in 1 min.
Time: 15 min

Flow: 300 µL/min

MS Parameters:

Experiment: SIR

Source: Electrospray (negative)
Capillary Voltage (kV) = 2.50
Cone Voltage (V) = variable (2-74)
Desolvation Temperature (°C) = 350
Desolvation Gas Flow (L/hr) = 1000

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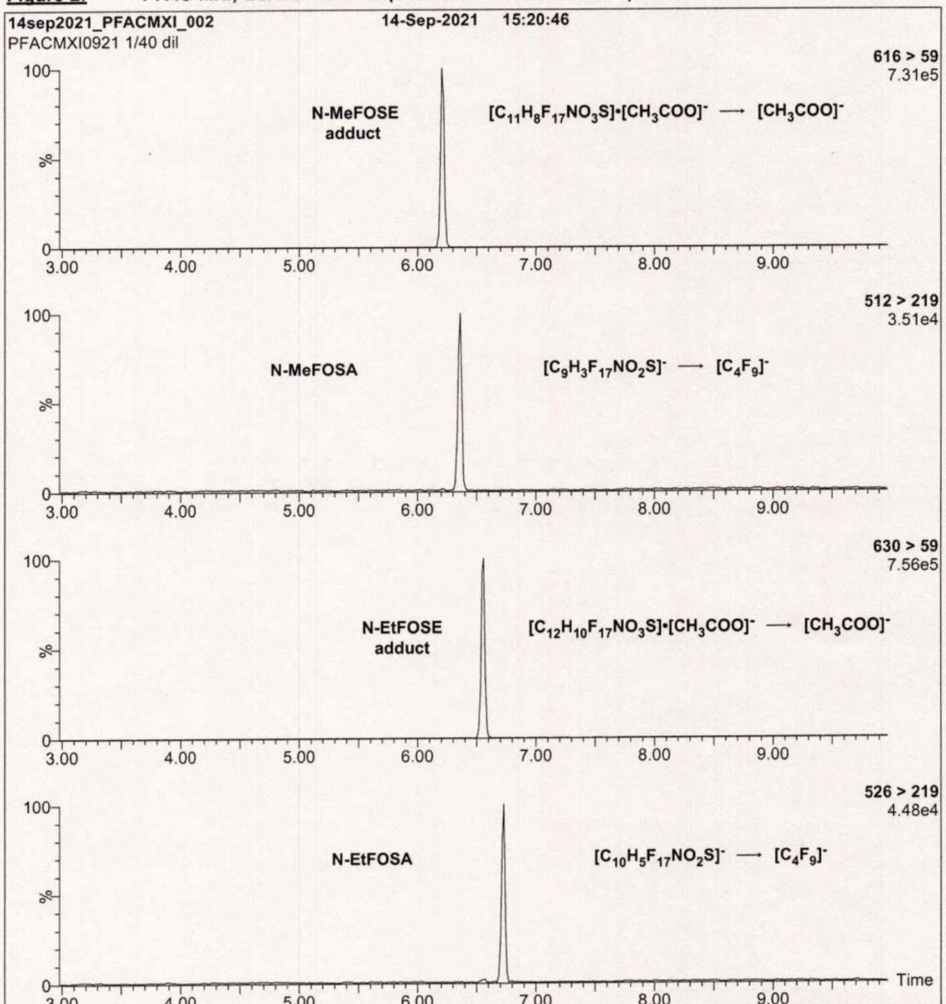
Figure 2: **PFAC-MXI; LC/MS/MS Data (Selected MRM Transitions)**



Conditions for Figure 2:

Injection: On-column (PFAC-MXI)

Mobile phase: Same as Figure 1

Flow: 300 µL/min

MS Parameters:
Collision Gas (mbar) = 3.31e-3
Collision Energy (eV) = 6-60 (variable)

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PFACMXI0921 (5 of 5)
rev0

Analytical Standard Record

Standard ID: **Y22B204**

Description:	PFAC-MXI-EPA 1633 Stock	Prepared:	02/17/2022
Standard Type:	Other	**Expires:**	**02/17/2023**
Solvent:	Methanol	Prepared By:	Robert Q. Bradley
Final Volume (mls):	1	Department:	PFAS
Vials:	1	Lot No.:	PFACMXI0921
Vendor:	Wellington Laboratories		

Comments:

Analyte	CAS Number	Concentration	Units
N-EtFOSA	4151-50-2	1	ug/mL
N-EtFOSE	1691-99-2	10	ug/mL
N-MeFOSA	31506-32-8	1	ug/mL
N-MeFOSE	24448-09-7	10	ug/mL

Reviewed By Date

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WELLINGTON LABORATORIES

CERTIFICATE OF ANALYSIS DOCUMENTATION

PFAC-MXI

Native Perfluorooctanesulfonamide and Perfluorooctanesulfonamidoethanol Solution/Mixture

PRODUCT CODE:	PFAC-MXI
LOT NUMBER:	PFACMXI0921
SOLVENT(S):	Methanol
DATE PREPARED: (mm/dd/yyyy)	09/08/2021
LAST TESTED: (mm/dd/yyyy)	09/14/2021
EXPIRY DATE: (mm/dd/yyyy)	09/14/2026
RECOMMENDED STORAGE:	Store ampoule in a cool, dark place

DESCRIPTION:

PFAC-MXI is a solution/mixture of two native perfluorooctanesulfonamides (FOSAs) and two native perfluorooctanesulfonamidoethanols (FOSEs). The components and their concentrations are given in Table A.

The individual components have a chemical purity of >98%.

DOCUMENTATION/ DATA ATTACHED:

Table A: Components and Concentrations of the Solution/Mixture
Figure 1: LC/MS Data (SIR)
Figure 2: LC/MS/MS Data (Selected MRM Transitions)

ADDITIONAL INFORMATION:

- See page 2 for further details.

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INTENDED USE:

The products prepared by Wellington Laboratories Inc. are for laboratory use only. This certified reference material (CRM) was designed to be used as a standard for the identification and/or quantification of the specific chemical compounds it contains.

HANDLING:

This product should only be used by qualified personnel familiar with its potential hazards and trained in the handling of hazardous chemicals. Due care should be exercised to prevent unnecessary human contact or ingestion. All procedures should be carried out in a well-functioning fume hood and suitable gloves, eye protection, and clothing should be worn at all times. Waste should be disposed of according to national and regional regulations. Safety Data Sheets (SDSs) are available upon request.

SYNTHESIS / CHARACTERIZATION:

Our products are synthesized using single-product unambiguous routes whenever possible. They are then characterized, and their structures and purities confirmed, using a combination of the most relevant techniques, such as NMR, GC/MS, LC/MS/MS, SFC/UV/MS/MS, x-ray crystallography, and melting point. Isotopic purities of mass-labelled compounds are also confirmed using HRGC/HRMS and/or LC/MS/MS.

HOMOGENEITY:

Prior to solution preparation, crystalline material is tested for homogeneity using a variety of techniques (as stated above) and its solubility in a given diluent is taken into consideration. Duplicate solutions of a new product are prepared from the same crystalline lot and, after the addition of an appropriate internal standard, they are compared by GC/MS, LC/MS/MS, and/or SFC/UV/MS/MS. The relative response factors of the analyte of interest in each solution are required to be <5% RSD. New solution lots of existing products, as well as mixtures and calibration solutions, are compared to older lots in a similar manner. This further confirms the homogeneity of the crystalline material as well as the stability and homogeneity of the solutions in the storage containers. In order to maintain the integrity of the assigned value(s), and associated uncertainty, the dilution or injection of a subsample of this product should be performed using calibrated measuring equipment.

UNCERTAINTY:

The maximum combined relative standard uncertainty of our reference standard solutions is calculated using the following equation:

The combined relative standard uncertainty, $u_c(y)$, of a value y and the uncertainty of the independent parameters $x_1, x_2, \ldots x_n$ on which it depends is:

$$u_c(y(x_1, x_2, \ldots x_n)) = \sqrt{\sum_{i=1}^{n} u(y, x_i)^2}$$

where x is expressed as a relative standard uncertainty of the individual parameter.

The individual uncertainties taken into account include those associated with weights (calibration of the balance) and volumes (calibration of the volumetric glassware). An expanded maximum combined percent relative uncertainty of ±5% (calculated with a coverage factor of 2 and a level of confidence of 95%) is stated on the Certificate of Analysis for all of our products.

TRACEABILITY:

All reference standard solutions are traceable to specific crystalline lots. The microbalances used for solution preparation are regularly calibrated by an external ISO/IEC 17025 accredited laboratory. In addition, their calibration is verified prior to each weighing using calibrated external weights traceable to an ISO/IEC 17025 accredited laboratory. All volumetric glassware used is calibrated, of Class A tolerance, and traceable to an ISO/IEC 17025 accredited laboratory. For certain products, traceability to international interlaboratory studies has also been established.

EXPIRY DATE / PERIOD OF VALIDITY:

Ongoing stability studies of this product have demonstrated stability in its composition and concentration, until the specified expiry date, in the unopened ampoule. Monitoring for any degradation or change in concentration of the listed analyte(s) is performed on a routine basis.

LIMITED WARRANTY:

At the time of shipment, all products are warranted to be free of defects in material and workmanship and to conform to the stated technical and purity specifications.

QUALITY MANAGEMENT:

This product was produced using a Quality Management System registered to the latest versions of ISO 9001 by SAI Global, ISO/IEC 17025 by the Canadian Association for Laboratory Accreditation Inc. (CALA; A1226), and ISO 17034 by ANSI National Accreditation Board (ANAB; AR-1523).

CALA Testing Accreditation No. A1226

ANAB ANSI National Accreditation Board ACCREDITED ISO 17034 REFERENCE MATERIAL PRODUCER

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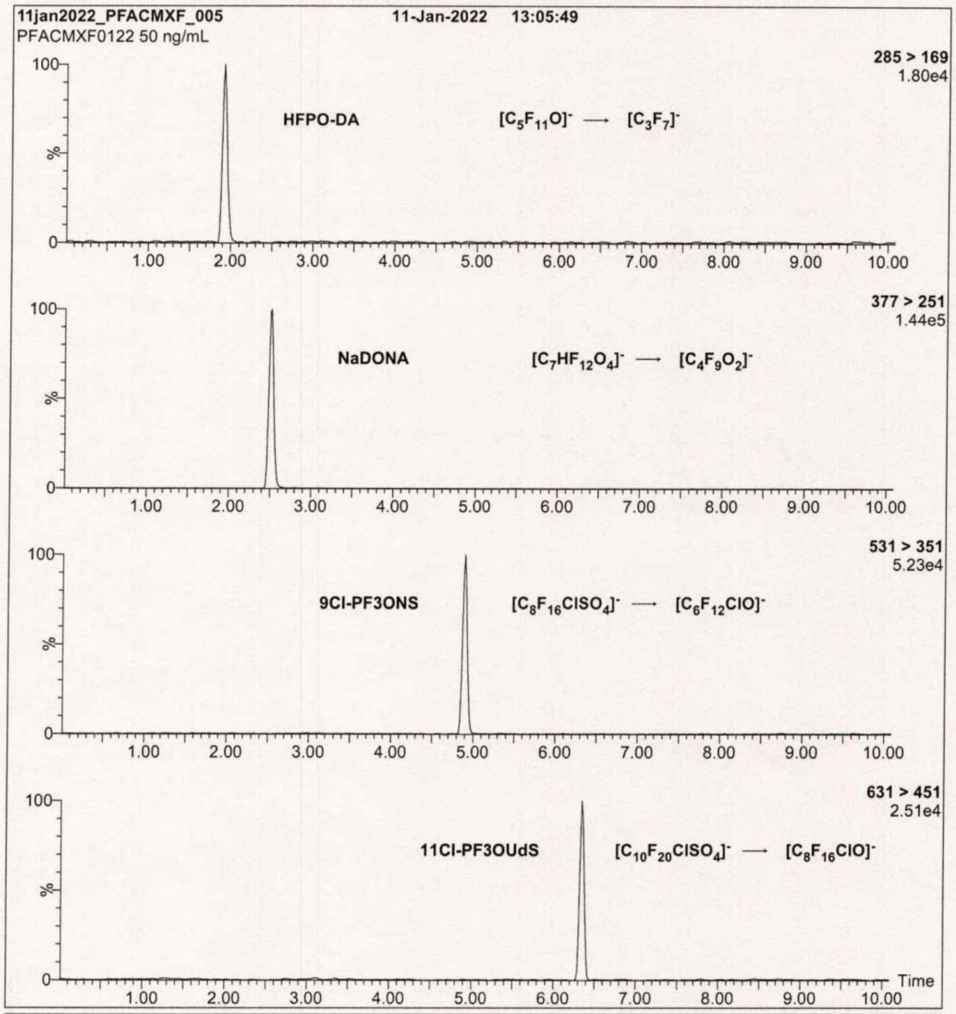
Figure 2: **PFAC-MXF; LC/MS/MS Data (Selected MRM Transitions)**



Conditions for Figure 2:

Injection: On-column (PFAC-MXF)

Mobile phase: Same as Figure 1

Flow: 300 µL/min

MS Parameters:
Collision Gas (mbar) = 3.43e-3
Collision Energy (eV) = 6-60 (variable)

Form#:13, Issued 2004-11-10
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PFACMXF0122 (5 of 5)
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INTENDED USE:

The products prepared by Wellington Laboratories Inc. are for laboratory use only. This certified reference material (CRM) was designed to be used as a standard for the identification and/or quantification of the specific chemical compounds it contains.

HANDLING:

This product should only be used by qualified personnel familiar with its potential hazards and trained in the handling of hazardous chemicals. Due care should be exercised to prevent unnecessary human contact or ingestion. All procedures should be carried out in a well-functioning fume hood and suitable gloves, eye protection, and clothing should be worn at all times. Waste should be disposed of according to national and regional regulations. Safety Data Sheets (SDSs) are available upon request.

SYNTHESIS / CHARACTERIZATION:

Our products are synthesized using single-product unambiguous routes whenever possible. They are then characterized, and their structures and purities confirmed, using a combination of the most relevant techniques, such as NMR, GC/MS, LC/MS/MS, SFC/UV/MS/MS, x-ray crystallography, and melting point. Isotopic purities of mass-labelled compounds are also confirmed using HRGC/HRMS and/or LC/MS/MS.

HOMOGENEITY:

Prior to solution preparation, crystalline material is tested for homogeneity using a variety of techniques (as stated above) and its solubility in a given diluent is taken into consideration. Duplicate solutions of a new product are prepared from the same crystalline lot and, after the addition of an appropriate internal standard, they are compared by GC/MS, LC/MS/MS, and/or SFC/UV/MS/MS. The relative response factors of the analyte of interest in each solution are required to be <5% RSD. New solution lots of existing products, as well as mixtures and calibration solutions, are compared to older lots in a similar manner. This further confirms the homogeneity of the crystalline material as well as the stability and homogeneity of the solutions in the storage containers. In order to maintain the integrity of the assigned value(s), and associated uncertainty, the dilution or injection of a subsample of this product should be performed using calibrated measuring equipment.

UNCERTAINTY:

The maximum combined relative standard uncertainty of our reference standard solutions is calculated using the following equation:

The combined relative standard uncertainty, $u_c(y)$, of a value y and the uncertainty of the independent parameters $x_1, x_2,...x_n$ on which it depends is:

$$u_c(y(x_1, x_2, ... x_n)) = \sqrt{\sum_{i=1}^{n} u(y, x_i)^2}$$

where x is expressed as a relative standard uncertainty of the individual parameter.

The individual uncertainties taken into account include those associated with weights (calibration of the balance) and volumes (calibration of the volumetric glassware). An expanded maximum combined percent relative uncertainty of ±5% (calculated with a coverage factor of 2 and a level of confidence of 95%) is stated on the Certificate of Analysis for all of our products.

TRACEABILITY:

All reference standard solutions are traceable to specific crystalline lots. The microbalances used for solution preparation are regularly calibrated by an external ISO/IEC 17025 accredited laboratory. In addition, their calibration is verified prior to each weighing using calibrated external weights traceable to an ISO/IEC 17025 accredited laboratory. All volumetric glassware used is calibrated, of Class A tolerance, and traceable to an ISO/IEC 17025 accredited laboratory. For certain products, traceability to international interlaboratory studies has also been established.

EXPIRY DATE / PERIOD OF VALIDITY:

Ongoing stability studies of this product have demonstrated stability in its composition and concentration, until the specified expiry date, in the unopened ampoule. Monitoring for any degradation or change in concentration of the listed analyte(s) is performed on a routine basis.

LIMITED WARRANTY:

At the time of shipment, all products are warranted to be free of defects in material and workmanship and to conform to the stated technical and purity specifications.

QUALITY MANAGEMENT:

This product was produced using a Quality Management System registered to the latest versions of ISO 9001 by SAI Global, ISO/IEC 17025 by the Canadian Association for Laboratory Accreditation Inc. (CALA; A1226), and ISO 17034 by ANSI National Accreditation Board (ANAB; AR-1523).

CALA Testing Accreditation No. A1226

ANAB ANSI National Accreditation Board ACCREDITED ISO 17034 REFERENCE MATERIAL PRODUCER

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Table A: **PFAC-MXF; Components and Concentrations (ng/mL; ± 5% in Methanol/Water (<1%))**

Compound	Acronym	Concentration* (ng/ml)		Peak Assignment in Figure 1
2,3,3,3-Tetrafluoro-2-(1,1,2,2,3,3,3-heptafluoropropoxy)-propanoic acid	HFPO-DA	2000		A
Compound	**Acronym**	**Concentration* (ng/mL)**		**Peak Assignment in Figure 1**
		as the salt	**as the acid**	
Sodium dodecafluoro-3H-4,8-dioxanonanoate	NaDONA	2000	1890	B
Potassium 9-chlorohexadecafluoro-3-oxanonane-1-sulfonate	9Cl-PF3ONS	2000	1870	C
Potassium 11-chloroeicosafluoro-3-oxaundecane-1-sulfonate	11Cl-PF3OUdS	2000	1890	D

* Concentrations have been rounded to three significant figures.

Certified By: [signature] B.G. Chittim, General Manager **Date:** 01/12/2022 (mm/dd/yyyy)

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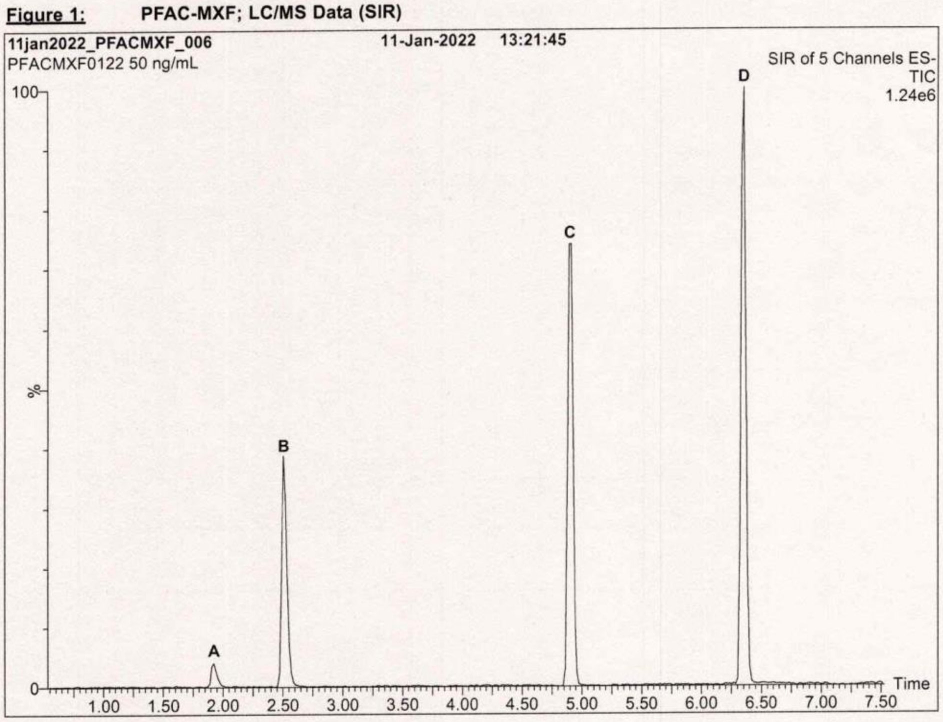
PFACMXF0122 (3 of 5)
rev0

Figure 1: **PFAC-MXF; LC/MS Data (SIR)**



Conditions for Figure 1:

Waters Acquity Ultra Performance LC
Waters Xevo TQ-S micro MS

Chromatographic Conditions:

Column: Acquity UPLC BEH Shield RP_{18}
1.7 µm, 2.1 x 100 mm

Mobile phase: Gradient
Start: 45% H_2O / 55% (80:20 MeOH:ACN)
(both with 10 mM NH_4OAc buffer)
Ramp to 90% organic over 8 min and hold for 2 min before returning to initial conditions in 0.75 min.
Time: 12 min

Flow: 300 µL/min

MS Parameters:

Experiment: SIR

Source: Electrospray (negative)
Capillary Voltage (kV) = 2.00
Cone Voltage (V) = variable (15-74)
Desolvation Temperature (°C) = 325
Desolvation Gas Flow (L/hr) = 1000

Form#:13, Issued 2004-11-10
Revision#:9, Revised 2020-12-23

PFACMXF0122 (4 of 5)
rev0

Analytical Standard Record

Standard ID: **Y22B199**

Description:	PFAC-MXF-Native Repl.STOCK EPA 1633 PFAS	Prepared:	02/17/2022
Standard Type:	Other	**Expires:**	**01/11/2025**
Solvent:	MeOH/H20	Prepared By:	Robert Q. Bradley
Final Volume (mls):	1	Department:	PFAS
Vials:	1	Lot No.:	PFACMXF0122
Vendor:	Wellington Laboratories		

Comments:

Analyte	CAS Number	Concentration	Units
11CL-PF3OUdS	763051-92-9	1.89	ug/mL
9CL-PF3ONS	756426-58-1	1.87	ug/mL
ADONA	919005-14-4	1.89	ug/mL
HFPO-DA (Gen-X)	13252-13-6	2	ug/mL

Reviewed By　　　　　　　　Date

WELLINGTON LABORATORIES

CERTIFICATE OF ANALYSIS DOCUMENTATION

PFAC-MXF

Native Replacement PFAS Solution/Mixture

PRODUCT CODE:	PFAC-MXF
LOT NUMBER:	PFACMXF0122
SOLVENT(S):	Methanol / Water (<1%)
DATE PREPARED: (mm/dd/yyyy)	01/10/2022
LAST TESTED: (mm/dd/yyyy)	01/11/2022
EXPIRY DATE: (mm/dd/yyyy)	01/11/2025
RECOMMENDED STORAGE:	Refrigerate ampoule

DESCRIPTION:

PFAC-MXF is a solution/mixture of sodium dodecafluoro-3H-4,8-dioxanonanoate (NaDONA), the major and minor components of F-53B (9Cl-PF3ONS and 11Cl-PF3OUdS), and GenX (HFPO-DA). The components and their concentrations are given in Table A.

The individual native components of this mixture all have chemical purities of >98%.

DOCUMENTATION/ DATA ATTACHED:

Table A: Components and Concentrations of the Solution/Mixture
Figure 1: LC/MS Data (SIR)
Figure 2: LC/MS/MS Data (Selected MRM Transitions)

ADDITIONAL INFORMATION:

- See page 2 for further details.
- Contains 4 mole eq. of NaOH to prevent conversion of the carboxylic acid to the methyl ester.

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Table A: **PFAC-MXJ; Components and Concentrations (µg/mL; ± 5% in methanol)**

Compound	Acronym	Concentration (µg/mL)
3-Perfluoropropyl propanoic acid	FPrPA	4.00
3-Perfluoropentyl propanoic acid	FPePA	20.0
3-Perfluoroheptyl propanoic acid	FHpPA	20.0

Certified By: ____________ **Date:** 10/02/2021
B.G. Chittim, General Manager (mm/dd/yyyy)

Form#:13, Issued 2004-11-10
Revision#:9, Revised 2020-12-23

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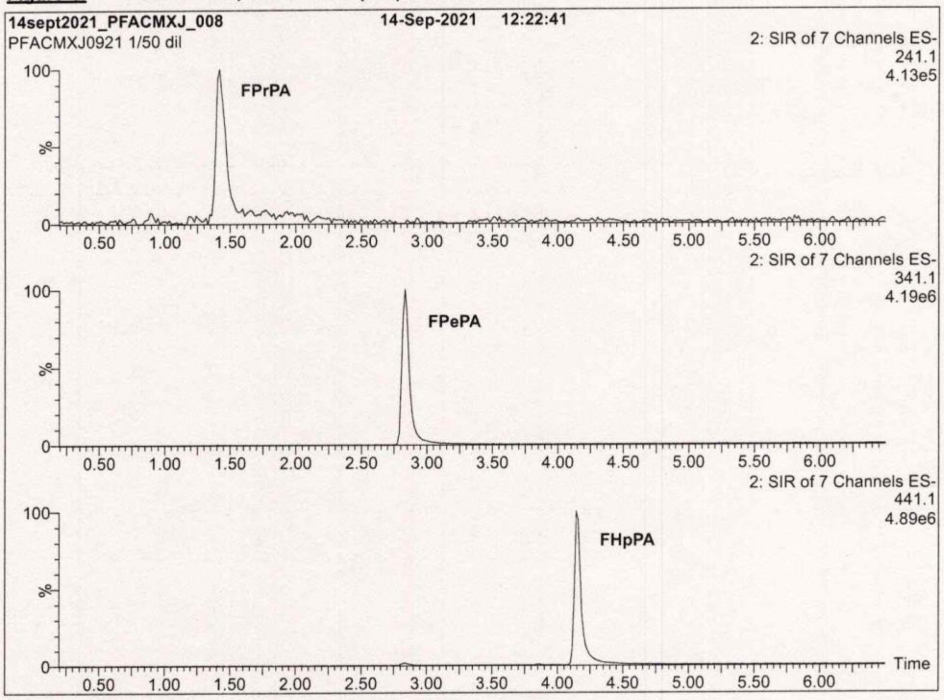
rev1

Figure 1: **PFAC-MXJ; LC/MS Data (SIR)**



Conditions for Figure 1:

Waters Acquity Ultra Performance LC
Waters Xevo TQ-S micro MS

Chromatographic Conditions:

Column: Acquity UPLC BEH Shield RP_{18}
1.7 µm, 2.1 x 100 mm

Mobile phase: Gradient
Start: 50% H_2O / 50% (80:20 MeOH:ACN)
(both with 10 mM NH_4OAc buffer)
Ramp to 90% organic over 9 min and hold for
2 min before returning to initial conditions in 1 min.
Time: 15 min

Flow: 300 µL/min

MS Parameters:

Experiment: SIR

Source: Electrospray (negative)
Capillary Voltage (kV) = 2.50
Cone Voltage (V) = variable (2-74)
Desolvation Temperature (°C) = 350
Desolvation Gas Flow (L/hr) = 1000

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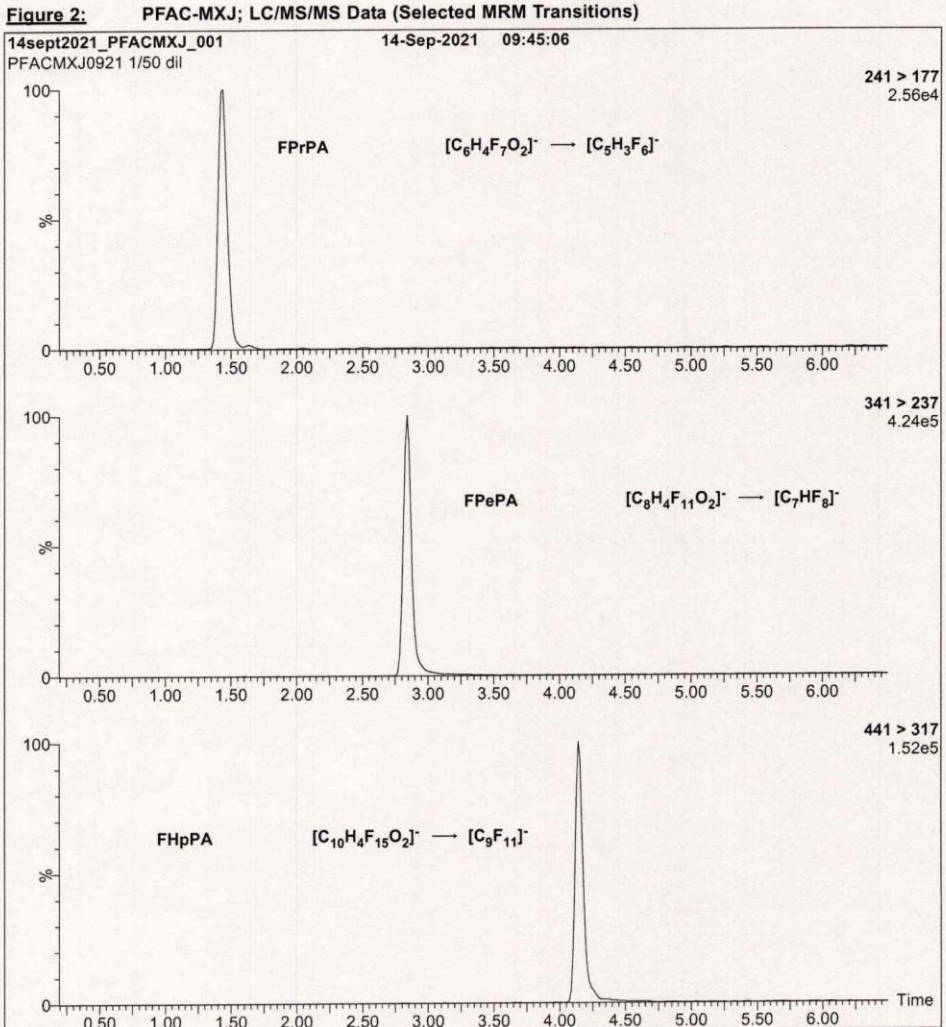
Figure 2: **PFAC-MXJ; LC/MS/MS Data (Selected MRM Transitions)**



Conditions for Figure 2:

Injection: On-column (PFAC-MXJ)

Mobile phase: Same as Figure 1

Flow: 300 µL/min

MS Parameters:
Collision Gas (mbar) = 3.31e-3
Collision Energy (eV) = 6-60 (variable)

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rev1

YORK
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Analytical Standard Record

Standard ID: **Y22B205**

Description:	PFAC-MXJ-EPA 1633 Stock mix	Prepared:	02/17/2022
Standard Type:	Other	Expires:	09/14/2026
Solvent:	Methanol	Prepared By:	Robert Q. Bradley
Final Volume (mls):	1	Department:	PFAS
Vials:	1	Lot No.:	PFACMXJ0921
Vendor:	Wellington Laboratories		

Comments:

Analyte	CAS Number	Concentration	Units
3-Perfluoroheptyl propanoic acid (FHpPA	812-70-4	20	ug/mL
3-Perfluoropentyl propanoic acid (FPePA)	914637-49-3	20	ug/mL
3-Perfluoropropyl propanoic acid (FPrPA)	356-02-2	4	ug/mL

Reviewed By　　　　Date

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WELLINGTON LABORATORIES

CERTIFICATE OF ANALYSIS DOCUMENTATION

PFAC-MXJ

Native X:3 Fluorotelomer Carboxylic Acid Solution/Mixture

PRODUCT CODE:	PFAC-MXJ
LOT NUMBER:	PFACMXJ0921
SOLVENT(S):	Methanol
DATE PREPARED: (mm/dd/yyyy)	09/08/2021
LAST TESTED: (mm/dd/yyyy)	09/14/2021
EXPIRY DATE: (mm/dd/yyyy)	09/14/2026
RECOMMENDED STORAGE:	Store ampoule in a cool, dark place

DESCRIPTION:

PFAC-MXJ is a solution/mixture of three native X:3 fluorotelomer carboxylic acids. The components and their concentrations are given in Table A.

The individual components have a chemical purity of >98%.

DOCUMENTATION/ DATA ATTACHED:

Table A: Components and Concentrations of the Solution/Mixture
Figure 1: LC/MS Data (SIR)
Figure 2: LC/MS/MS Data (Selected MRM Transitions)

ADDITIONAL INFORMATION:

- See page 2 for further details.

FOR LABORATORY USE ONLY: NOT FOR HUMAN OR DRUG USE

Wellington Laboratories Inc., 345 Southgate Dr. Guelph ON N1G 3M5 CANADA
519-822-2436 • Fax: 519-822-2849 • info@well-labs.com

INTENDED USE:

The products prepared by Wellington Laboratories Inc. are for laboratory use only. This certified reference material (CRM) was designed to be used as a standard for the identification and/or quantification of the specific chemical compounds it contains.

HANDLING:

This product should only be used by qualified personnel familiar with its potential hazards and trained in the handling of hazardous chemicals. Due care should be exercised to prevent unnecessary human contact or ingestion. All procedures should be carried out in a well-functioning fume hood and suitable gloves, eye protection, and clothing should be worn at all times. Waste should be disposed of according to national and regional regulations. Safety Data Sheets (SDSs) are available upon request.

SYNTHESIS / CHARACTERIZATION:

Our products are synthesized using single-product unambiguous routes whenever possible. They are then characterized, and their structures and purities confirmed, using a combination of the most relevant techniques, such as NMR, GC/MS, LC/MS/MS, SFC/UV/MS/MS, x-ray crystallography, and melting point. Isotopic purities of mass-labelled compounds are also confirmed using HRGC/HRMS and/or LC/MS/MS.

HOMOGENEITY:

Prior to solution preparation, crystalline material is tested for homogeneity using a variety of techniques (as stated above) and its solubility in a given diluent is taken into consideration. Duplicate solutions of a new product are prepared from the same crystalline lot and, after the addition of an appropriate internal standard, they are compared by GC/MS, LC/MS/MS, and/or SFC/UV/MS/MS. The relative response factors of the analyte of interest in each solution are required to be <5% RSD. New solution lots of existing products, as well as mixtures and calibration solutions, are compared to older lots in a similar manner. This further confirms the homogeneity of the crystalline material as well as the stability and homogeneity of the solutions in the storage containers. In order to maintain the integrity of the assigned value(s), and associated uncertainty, the dilution or injection of a subsample of this product should be performed using calibrated measuring equipment.

UNCERTAINTY:

The maximum combined relative standard uncertainty of our reference standard solutions is calculated using the following equation:

The combined relative standard uncertainty, $u_c(y)$, of a value y and the uncertainty of the independent parameters $x_1, x_2, \dots x_n$ on which it depends is:

$$u_c(y(x_1, x_2, \dots x_n)) = \sqrt{\sum_{i=1}^{n} u(y, x_i)^2}$$

where x is expressed as a relative standard uncertainty of the individual parameter.

The individual uncertainties taken into account include those associated with weights (calibration of the balance) and volumes (calibration of the volumetric glassware). An expanded maximum combined percent relative uncertainty of ±5% (calculated with a coverage factor of 2 and a level of confidence of 95%) is stated on the Certificate of Analysis for all of our products.

TRACEABILITY:

All reference standard solutions are traceable to specific crystalline lots. The microbalances used for solution preparation are regularly calibrated by an external ISO/IEC 17025 accredited laboratory. In addition, their calibration is verified prior to each weighing using calibrated external weights traceable to an ISO/IEC 17025 accredited laboratory. All volumetric glassware used is calibrated, of Class A tolerance, and traceable to an ISO/IEC 17025 accredited laboratory. For certain products, traceability to international interlaboratory studies has also been established.

EXPIRY DATE / PERIOD OF VALIDITY:

Ongoing stability studies of this product have demonstrated stability in its composition and concentration, until the specified expiry date, in the unopened ampoule. Monitoring for any degradation or change in concentration of the listed analyte(s) is performed on a routine basis.

LIMITED WARRANTY:

At the time of shipment, all products are warranted to be free of defects in material and workmanship and to conform to the stated technical and purity specifications.

QUALITY MANAGEMENT:

This product was produced using a Quality Management System registered to the latest versions of ISO 9001 by SAI Global, ISO/IEC 17025 by the Canadian Association for Laboratory Accreditation Inc. (CALA; A1226), and ISO 17034 by ANSI National Accreditation Board (ANAB; AR-1523).

CALA Testing Accreditation No. A1226

ANAB ANSI National Accreditation Board ACCREDITED ISO 17034 REFERENCE MATERIAL PRODUCER

For additional information or assistance concerning this or any other products from Wellington Laboratories Inc., please visit our website at www.well-labs.com or contact us directly at info@well-labs.com

Form#:13, Issued 2004-11-10
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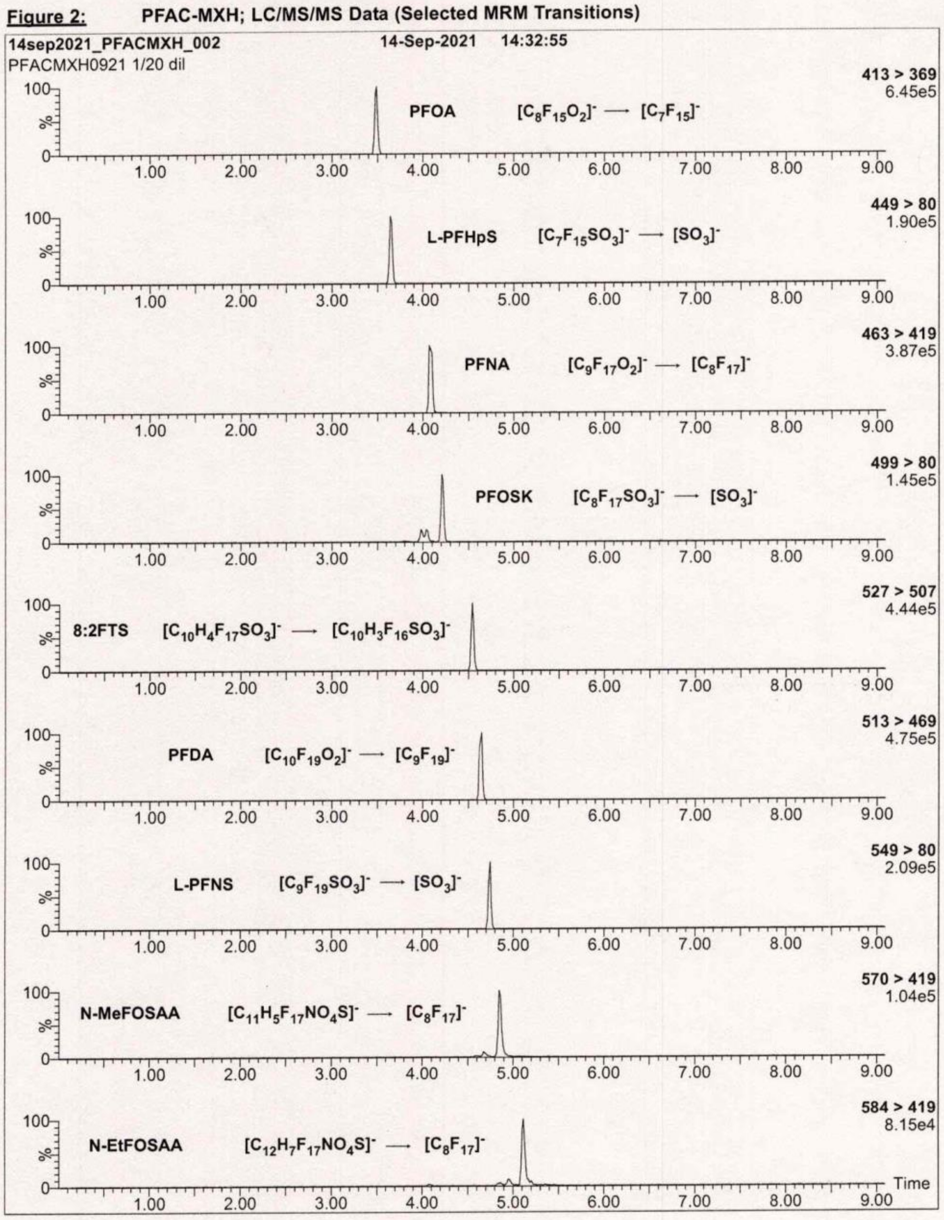
PFACMXJ0921 (2 of 5)
rev1

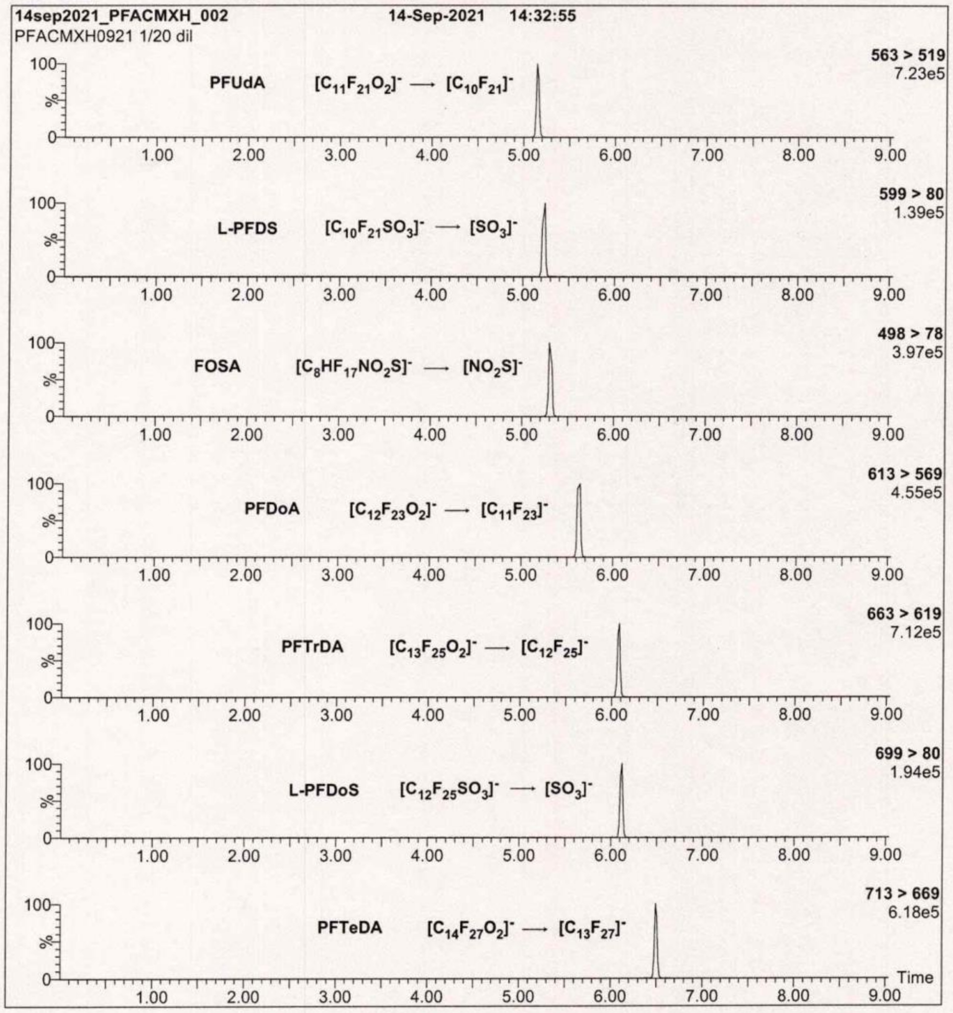
Figure 2: **PFAC-MXH; LC/MS/MS Data (Selected MRM Transitions)**



Form#:13, Issued 2004-11-10
Revision#:9, Revised 2020-12-23

PFACMXH0921 (10 of 11)
rev0

Figure 2: **PFAC-MXH; LC/MS/MS Data (Selected MRM Transitions)**



Conditions for Figure 2:

Injection: On-column (PFAC-MXH)

Mobile phase: Same as Figure 1

Flow: 300 µL/min

MS Parameters:
Collision Gas (mbar) = 3.31e-3
Collision Energy (eV) = 6-60 (variable)

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Table E: **PFOSK; Isomeric Components and Percent Composition (by ^{19}F-NMR)***

Isomer	Compound	Structure	Percent Composition by ^{19}F-NMR	
1	Potassium perfluoro-1-octanesulfonate	$CF_3CF_2CF_2CF_2CF_2CF_2CF_2CF_2SO_3^-K^+$	78.8	78.8
2	Potassium 1-trifluoromethylperfluoroheptanesulfonate**	$CF_3CF_2CF_2CF_2CF_2CF_2CF(CF_3)SO_3^-K^+$	1.2	21.1
3	Potassium 2-trifluoromethylperfluoroheptanesulfonate	$CF_3CF_2CF_2CF_2CF_2CF(CF_3)CF_2SO_3^-K^+$	0.6	
4	Potassium 3-trifluoromethylperfluoroheptanesulfonate	$CF_3CF_2CF_2CF_2CF(CF_3)CF_2CF_2SO_3^-K^+$	1.9	
5	Potassium 4-trifluoromethylperfluoroheptanesulfonate	$CF_3CF_2CF_2CF(CF_3)CF_2CF_2CF_2SO_3^-K^+$	2.2	
6	Potassium 5-trifluoromethylperfluoroheptanesulfonate	$CF_3CF_2CF(CF_3)CF_2CF_2CF_2CF_2SO_3^-K^+$	4.5	
7	Potassium 6-trifluoromethylperfluoroheptanesulfonate	$CF_3CF(CF_3)CF_2CF_2CF_2CF_2CF_2SO_3^-K^+$	10.0	
8	Potassium 5,5-di(trifluoromethyl)perfluorohexanesulfonate	$CF_3C(CF_3)_2CF_2CF_2CF_2CF_2SO_3^-K^+$	0.2	
9	Potassium 4,4-di(trifluoromethyl)perfluorohexanesulfonate	$CF_3CF_2C(CF_3)_2CF_2CF_2CF_2SO_3^-K^+$	0.03	
10	Potassium 4,5-di(trifluoromethyl)perfluorohexanesulfonate	$CF_3CF(CF_3)CF(CF_3)CF_2CF_2CF_2SO_3^-K^+$	0.4	
11	Potassium 3,5-di(trifluoromethyl)perfluorohexanesulfonate	$CF_3CF(CF_3)CF_2CF(CF_3)CF_2CF_2SO_3^-K^+$	0.07	

* Percent of total perfluorooctanesulfonate isomers only.
** Systematic Name: Potassium perfluorooctane-2-sulfonate.

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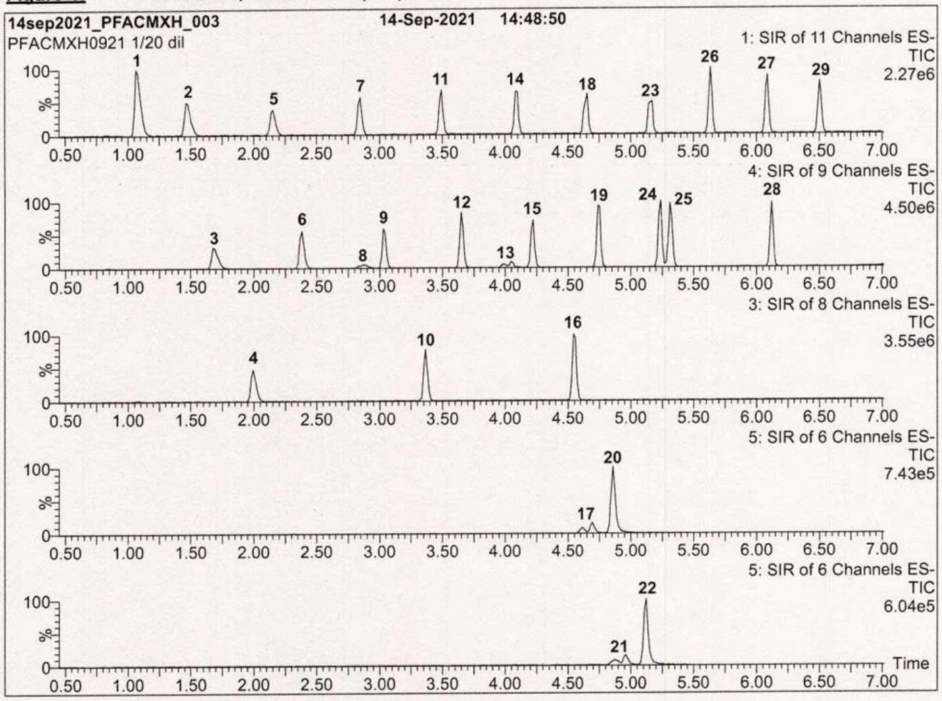
Figure 1: **PFAC-MXH; LC/MS Data (SIR)**



Conditions for Figure 1:

Waters Acquity Ultra Performance LC
Waters Xevo TQ-S micro MS

Chromatographic Conditions:

Column: Acquity UPLC BEH Shield RP_{18}
1.7 µm, 2.1 x 100 mm

Mobile phase: Gradient
Start: 50% H_2O / 50% (80:20 MeOH:ACN)
(both with 10 mM NH_4OAc buffer)
Ramp to 90% organic over 9 min and hold for 2 min before returning to initial conditions in 1 min.
Time: 15 min

Flow: 300 µL/min

MS Parameters:

Experiment: SIR

Source: Electrospray (negative)
Capillary Voltage (kV) = 2.50
Cone Voltage (V) = variable (2-74)
Desolvation Temperature (°C) = 350
Desolvation Gas Flow (L/hr) = 1000

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Figure 2: PFAC-MXH; LC/MS/MS Data (Selected MRM Transitions)

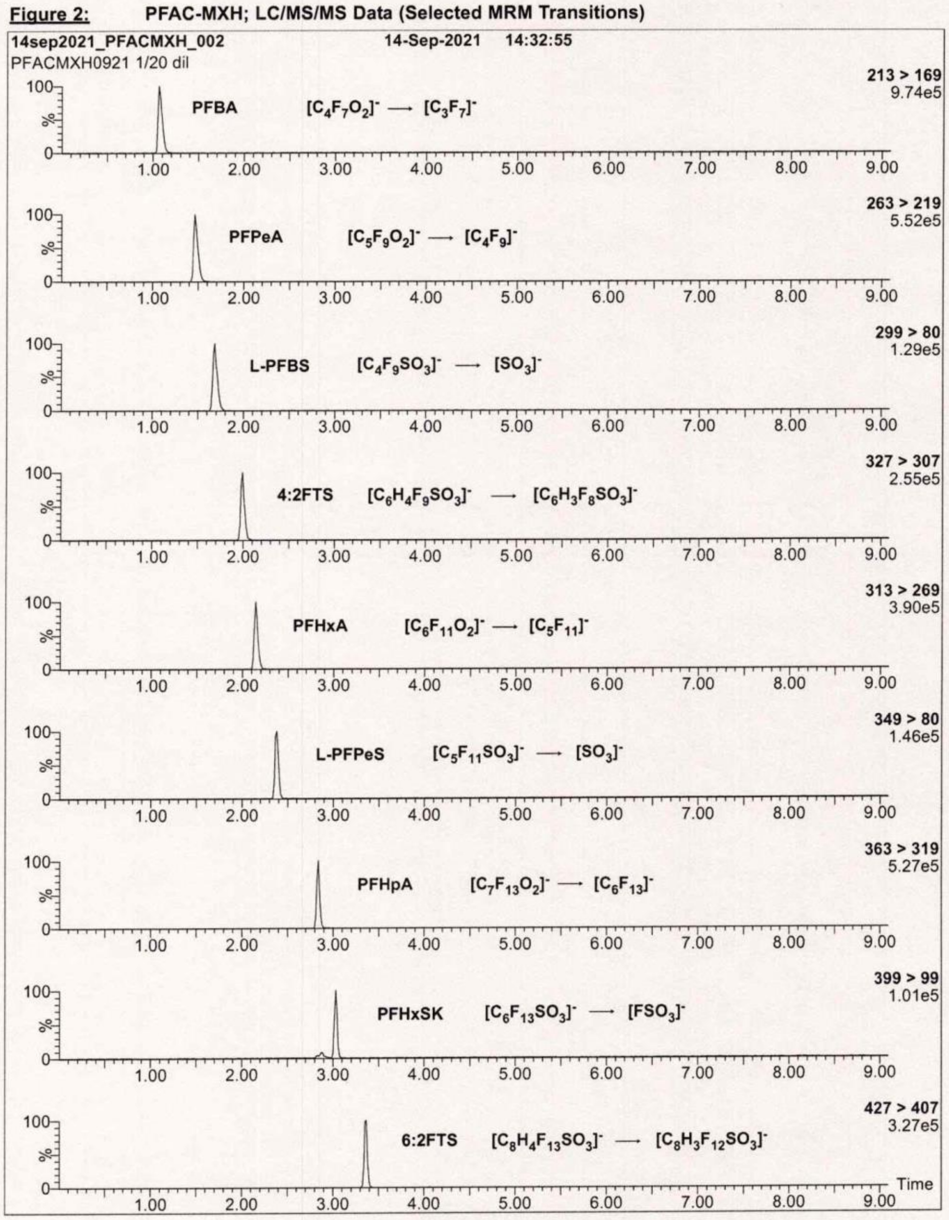

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Table B: **br-NMeFOSAA; Isomeric Components and Percent Composition (by ^{19}F-NMR)***

Isomer	Compound	Structure	Percent Composition by ^{19}F-NMR	
1	N-methylperfluoro-1-octanesulfonamidoacetic acid	$CF_3(CF_2)_7SO_2NCH_2CO_2H$ CH_3	76.0	76.0
2	N-methylperfluoro-3-methylheptanesulfonamidoacetic acid	$CF_3(CF_2)_3CF(CF_2)_2SO_2NCH_2CO_2H$ CF_3 CH_3	0.7	24.0
3	N-methylperfluoro-4-methylheptanesulfonamidoacetic acid	$CF_3(CF_2)_2CF(CF_2)_3SO_2NCH_2CO_2H$ CF_3 CH_3	2.0	
4	N-methylperfluoro-5-methylheptanesulfonamidoacetic acid	$CF_3CF_2CF(CF_2)_4SO_2NCH_2CO_2H$ CF_3 CH_3	6.0	
5	N-methylperfluoro-6-methylheptanesulfonamidoacetic acid	$CF_3CF(CF_2)_5SO_2NCH_2CO_2H$ CF_3 CH_3	14.0	
6	N-methylperfluoro-5,5-dimethylhexanesulfonamidoacetic acid	CF_3 $CF_3C(CF_2)_4SO_2NCH_2CO_2H$ CF_3 CH_3	0.2	
7	Other Unidentified Isomers		1.1	

* Percent of total N-methylperfluorooctanesulfonamidoacetic acid isomers only.

Form#:13, Issued 2004-11-10
Revision#:9, Revised 2020-12-23

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Table C: **br-NEtFOSAA; Isomeric Components and Percent Composition (by ^{19}F-NMR)***

Isomer	Compound	Structure	Percent Composition by ^{19}F-NMR	
1	N-ethylperfluoro-1-octanesulfonamidoacetic acid	$CF_3(CF_2)_7SO_2NCH_2CO_2H$ C_2H_5	77.5	77.5
2	N-ethylperfluoro-3-methylheptanesulfonamidoacetic acid	$CF_3(CF_2)_3CF(CF_2)_2SO_2NCH_2CO_2H$ CF_3 C_2H_5	2.3	22.5
3	N-ethylperfluoro-4-methylheptanesulfonamidoacetic acid	$CF_3(CF_2)_2CF(CF_2)_3SO_2NCH_2CO_2H$ CF_3 C_2H_5	2.2	
4	N-ethylperfluoro-5-methylheptanesulfonamidoacetic acid	$CF_3CF_2CF(CF_2)_4SO_2NCH_2CO_2H$ CF_3 C_2H_5	5.4	
5	N-ethylperfluoro-6-methylheptanesulfonamidoacetic acid	$CF_3CF(CF_2)_5SO_2NCH_2CO_2H$ CF_3 C_2H_5	10.4	
6	N-ethylperfluoro-5,5-dimethylhexanesulfonamidoacetic acid	CF_3 $CF_3C(CF_2)_4SO_2NCH_2CO_2H$ CF_3 C_2H_5	0.3	
7	N-ethylperfluoro-4,5-dimethylhexanesulfonamidoacetic acid	CF_3 $CF_3CFCF(CF_2)_3SO_2NCH_2CO_2H$ CF_3 C_2H_5	0.3	
8	N-ethylperfluoro-3,5-dimethylhexanesulfonamidoacetic acid	CF_3 $CF_3CFCF_2CF(CF_2)_2SO_2NCH_2CO_2H$ CF_3 C_2H_5	0.3	
9	Other Unidentified Isomers		1.3	

* Percent of total N-ethylperfluorooctanesulfonamidoacetic acid isomers only.

Table D: **PFHxSK; Isomeric Components and Percent Composition (by ^{19}F-NMR)***

Isomer	Compound	Structure	Percent Composition by ^{19}F-NMR	
1	Potassium perfluoro-1-hexanesulfonate	$CF_3CF_2CF_2CF_2CF_2CF_2SO_3^-K^+$	81.1	81.1
2	Potassium 1-trifluoromethylperfluoropentanesulfonate**	$CF_3CF_2CF_2CF_2CFSO_3^-K^+$ CF_3	2.9	18.9
3	Potassium 2-trifluoromethylperfluoropentanesulfonate	$CF_3CF_2CF_2CFCF_2SO_3^-K^+$ CF_3	1.4	
4	Potassium 3-trifluoromethylperfluoropentanesulfonate	$CF_3CF_2CFCF_2CF_2SO_3^-K^+$ CF_3	5.0	
5	Potassium 4-trifluoromethylperfluoropentanesulfonate	$CF_3CFCF_2CF_2CF_2SO_3^-K^+$ CF_3	8.9	
6	Potassium 3,3-di(trifluoromethyl)perfluorobutanesulfonate	CF_3 $CF_3CCF_2CF_2SO_3^-K^+$ CF_3	0.2	
7	Other Unidentified Isomers		0.5	

* Percent of total perfluorohexanesulfonate isomers only.
** Systematic Name: Potassium perfluorohexane-2-sulfonate.

WELLINGTON LABORATORIES

CERTIFICATE OF ANALYSIS DOCUMENTATION

PFAC-MXH

Native Per- and Poly-fluoroalkyl Substance Solution/Mixture

PRODUCT CODE:	PFAC-MXH
LOT NUMBER:	PFACMXH0921
SOLVENT(S):	Methanol / Isopropanol (2%) / Water (<1%)
DATE PREPARED: (mm/dd/yyyy)	09/09/2021
LAST TESTED: (mm/dd/yyyy)	09/14/2021
EXPIRY DATE: (mm/dd/yyyy)	09/14/2026
RECOMMENDED STORAGE:	Refrigerate ampoule

DESCRIPTION:

PFAC-MXH is a solution/mixture of eleven native linear perfluoroalkylcarboxylic acids (C_4-C_{14}), eight native perfluoroalkanesulfonates (C_4, C_5, C_7, C_9, C_{10} and C_{12} linear; C_6 and C_8 linear and branched), three native fluorotelomer sulfonates (4:2, 6:2, and 8:2), two native linear and branched perfluorooctanesulfonamidoacetic acids, and perfluoro-1-octanesulfonamide (FOSA). The components and their concentrations are given in Table A.

The individual components of this mixture all have chemical purities of >98%.

DOCUMENTATION/ DATA ATTACHED:

Table A: Components and Concentrations of the Solution/Mixture
Table B: Isomeric Components and Percent Composition of br-NMeFOSAA
Table C: Isomeric Components and Percent Composition of br-NEtFOSAA
Table D: Isomeric Components and Percent Composition of PFHxSK
Table E: Isomeric Components and Percent Composition of PFOSK
Figure 1: LC/MS Data (SIR)
Figure 2: LC/MS/MS Data (Selected MRM Transitions)

ADDITIONAL INFORMATION:

- See page 2 for further details.
- Contains 4 mole eq. of NaOH to prevent conversion of the carboxylic acids to their respective methyl esters.

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519-822-2436 • Fax: 519-822-2849 • info@well-labs.com

INTENDED USE:

The products prepared by Wellington Laboratories Inc. are for laboratory use only. This certified reference material (CRM) was designed to be used as a standard for the identification and/or quantification of the specific chemical compounds it contains.

HANDLING:

This product should only be used by qualified personnel familiar with its potential hazards and trained in the handling of hazardous chemicals. Due care should be exercised to prevent unnecessary human contact or ingestion. All procedures should be carried out in a well-functioning fume hood and suitable gloves, eye protection, and clothing should be worn at all times. Waste should be disposed of according to national and regional regulations. Safety Data Sheets (SDSs) are available upon request.

SYNTHESIS / CHARACTERIZATION:

Our products are synthesized using single-product unambiguous routes whenever possible. They are then characterized, and their structures and purities confirmed, using a combination of the most relevant techniques, such as NMR, GC/MS, LC/MS/MS, SFC/UV/MS/MS, x-ray crystallography, and melting point. Isotopic purities of mass-labelled compounds are also confirmed using HRGC/HRMS and/or LC/MS/MS.

HOMOGENEITY:

Prior to solution preparation, crystalline material is tested for homogeneity using a variety of techniques (as stated above) and its solubility in a given diluent is taken into consideration. Duplicate solutions of a new product are prepared from the same crystalline lot and, after the addition of an appropriate internal standard, they are compared by GC/MS, LC/MS/MS, and/or SFC/UV/MS/MS. The relative response factors of the analyte of interest in each solution are required to be <5% RSD. New solution lots of existing products, as well as mixtures and calibration solutions, are compared to older lots in a similar manner. This further confirms the homogeneity of the crystalline material as well as the stability and homogeneity of the solutions in the storage containers. In order to maintain the integrity of the assigned value(s), and associated uncertainty, the dilution or injection of a subsample of this product should be performed using calibrated measuring equipment.

UNCERTAINTY:

The maximum combined relative standard uncertainty of our reference standard solutions is calculated using the following equation:

The combined relative standard uncertainty, $u_c(y)$, of a value y and the uncertainty of the independent parameters $x_1, x_2, \ldots x_n$ on which it depends is:

$$u_c(y(x_1, x_2, \ldots x_n)) = \sqrt{\sum_{i=1}^{n} u(y, x_i)^2}$$

where x is expressed as a relative standard uncertainty of the individual parameter.

The individual uncertainties taken into account include those associated with weights (calibration of the balance) and volumes (calibration of the volumetric glassware). An expanded maximum combined percent relative uncertainty of ±5% (calculated with a coverage factor of 2 and a level of confidence of 95%) is stated on the Certificate of Analysis for all of our products.

TRACEABILITY:

All reference standard solutions are traceable to specific crystalline lots. The microbalances used for solution preparation are regularly calibrated by an external ISO/IEC 17025 accredited laboratory. In addition, their calibration is verified prior to each weighing using calibrated external weights traceable to an ISO/IEC 17025 accredited laboratory. All volumetric glassware used is calibrated, of Class A tolerance, and traceable to an ISO/IEC 17025 accredited laboratory. For certain products, traceability to international interlaboratory studies has also been established.

EXPIRY DATE / PERIOD OF VALIDITY:

Ongoing stability studies of this product have demonstrated stability in its composition and concentration, until the specified expiry date, in the unopened ampoule. Monitoring for any degradation or change in concentration of the listed analyte(s) is performed on a routine basis.

LIMITED WARRANTY:

At the time of shipment, all products are warranted to be free of defects in material and workmanship and to conform to the stated technical and purity specifications.

QUALITY MANAGEMENT:

This product was produced using a Quality Management System registered to the latest versions of ISO 9001 by SAI Global, ISO/IEC 17025 by the Canadian Association for Laboratory Accreditation Inc. (CALA; A1226), and ISO 17034 by ANSI National Accreditation Board (ANAB; AR-1523).

CALA Testing Accreditation No. A1226

ANAB ANSI National Accreditation Board ACCREDITED ISO 17034 REFERENCE MATERIAL PRODUCER

For additional information or assistance concerning this or any other products from Wellington Laboratories Inc., please visit our website at www.well-labs.com or contact us directly at info@well-labs.com

Form#:13, Issued 2004-11-10
Revision#:9, Revised 2020-12-23

PFACMXH0921 (2 of 11)
rev0

Table A: **PFAC-MXH; Components and Concentrations (µg/mL, ± 5% in methanol / isopropanol (2%) / water (<1%))**

Compound	Acronym	Concentration* (µg/mL)	Peak Assignment in Figure 1
Perfluoro-n-butanoic acid	PFBA	4.00	1
Perfluoro-n-pentanoic acid	PFPeA	2.00	2
Perfluoro-n-hexanoic acid	PFHxA	1.00	5
Perfluoro-n-heptanoic acid	PFHpA	1.00	7
Perfluoro-n-octanoic acid	PFOA	1.00	11
Perfluoro-n-nonanoic acid	PFNA	1.00	14
Perfluoro-n-decanoic acid	PFDA	1.00	18
Perfluoro-n-undecanoic acid	PFUdA	1.00	23
Perfluoro-n-dodecanoic acid	PFDoA	1.00	26
Perfluoro-n-tridecanoic acid	PFTrDA	1.00	27
Perfluoro-n-tetradecanoic acid	PFTeDA	1.00	29
Perfluoro-1-octanesulfonamide	FOSA	1.00	25
N-methylperfluorooctanesulfonamidoacetic acid [a]	N-MeFOSAA: linear isomer	0.760	20
	N-MeFOSAA: ∑ branched isomers	0.240	17
N-ethylperfluorooctanesulfonamidoacetic acid [b]	N-EtFOSAA: linear isomer	0.775	22
	N-EtFOSAA: ∑ branched isomers	0.225	21

Compound	Acronym	Concentration* (µg/mL) as the salt	Concentration* (µg/mL) as the acid	Peak Assignment in Figure 1
Potassium perfluoro-1-butanesulfonate	L-PFBS	1.00	0.887	3
Sodium perfluoro-1-pentanesulfonate	L-PFPeS	1.00	0.941	6
Potassium perfluorohexanesulfonate [c]	PFHxSK: linear isomer	0.811	0.741	9
	PFHxSK: ∑ branched isomers	0.189	0.173	8
Sodium perfluoro-1-heptanesulfonate	L-PFHpS	1.00	0.953	12
Potassium perfluorooctanesulfonate [d]	PFOSK: linear isomer	0.788	0.732	15
	PFOSK: ∑ branched isomers	0.211	0.196	13
Sodium perfluoro-1-nonanesulfonate	L-PFNS	1.00	0.962	19
Sodium perfluoro-1-decanesulfonate	L-PFDS	1.00	0.965	24
Sodium perfluoro-1-dodecanesulfonate	L-PFDoS	1.00	0.970	28
Sodium 1H,1H,2H,2H-perfluorohexanesulfonate	4:2FTS	4.00	3.75	4
Sodium 1H,1H,2H,2H-perfluorooctanesulfonate	6:2FTS	4.00	3.80	10
Sodium 1H,1H,2H,2H-perfluorodecanesulfonate	8:2FTS	4.00	3.84	16

[a] See Table B for percent composition of linear and branched N-MeFOSAA isomers.
[b] See Table C for percent composition of linear and branched N-EtFOSAA isomers.
[c] See Table D for percent composition of linear and branched PFHxSK isomers.
[d] See Table E for percent composition of linear and branched PFOSK isomers.

* Concentrations have been rounded to three significant figures.

Certified By: B.G. Chittim, General Manager **Date:** 09/23/2021 (mm/dd/yyyy)

Form#:13, Issued 2004-11-10
Revision#:9, Revised 2020-12-23

PFACMXH0921 (3 of 11) rev0

YORK
ANALYTICAL LABORATORIES, INC.

Analytical Standard Record

Standard ID: **Y22B201**

Description:	PFAC-MXH STOCK PFAS EPA 1633	Prepared:	02/17/2022
Standard Type:	Other	**Expires:**	**09/14/2026**
Solvent:	MeOH/IPA/H2O	Prepared By:	Robert Q. Bradley
Final Volume (mls):	1	Department:	PFAS
Vials:	1	Lot No.:	PFACMXH0921
Vendor:	Wellington Laboratories		

Comments:

Analyte	CAS Number	Concentration	Units
1H,1H,2H,2H-Perfluorodecanesulfonic acid	39108-34-4	3.84	ug/mL
1H,1H,2H,2H-Perfluorohexanesulfonic acid	757124-72-4	3.75	ug/mL
1H,1H,2H,2H-Perfluorooctanesulfonic acid	27619-97-2	3.8	ug/mL
N-EtFOSAA	2991-50-6	1	ug/mL
N-MeFOSAA	2355-31-9	1	ug/mL
Perfluoro-1-decanesulfonic acid (PFDS)	335-77-3	0.965	ug/mL
Perfluoro-1-heptanesulfonic acid (PFHpS)	375-92-8	0.953	ug/mL
Perfluoro-1-nonanesulfonic acid (PFNS)	68259-12-1	0.962	ug/mL
Perfluoro-1-octanesulfonamide (FOSA)	754-91-6	1	ug/mL
Perfluoro-1-pentanesulfonate (PFPeS)	2706-91-4	0.941	ug/mL
Perfluorobutanesulfonic acid (PFBS)	375-73-5	0.887	ug/mL
Perfluorodecanesulfonic acid(PFDS)	335-77-3	0.965	ug/mL
Perfluorodecanoic acid (PFDA)	335-76-2	1	ug/mL
Perfluorododecanoic acid (PFDoA)	307-55-1	1	ug/mL
Perfluoroheptanoic acid (PFHpA)	375-85-9	1	ug/mL
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	0.914	ug/mL
Perfluorohexanoic acid (PFHxA)	307-24-4	1	ug/mL
Perfluoro-n-butanoic acid (PFBA)	375-22-4	4	ug/mL
Perfluorononanoic acid (PFNA)	375-95-1	1	ug/mL
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	0.928	ug/mL
Perfluorooctanoic acid (PFOA)	335-67-1	1	ug/mL
Perfluoropentanoic acid (PFPeA)	2706-90-3	1	ug/mL
Perfluorotetradecanoic acid (PFTA)	376-06-7	1	ug/mL
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	1	ug/mL
Perfluoroundecanoic acid (PFUnA)	2058-94-8	1	ug/mL

Reviewed By   Date

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Attachment 4 – Calibration Concentrations, nominal

Calibration Solutions (ng/mL) Compound

CS1 (LOQ) CS2 Perfluor	**alkyl carboxylic**		**CS3**	**CS4 (CV[1])**	**CS5**	**CS6**	**CS7[2]**
acids							
PFBA	0.8	2	5	10	20	50	250
PFPeA	0.4	1	2.5	5	10	25	125
PFHxA	0.2	0.5	1.25	2.5	5	12.5	62.5
PFHpA	0.2	0.5	1.25	2.5	5	12.5	62.5
PFOA	0.2	0.5	1.25	2.5	5	12.5	62.5
PFNA	0.2	0.5	1.25	2.5	5	12.5	62.5
PFDA	0.2	0.5	1.25	2.5	5	12.5	62.5
PFUnA	0.2	0.5	1.25	2.5	5	12.5	62.5
PFDoA	0.2	0.5	1.25	2.5	5	12.5	62.5
PFTrDA	0.2	0.5	1.25	2.5	5	12.5	62.5
PFTeDA	0.2	0.5	1.25	2.5	5	12.5	62.5
Perfluoroalkyl sulfonic acids							
PFBS	0.2	0.5	1.25	2.5	5	12.5	62.5
PFPeS	0.2	0.5	1.25	2.5	5	12.5	62.5
PFHxS	0.2	0.5	1.25	2.5	5	12.5	62.5
PFHpS	0.2	0.5	1.25	2.5	5	12.5	62.5
PFOS	0.2	0.5	1.25	2.5	5	12.5	62.5
PFNS	0.2	0.5	1.25	2.5	5	12.5	62.5
PFDS	0.2	0.5	1.25	2.5	5	12.5	62.5
PFDoS	0.2	0.5	1.25	2.5	5	12.5	62.5
Fluorotelomer sulfonic acids							
4:2FTS	0.8	2	5	10	20	50	NA
6:2FTS	0.8	2	5	10	20	50	NA
8:2FTS	0.8	2	5	10	20	50	NA
Perfluorooctane sulfonamides							
PFOSA	0.2	0.5	1.25	2.5	5	12.5	62.5
NMeFOSA	0.2	0.5	1.25	2.5	5	12.5	62.5
NEtFOSA	0.2	0.5	1.25	2.5	5	12.5	62.5
Perfluorooctane sulfonamidoacetic acids							
NMeFOSAA	0.2	0.5	1.25	2.5	5	12.5	62.5
NEtFOSAA	0.2	0.5	1.25	2.5	5	12.5	62.5
Perfluorooctane sulfonamide ethanols							
NMeFOSE	2	5	12.5	25	50	125	625
NEtFOSE	2	5	12.5	25	50	125	625
Per- and polyfluoroether carboxylic acids							
HFPO-DA	0.8	2	5	10	20	50	250
ADONA	0.8	2	5	10	20	50	250
PFMPA	0.4	1	2.5	5	10	25	125
PFMBA	0.4	1	2.5	5	10	25	125
NFDHA	0.4	1	2.5	5	10	25	125
Ether sulfonic acids							
9Cl-PF3ONS	0.8	2	5	10	20	50	250
11Cl-PF3OUdS	0.8	2	5	10	20	50	250
PFEESA	0.4	1	2.5	5	10	25	125

Calibration Solutions (ng/mL) Compound

CS1 (LOQ) CS2 Fluorote	lomer carboxylic		CS3	CS4 (CV[1])	CS5	CS6	CS7[2]
acids							
3:3FTCA	1.0	2.5	6.26	12.5	25	62.4	312
5:3FTCA	5.0	12.5	31.3	62.5	125	312	1560
7:3FTCA	5.0	12.5	31.3	62.5	125	312	1560
Extracted Internal Standard (EIS) Analytes							
$^{13}C_4$-PFBA	10	10	10	10	10	10	10
$^{13}C_5$-PFPeA	5	5	5	5	5	5	5
$^{13}C_5$-PFHxA	2.5	2.5	2.5	2.5	2.5	2.5	2.5
$^{13}C_4$-PFHpA	2.5	2.5	2.5	2.5	2.5	2.5	2.5
$^{13}C_8$-PFOA	2.5	2.5	2.5	2.5	2.5	2.5	2.5
$^{13}C_9$-PFNA	1.25	1.25	1.25	1.25	1.25	1.25	1.25
$^{13}C_6$-PFDA	1.25	1.25	1.25	1.25	1.25	1.25	1.25
$^{13}C_7$-PFUnA	1.25	1.25	1.25	1.25	1.25	1.25	1.25
$^{13}C_2$-PFDoA	1.25	1.25	1.25	1.25	1.25	1.25	1.25
$^{13}C_2$-PFTeDA	1.25	1.25	1.25	1.25	1.25	1.25	1.25
$^{13}C_3$-PFBS	2.5	2.5	2.5	2.5	2.5	2.5	2.5
$^{13}C_3$-PFHxS	2.5	2.5	2.5	2.5	2.5	2.5	2.5
$^{13}C_8$-PFOS	2.5	2.5	2.5	2.5	2.5	2.5	2.5
$^{13}C_2$-4:2FTS	5	5	5	5	5	5	5
$^{13}C_2$-6:2FTS	5	5	5	5	5	5	5
$^{13}C_2$-8:2FTS	5	5	5	5	5	5	5
$^{13}C_8$-PFOSA	2.5	2.5	2.5	2.5	2.5	2.5	2.5
D_3-NMeFOSA	2.5	2.5	2.5	2.5	2.5	2.5	2.5
D_5-NEtFOSA	2.5	2.5	2.5	2.5	2.5	2.5	2.5
D_3-NMeFOSAA	5	5	5	5	5	5	5
D_5-NEtFOSAA	5	5	5	5	5	5	5
D_7-NMeFOSE	25	25	25	25	25	25	25
D_9-NEtFOSE	25	25	25	25	25	25	25
$^{13}C_3$-HFPO-DA	10	10	10	10	10	10	10
Non-extracted Internal Standard (NIS) Analytes							
$^{13}C_3$-PFBA	5	5	5	5	5	5	5
$^{13}C_2$-PFHxA	2.5	2.5	2.5	2.5	2.5	2.5	2.5
$^{13}C_4$-PFOA	2.5	2.5	2.5	2.5	2.5	2.5	2.5
$^{13}C_5$-PFNA	1.25	1.25	1.25	1.25	1.25	1.25	1.25
$^{13}C_2$-PFDA	1.25	1.25	1.25	1.25	1.25	1.25	1.25
$^{18}O_2$-PFHxS	2.5	2.5	2.5	2.5	2.5	2.5	2.5
$^{13}C_4$-PFOS	2.5	2.5	2.5	2.5	2.5	2.5	2.5

[1] This calibration point is used as the calibration verification (CV)

[2] A minimum of six contiguous calibrations standards are required for linear models and a minimum of seven calibration standards are required for second-order models.

Attachment 5 -HPLC Method Parameters

HPLC Acquisition Method Report

Stroke A
- **Automatic Stroke Calculation A** — 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
- **Stoptime** — 10.00 min

Post Time
- **Posttime Mode** — Time set
- **Posttime** — 1.50 min

Injection

Injection with needle wash
3.00 µL

Solvent Composition

	Channel	Name 1	Name 2	Selected	Used	Percent
1	A	Water 5mM ammonium acetate		Ch. 1	Yes	90.00 %
2	B	Methanol		Ch. 1	Yes	10.00 %

Timetable

	Time	A	B	Flow
1	3.50 min	50.00 %	50.00 %	0.400 mL/min
2	8.00 min	10.00 %	90.00 %	0.400 mL/min
3	8.50 min	90.00 %	10.00 %	0.400 mL/min

Name: **Column Comp.** Module: **G1316C**

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

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

Stop Time
- **Stoptime Mode** — As pump/injector

Post Time
- **Posttime Mode** — Off

Timetable

Valve Position — Position 1 (Port 1 -> 2)

Ready when front door open — Yes

Attachment 6 - Triple Quadrupole Acquisition Method

Acquisition Method Report

Agilent Technologies

Acquisition Method Info

Method Name	PFAS1633_ACQ_092922.m
Method Path	D:\MassHunter\methods\PFAS1633_ACQ_092922.m
Method Description	EPA 1633_Target PFAS Isotope Dilution_Acquisition

Device List

- HiP Sampler
- Binary Pump
- Column Comp.
- QQQ

MS QQQ Mass Spectrometer

Ion Source	AJS ESI	**Tune File**	D:\MassHunter\Tune\QQQ\G6460C\atunes.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	350	Yes	550	Yes	3

Time Segment 1

Scan Segments

Cpd Name	ISTD?	Prec Ion	MS1 Res	Prod Ion	MS2 Res	Primary	Trigger	Frag (V)	CE(V)	Cell Acc (V)	Ret Time (min)	Ret Window	Polarity
11-Cl-PF3OUdS	No	631	Unit/Enh (6490)	451	Unit/Enh (6490)	Yes	No	170	33	4	7.62	3	Negative
1H,1H,2H,2H-perfluoro-1-decanesulfonate (82FTS)	No	527	Unit/Enh (6490)	507	Unit/Enh (6490)	Yes	No	170	28	4	7.14	3	Negative
1H,1H,2H,2H-perfluoro-1-decanesulfonate (82FTS)	No	527	Unit/Enh (6490)	80.9	Unit/Enh (6490)	Yes	No	170	40	4	7.14	3	Negative
1H,1H,2H,2H-perfluoro-1-hexanesulfonate (42FTS)	No	327	Unit/Enh (6490)	307	Unit/Enh (6490)	Yes	No	162	20	4	4.788	3	Negative
1H,1H,2H,2H-perfluoro-1-hexanesulfonate (42FTS)	No	327	Unit/Enh (6490)	80.9	Unit/Enh (6490)	Yes	No	162	36	4	4.788	3	Negative
1H,1H,2H,2H-perfluoro-1-octanesulfonate (62FTS)	No	427	Unit/Enh (6490)	407	Unit/Enh (6490)	Yes	No	162	24	4	6.168	3	Negative
1H,1H,2H,2H-perfluoro-1-octanesulfonate (62FTS)	No	427	Unit/Enh (6490)	79.7	Unit/Enh (6490)	Yes	No	162	48	4	6.168	3	Negative
3:3FTCA	No	241	Unit/Enh (6490)	177	Unit/Enh (6490)	Yes	No	74	4	4	3.4	3	Negative
3-3FTCA	No	241	Unit/Enh (6490)	117	Unit/Enh (6490)	Yes	No	74	44	4	3.4	3	Negative

Acquisition Method Report

Agilent Technologies

Cpd Name	ISTD?	Prec Ion	MS1 Res	Prod Ion	MS2 Res	Primary	Trigger	Frag (V)	CE(V)	Cell Acc (V)	Ret Time (min)	Ret Window	Polarity
5-3FTCA	No	341	Unit/Enh (6490)	237	Unit/Enh (6490)	Yes	No	84	12	4	5.73	3	Negative
5-3FTCA	No	341	Unit/Enh (6490)	217	Unit/Enh (6490)	Yes	No	84	24	4	5.73	3	Negative
7-3FTCA	No	441	Unit/Enh (6490)	337	Unit/Enh (6490)	Yes	No	76	12	4	6.7	3	Negative
7-3FTCA	No	441	Unit/Enh (6490)	317	Unit/Enh (6490)	Yes	No	76	24	4	6.7	3	Negative
9-Cl-PF3ONS	No	531	Unit/Enh (6490)	351	Unit/Enh (6490)	Yes	No	175	29	4	6.89	3	Negative
ADONA	No	377	Unit/Enh (6490)	251	Unit/Enh (6490)	Yes	No	103	9	4	5.62	3	Negative
ADONA	No	377	Unit/Enh (6490)	85	Unit/Enh (6490)	Yes	No	103	37	4	5.62	3	Negative
d3-NMeFOSA	No	515	Unit/Enh (6490)	219	Unit/Enh (6490)	Yes	No	134	20	4	7.17	3	Negative
d3-N-MeFOSAA	No	572.99	Unit/Enh (6490)	418.8	Unit/Enh (6490)	Yes	No	130	20	4	7.17	3	Negative
d5-NEtFOSA	No	531	Unit/Enh (6490)	219	Unit/Enh (6490)	Yes	No	150	20	4	8.52	3	Negative
d5-NEtFOSA	No	531	Unit/Enh (6490)	169	Unit/Enh (6490)	Yes	No	150	20	4	8.52	3	Negative
d5-N-EtFOSAA	No	589.02	Unit/Enh (6490)	530.9	Unit/Enh (6490)	Yes	No	130	20	4	7.36	3	Negative
d5-N-EtFOSAA	No	589.02	Unit/Enh (6490)	418.8	Unit/Enh (6490)	Yes	No	130	20	4	7.36	3	Negative
d7-NMeFOSE	No	623	Unit/Enh (6490)	310	Unit/Enh (6490)	Yes	No	150	15	4	8.28	3	Negative
d7-NMeFOSE	No	623	Unit/Enh (6490)	59	Unit/Enh (6490)	Yes	No	88	15	4	8.28	3	Negative
d9-NEtFOSE	No	639	Unit/Enh (6490)	59	Unit/Enh (6490)	Yes	No	150	15	4	8.6	3	Negative
HFPO-DA	No	285	Unit/Enh (6490)	169.1	Unit/Enh (6490)	Yes	No	100	20	4	4.95	3	Negative
M2-4:2FTS	No	329	Unit/Enh (6490)	309	Unit/Enh (6490)	Yes	No	156	20	4	4.787	3	Negative
M2-4:2FTS	No	329	Unit/Enh (6490)	81	Unit/Enh (6490)	Yes	No	156	28	4	4.787	3	Negative
M2-6:2FTS	No	429	Unit/Enh (6490)	409	Unit/Enh (6490)	Yes	No	162	24	4	6.01	3	Negative
M2-6:2FTS	No	429	Unit/Enh (6490)	81	Unit/Enh (6490)	Yes	No	162	40	4	6.01	3	Negative
M2-8:2FTS	No	529	Unit/Enh (6490)	509	Unit/Enh (6490)	Yes	No	165	28	4	6.98	3	Negative
M2-8:2FTS	No	529	Unit/Enh (6490)	81	Unit/Enh (6490)	Yes	No	165	40	4	6.98	3	Negative
M2PFTeDA	No	715	Unit/Enh (6490)	670	Unit/Enh (6490)	Yes	No	62	12	4	8.25	3	Negative
M3-HFPO-DA	No	287	Unit/Enh (6490)	169	Unit/Enh (6490)	Yes	No	90	5	4	4.99	3	Negative
M3PFBA	Yes	216	Unit/Enh (6490)	172	Unit/Enh (6490)	Yes	No	90	5	4	1.2	2	Negative
M3PFBS	No	302	Unit/Enh (6490)	98.9	Unit/Enh (6490)	Yes	No	114	32	4	3.94	3	Negative
M3PFBS	No	302	Unit/Enh (6490)	79.9	Unit/Enh (6490)	Yes	No	114	40	4	3.94	3	Negative
M3PFHxS	No	402	Unit/Enh (6490)	98.9	Unit/Enh (6490)	Yes	No	165	40	4	5.55	3	Negative
M3PFHxS	No	402	Unit/Enh (6490)	80	Unit/Enh (6490)	Yes	No	165	48	4	5.55	3	Negative
M4PFHpA	No	367	Unit/Enh (6490)	322	Unit/Enh (6490)	Yes	No	124	8	4	5.601	3	Negative
M5PFHxA	No	318	Unit/Enh (6490)	273	Unit/Enh (6490)	Yes	No	70	4	4	5.47	3	Negative
M5PFHxA	No	318	Unit/Enh (6490)	120	Unit/Enh (6490)	Yes	No	70	4	4	5.47	3	Negative
M6PFDA	No	519	Unit/Enh (6490)	473.9	Unit/Enh (6490)	Yes	No	59	8	4	6.99	3	Negative
M7PFUdA	No	570	Unit/Enh (6490)	525	Unit/Enh (6490)	Yes	No	64	8	4	7.38	3	Negative
MPFDA	Yes	514.98	Unit/Enh (6490)	469.8	Unit/Enh (6490)	Yes	No	94	5	4	6.972	2	Negative
MPFHxA	Yes	314.99	Unit/Enh (6490)	269.8	Unit/Enh (6490)	Yes	No	86	4	4	4.705	2	Negative
MPFHxA	Yes	314.99	Unit/Enh (6490)	120	Unit/Enh (6490)	Yes	No	86	4	4	4.705	2	Negative
MPFHxS	Yes	403	Unit/Enh (6490)	103	Unit/Enh (6490)	Yes	No	110	37	4	5.63	2	Negative
MPFHxS	Yes	403	Unit/Enh (6490)	84	Unit/Enh (6490)	Yes	No	110	40	4	5.63	2	Negative
MPFNA	Yes	468	Unit/Enh (6490)	423	Unit/Enh (6490)	Yes	No	66	4	4	6.541	2	Negative
MPFOA	Yes	417	Unit/Enh (6490)	372	Unit/Enh (6490)	Yes	No	84	4	4	6.03	2	Negative
MPFOS	Yes	502.96	Unit/Enh (6490)	99	Unit/Enh (6490)	Yes	No	148	48	4	6.57	3	Negative

Acquisition Method Report

Agilent Technologies

Cpd Name	ISTD?	Prec Ion	MS1 Res	Prod Ion	MS2 Res	Primary	Trigger	Frag (V)	CE (V)	Cell Acc (V)	Ret Time (min)	Ret Window	Polarity
MPFOS	Yes	502.96	Unit/Enh (6490)	80	Unit/Enh (6490)	Yes	No	148	54	4	6.57	3	Negative
NEtFOSA	No	526	Unit/Enh (6490)	219	Unit/Enh (6490)	Yes	No	120	20	4	8.528	3	Negative
NEtFOSA	No	526	Unit/Enh (6490)	169	Unit/Enh (6490)	Yes	No	120	20	4	8.528	3	Negative
N-EtFOSAA	No	584	Unit/Enh (6490)	525.9	Unit/Enh (6490)	Yes	No	130	20	4	7.521	3	Negative
N-EtFOSAA	No	584	Unit/Enh (6490)	418.8	Unit/Enh (6490)	Yes	No	130	20	4	7.521	3	Negative
NEtFOSE	No	630	Unit/Enh (6490)	59	Unit/Enh (6490)	Yes	No	120	20	4	8.301	3	Negative
NFDHA	No	295	Unit/Enh (6490)	201.1	Unit/Enh (6490)	Yes	No	92	2	4	4.641	3	Negative
NFDHA	No	295	Unit/Enh (6490)	84.9	Unit/Enh (6490)	Yes	No	92	34	4	4.641	3	Negative
NMeFOSA	No	512	Unit/Enh (6490)	219	Unit/Enh (6490)	Yes	No	120	20	4	8.298	3	Negative
NMeFOSA	No	512	Unit/Enh (6490)	169	Unit/Enh (6490)	Yes	No	120	20	4	8.298	3	Negative
N-MeFOSAA	No	570	Unit/Enh (6490)	511.9	Unit/Enh (6490)	Yes	No	150	20	4	7.335	3	Negative
N-MeFOSAA	No	570	Unit/Enh (6490)	418.9	Unit/Enh (6490)	Yes	No	150	20	4	7.335	3	Negative
NMeFOSE	No	616	Unit/Enh (6490)	59	Unit/Enh (6490)	Yes	No	120	20	4	8.301	3	Negative
Perfluoro-1-[13C8]octanesulfonamide (M8FOSA)	No	506	Unit/Enh (6490)	78	Unit/Enh (6490)	Yes	No	162	48	4	7.59	3	Negative
Perfluoro-1-[13C8]octanesulfonic acid (M8PFOS)	No	507	Unit/Enh (6490)	98.9	Unit/Enh (6490)	Yes	No	174	48	4	6.59	3	Negative
Perfluoro-1-[13C8]octanesulfonic acid (M8PFOS)	No	507	Unit/Enh (6490)	80	Unit/Enh (6490)	Yes	No	174	54	4	6.59	3	Negative
Perfluoro-1-decanesulfonate (L-PFDS)	No	598.9	Unit/Enh (6490)	98.9	Unit/Enh (6490)	Yes	No	156	50	4	7.546	3	Negative
Perfluoro-1-decanesulfonate (L-PFDS)	No	598.9	Unit/Enh (6490)	98.9	Unit/Enh (6490)	Yes	No	100	60	4	7.546	3	Negative
Perfluoro-1-heptanesulfonate (L-PFHpS)	No	448.9	Unit/Enh (6490)	98.9	Unit/Enh (6490)	Yes	No	162	48	4	6.252	3	Negative
Perfluoro-1-heptanesulfonate (L-PFHpS)	No	448.9	Unit/Enh (6490)	80	Unit/Enh (6490)	Yes	No	162	48	4	6.252	3	Negative
Perfluoro-1-octanesulfonamide (FOSA)	No	497.9	Unit/Enh (6490)	478	Unit/Enh (6490)	Yes	No	156	100	4	7.651	3	Negative
Perfluoro-1-octanesulfonamide (FOSA)	No	497.9	Unit/Enh (6490)	78	Unit/Enh (6490)	Yes	No	156	40	4	7.651	3	Negative
Perfluoro-1-pentanesulfonate (L-PFPeS)	No	348.9	Unit/Enh (6490)	98.9	Unit/Enh (6490)	Yes	No	150	36	4	5.042	3	Negative
Perfluoro-1-pentanesulfonate (L-PFPeS)	No	348.9	Unit/Enh (6490)	79.9	Unit/Enh (6490)	Yes	No	150	40	4	5.042	3	Negative

Acquisition Method Report

Agilent Technologies

Cpd Name	ISTD?	Prec Ion	MS1 Res	Prod Ion	MS2 Res	Primary	Trigger	Frag (V)	CE(V)	Cell Acc (V)	Ret Time (min)	Ret Window	Polarity
Perfluorobutanesulfonic acid (PFBS)	No	298.9	Unit/Enh (6490)	98.9	Unit/Enh (6490)	Yes	No	150	32	4	4.042	3	Negative
Perfluorobutanesulfonic acid (PFBS)	No	298.9	Unit/Enh (6490)	79.9	Unit/Enh (6490)	Yes	No	150	36	4	4.042	3	Negative
Perfluorodecanoic acid (PFDA)	No	513	Unit/Enh (6490)	468.8	Unit/Enh (6490)	Yes	No	90	8	4	7.158	3	Negative
Perfluorodecanoic acid (PFDA)	No	513	Unit/Enh (6490)	268.8	Unit/Enh (6490)	Yes	No	90	16	4	7.158	3	Negative
Perfluorododecanesulfonic acid (PFDoS)	No	699	Unit/Enh (6490)	99	Unit/Enh (6490)	Yes	No	100	60	4	7.984	3	Negative
Perfluorododecanesulfonic acid (PFDoS)	No	699	Unit/Enh (6490)	80	Unit/Enh (6490)	Yes	No	156	50	4	7.984	3	Negative
Perfluorododecanoic acid (PFDoA)	No	613	Unit/Enh (6490)	568.8	Unit/Enh (6490)	Yes	No	90	12	4	7.876	3	Negative
Perfluorododecanoic acid (PFDoA)	No	613	Unit/Enh (6490)	168.7	Unit/Enh (6490)	Yes	No	90	28	4	7.876	3	Negative
Perfluoroheptanoic acid (PFHpA)	No	363	Unit/Enh (6490)	318.8	Unit/Enh (6490)	Yes	No	90	8	4	5.601	3	Negative
Perfluoroheptanoic acid (PFHpA)	No	363	Unit/Enh (6490)	168.9	Unit/Enh (6490)	Yes	No	90	16	4	5.601	3	Negative
Perfluorohexanesulfonic acid (PFHxS)	No	398.9	Unit/Enh (6490)	98.9	Unit/Enh (6490)	Yes	No	150	40	4	5.685	3	Negative
Perfluorohexanesulfonic acid (PFHxS)	No	398.9	Unit/Enh (6490)	79.9	Unit/Enh (6490)	Yes	No	150	44	4	5.685	3	Negative
Perfluorohexanoic acid (PFHxA)	No	313	Unit/Enh (6490)	268.9	Unit/Enh (6490)	Yes	No	70	4	4	4.856	3	Negative
Perfluorohexanoic acid (PFHxA)	No	313	Unit/Enh (6490)	119	Unit/Enh (6490)	Yes	No	70	20	4	4.856	3	Negative
Perfluoro-n-[1,2-13C2]dodecanoic acid (MPFDoA)	No	615	Unit/Enh (6490)	570	Unit/Enh (6490)	Yes	No	53	8	4	7.71	3	Negative
Perfluoro-n-[13C4]butanoic acid (MPFBA)	No	217	Unit/Enh (6490)	172	Unit/Enh (6490)	Yes	No	59	4	4	1.22	3	Negative
Perfluoro-n-[13C54]pentanoic acid (M5PFPeA)	No	268	Unit/Enh (6490)	223	Unit/Enh (6490)	Yes	No	62	4	4	3.44	3	Negative
Perfluoro-n-[13C8]octanoic acid (M8PFOA)	No	421	Unit/Enh (6490)	376	Unit/Enh (6490)	Yes	No	59	4	4	6.05	3	Negative
Perfluoro-n-[13C8]octanoic acid (M8PFOA)	No	421	Unit/Enh (6490)	172	Unit/Enh (6490)	Yes	No	59	16	4	6.05	3	Negative

Acquisition Method Report

Agilent Technologies

Cpd Name	ISTD?	Prec Ion	MS1 Res	Prod Ion	MS2 Res	Primary	Trigger	Frag (V)	CE(V)	Cell Acc (V)	Ret Time (min)	Ret Window	Polarity
Perfluoro-n-[13C9]nonanoic acid (M9PFNA)	No	472	Unit/Enh (6490)	427	Unit/Enh (6490)	Yes	No	59	8	4	6.56	3	Negative
Perfluoro-n-[13C9]nonanoic acid (M9PFNA)	No	472	Unit/Enh (6490)	223	Unit/Enh (6490)	Yes	No	59	16	4	6.56	3	Negative
Perfluoro-n-butanoic acid (PFBA)	No	213	Unit/Enh (6490)	168.9	Unit/Enh (6490)	Yes	No	70	4	4	1.246	3	Negative
Perfluorononanesulfonate (L-PFNS)	No	548.9	Unit/Enh (6490)	98.9	Unit/Enh (6490)	Yes	No	159	48	4	7.174	3	Negative
Perfluorononanesulfonate (L-PFNS)	No	548.9	Unit/Enh (6490)	79.9	Unit/Enh (6490)	Yes	No	159	48	4	7.174	3	Negative
Perfluorononanoic acid (PFNA)	No	463	Unit/Enh (6490)	418.8	Unit/Enh (6490)	Yes	No	90	8	4	6.718	3	Negative
Perfluorononanoic acid (PFNA)	No	463	Unit/Enh (6490)	218.8	Unit/Enh (6490)	Yes	No	90	16	4	6.718	3	Negative
Perfluoro-n-pentanoic acid (PFPeA)	No	263	Unit/Enh (6490)	219	Unit/Enh (6490)	Yes	No	62	4	4	3.526	3	Negative
Perfluorooctanesulfonic acid (PFOS)	No	498.9	Unit/Enh (6490)	98.9	Unit/Enh (6490)	Yes	No	150	44	4	6.743	3	Negative
Perfluorooctanesulfonic acid (PFOS)	No	498.9	Unit/Enh (6490)	79.9	Unit/Enh (6490)	Yes	No	150	84	4	6.743	3	Negative
Perfluorooctanoic acid (PFOA)	No	413	Unit/Enh (6490)	368.8	Unit/Enh (6490)	Yes	No	90	8	4	6.202	3	Negative
Perfluorooctanoic acid (PFOA)	No	413	Unit/Enh (6490)	168.9	Unit/Enh (6490)	Yes	No	90	16	4	6.202	3	Negative
Perfluorotetradecanoic acid (PFTA)	No	713	Unit/Enh (6490)	669	Unit/Enh (6490)	Yes	No	110	12	4	8.414	3	Negative
Perfluorotetradecanoic acid (PFTA)	No	713	Unit/Enh (6490)	168.8	Unit/Enh (6490)	Yes	No	110	28	4	8.414	3	Negative
Perfluorotridecanoic acid (PFTrDA)	No	663	Unit/Enh (6490)	618.8	Unit/Enh (6490)	Yes	No	90	12	4	8.164	3	Negative
Perfluoroundecanoic acid (PFUnA)	No	563	Unit/Enh (6490)	519	Unit/Enh (6490)	Yes	No	90	8	4	7.538	3	Negative
Perfluoroundecanoic acid (PFUnA)	No	563	Unit/Enh (6490)	169	Unit/Enh (6490)	Yes	No	90	24	4	7.538	3	Negative
PFEESA	No	315	Unit/Enh (6490)	135	Unit/Enh (6490)	Yes	No	112	26	4	4.464	3	Negative
PFEESA	No	315	Unit/Enh (6490)	83	Unit/Enh (6490)	Yes	No	112	14	4	4.464	3	Negative
PFMBA	No	279	Unit/Enh (6490)	85	Unit/Enh (6490)	Yes	No	75	18	4	4.011	3	Negative
PFMPA	No	229	Unit/Enh (6490)	85	Unit/Enh (6490)	Yes	No	59	6	4	2.15	3	Negative

Scan Parameters

Data Stg	Threshold
Centroid	0

Acquisition Method Report

Agilent Technologies

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: HiP Sampler **Module:** G4226A

Auxiliary	
Draw Speed	100.0 µL/min
Eject Speed	400.0 µL/min
Draw Position Offset	1.5 mm
Wait Time After Drawing	1.2 s
Sample Flush Out Factor	5.0
Vial/Well bottom sensing	Yes
Injection	
Injection Mode	Injection with needle wash
Injection Volume	3.00 µL
Needle Wash	
Needle Wash Location	Flush Port
Wash Time	10.0 s
High throughput	
Automatic Delay Volume Reduction	No
Overlapped Injection	
Enable Overlapped Injection	No
Valve Switching	
Valve Movements	0
Valve Switch Time 1	
Switch Time 1 Enabled	No
Valve Switch Time 2	
Switch Time 2 Enabled	No
Valve Switch Time 3	
Switch Time 3 Enabled	No
Valve Switch Time 4	
Switch Time 4 Enabled	No
Stop Time	
Stoptime Mode	As pump/No limit
Post Time	
Posttime Mode	Off

Name: Binary Pump **Module:** G4220A

Flow	0.400 mL/min
Use Solvent Types	No
Stroke Mode	Synchronized
Low Pressure Limit	0.00 bar
High Pressure Limit	600.00 bar
Max. Flow Ramp Up	100.000 mL/min²
Max. Flow Ramp Down	100.000 mL/min²
Expected Mixer	No check

ATTACHMENT F

ELAP Certification

(York Analytical Laboratories, Inc.)

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2024
Issued April 01, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. CATHERINE L. MOSHER
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
Diphenylamine	EPA 8270D
	EPA 8270E

Serial No.: 67519

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Amines

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
	EPA 608.3
Chlordane Total	EPA 8081B
	EPA 608.3

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Chlorinated Hydrocarbon Pesticides

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
	EPA 608.3
Mirex	EPA 8081B
Toxaphene	EPA 8081B
	EPA 608.3

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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 8270D
	EPA 8270E
Hexachlorobutadiene	EPA 625.1
	EPA 8270D
	EPA 8270E
Hexachlorocyclopentadiene	EPA 625.1
	EPA 8270D
	EPA 8270E
Hexachloroethane	EPA 625.1
	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

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Chlorophenoxy Acid Pesticides

2,4-D	EPA 8151A
Dicamba	EPA 8151A

Demand

Biochemical Oxygen Demand	SM 5210B-2016
Carbonaceous BOD	SM 5210B-2016
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
	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

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Haloethers

4-Bromophenylphenyl ether	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 Le	EPA 8011
1,2-Dibromoethane, Low Level	EPA 8011

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

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Low Level Polynuclear Aromatics

Benzo(a)anthracene Low Level	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
	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

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All approved analytes are listed below:

Low Level Polynuclear Aromatics

Indeno(1,2,3-cd)pyrene Low Level	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
	EPA 6010D
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

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Metals I

Chromium, Total	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)
	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

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WADSWORTH CENTER

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CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. CATHERINE L. MOSHER
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 I

Manganese, Total	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)
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

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Metals II

Aluminum, Total	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)
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. 1983)
	EPA 7470A
	EPA 7473
Vanadium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C

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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

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)
Tin, Total	EPA 6020A
	EPA 200.8, Rev. 5.4 (1994)
Titanium, Total	EPA 6020A
	EPA 200.8, Rev. 5.4 (1994)

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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	SM 2340B-2011
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-2016
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)

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

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Nitroaromatics and Isophorone

Isophorone	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
	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

Organophosphate Pesticides

Atrazine	EPA 8270D
	EPA 8270E

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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 625.1
	EPA 8270D
	EPA 8270E
Bis(2-ethylhexyl) phthalate	EPA 625.1
	EPA 8270D
	EPA 8270E
Diethyl phthalate	EPA 625.1
	EPA 8270D
	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

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Polychlorinated Biphenyls

Aroclor 1016 (PCB-1016)	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
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

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Polynuclear Aromatics

Benzo(a)anthracene	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
	EPA 8270D
	EPA 8270E
Chrysene	EPA 625.1
	EPA 8270D
	EPA 8270E
Dibenzo(a,h)anthracene	EPA 625.1
	EPA 8270D
	EPA 8270E
Fluoranthene	EPA 625.1
	EPA 8270D
	EPA 8270E
Fluorene	EPA 625.1
	EPA 8270D
	EPA 8270E
Indeno(1,2,3-cd)pyrene	EPA 625.1
	EPA 8270D

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Polynuclear Aromatics

Indeno(1,2,3-cd)pyrene	EPA 8270E
Naphthalene	EPA 625.1
	EPA 8270D
	EPA 8270E
Phenanthrene	EPA 8270D
	EPA 8270E
Pyrene	EPA 625.1
	EPA 8270D
	EPA 8270E

Priority Pollutant Phenols

2,3,4,6 Tetrachlorophenol	EPA 8270D
	EPA 8270E
2,4,5-Trichlorophenol	EPA 625.1
	EPA 8270D
	EPA 8270E
2,4,6-Trichlorophenol	EPA 625.1
	EPA 8270D
	EPA 8270E
2,4-Dichlorophenol	EPA 625.1
	EPA 8270D
	EPA 8270E
2,4-Dimethylphenol	EPA 625.1
	EPA 8270D
	EPA 8270E
2,4-Dinitrophenol	EPA 8270D
	EPA 8270E
2-Chlorophenol	EPA 625.1

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Priority Pollutant Phenols

2-Chlorophenol	EPA 8270D
	EPA 8270E
2-Methyl-4,6-dinitrophenol	EPA 625.1
	EPA 8270D
	EPA 8270E
2-Methylphenol	EPA 625.1
	EPA 8270D
	EPA 8270E
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

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Priority Pollutant Phenols

Phenol	EPA 8270E

Residue

Settleable Solids	SM 2540 F-2015
Solids, Total	SM 2540 B-2015
Solids, Total Dissolved	SM 2540 C-2015
Solids, Total Suspended	SM 2540 D-2015

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

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Semi-Volatile Organics

Benzyl alcohol	EPA 8270E
Caprolactam	EPA 8270D
	EPA 8270E
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
	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

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Volatile Aromatics

Benzene	EPA 624.1
Bromobenzene	EPA 8260D
	EPA 8260C
Chlorobenzene	EPA 8260D
	EPA 8260C
	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

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NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2024
Issued April 01, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. CATHERINE L. MOSHER
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:

Volatile Aromatics

Styrene	EPA 8260D
	EPA 8260C
	EPA 624.1
tert-Butylbenzene	EPA 8260D
	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

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Volatile Halocarbons

1,1-Dichloroethane	EPA 624.1
1,1-Dichloroethene	EPA 8260D
	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

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Volatile Halocarbons

Bromodichloromethane	EPA 8260D
	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

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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
	EPA 624.1

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Volatile Halocarbons

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
Methyl acetate	EPA 8260D
	EPA 8260C
Methyl cyclohexane	EPA 8260D

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ENVIRONMENTAL ANALYSES NON POTABLE WATER
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Volatiles Organics

Methyl cyclohexane	EPA 8260C
Vinyl acetate	EPA 8260D
	EPA 8260C

Sample Preparation Methods

	SM 4500-P B(5)-2011
	EPA 5030C
	SM 4500-CN B-2016 and C-2016
	EPA 3015A
	EPA 3010A
	EPA 3005A
	EPA 3510C
	SM 4500-N Org B-2011 or C-2011

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Fuel Additives

Methyl tert-butyl ether	EPA 524.2
Naphthalene	EPA 524.2

Metals I

Arsenic, Total	EPA 200.8 Rev. 5.4
Barium, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
Cadmium, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
Chromium, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
Copper, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
Iron, Total	EPA 200.7 Rev. 4.4
Lead, Total	EPA 200.8 Rev. 5.4
Manganese, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
Mercury, Total	EPA 245.1 Rev. 3.0
Silver, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
Zinc, Total	EPA 200.7 Rev. 4.4

Metals II

Aluminum, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
Antimony, Total	EPA 200.8 Rev. 5.4
Beryllium, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4

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Metals II

Molybdenum, Total	EPA 200.8 Rev. 5.4
Nickel, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
Thallium, Total	EPA 200.8 Rev. 5.4
Vanadium, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4

Metals III

Calcium, Total	EPA 200.7 Rev. 4.4
Magnesium, Total	EPA 200.7 Rev. 4.4
Potassium, Total	EPA 200.7 Rev. 4.4
Sodium, Total	EPA 200.7 Rev. 4.4

Miscellaneous

1,4-Dioxane	EPA 522
Turbidity	EPA 180.1 Rev. 2.0

Non-Metals

Alkalinity	SM 21-23 2320B (-97)
Calcium Hardness	EPA 200.7 Rev. 4.4
Chloride	EPA 300.0 Rev. 2.1
Color	SM 21-23 2120B (-01)
Fluoride, Total	EPA 300.0 Rev. 2.1
Orthophosphate (as P)	SM 19, 21-23 4500-P E (-99)
Solids, Total Dissolved	SM 21-23 2540C (-97)
Specific Conductance	EPA 120.1 Rev. 1982
Sulfate (as SO4)	EPA 300.0 Rev. 2.1

Trihalomethanes

Bromodichloromethane	EPA 524.2

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Trihalomethanes

Bromoform	EPA 524.2
Chloroform	EPA 524.2
Dibromochloromethane	EPA 524.2

Volatile Aromatics

1,2,3-Trichlorobenzene	EPA 524.2
1,2,4-Trichlorobenzene	EPA 524.2
1,2,4-Trimethylbenzene	EPA 524.2
1,2-Dichlorobenzene	EPA 524.2
1,3,5-Trimethylbenzene	EPA 524.2
1,3-Dichlorobenzene	EPA 524.2
1,4-Dichlorobenzene	EPA 524.2
2-Chlorotoluene	EPA 524.2
4-Chlorotoluene	EPA 524.2
Benzene	EPA 524.2
Bromobenzene	EPA 524.2
Chlorobenzene	EPA 524.2
Ethyl benzene	EPA 524.2
Hexachlorobutadiene	EPA 524.2
Isopropylbenzene	EPA 524.2
n-Butylbenzene	EPA 524.2
n-Propylbenzene	EPA 524.2
p-Isopropyltoluene (P-Cymene)	EPA 524.2
sec-Butylbenzene	EPA 524.2
Styrene	EPA 524.2
tert-Butylbenzene	EPA 524.2
Toluene	EPA 524.2
Total Xylenes	EPA 524.2

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Volatile Halocarbons

1,1,1,2-Tetrachloroethane	EPA 524.2
1,1,1-Trichloroethane	EPA 524.2
1,1,2-Trichloroethane	EPA 524.2
1,1-Dichloroethane	EPA 524.2
1,1-Dichloroethene	EPA 524.2
1,1-Dichloropropene	EPA 524.2
1,2,3-Trichloropropane	EPA 524.2
1,2-Dichloroethane	EPA 524.2
1,2-Dichloropropane	EPA 524.2
1,3-Dichloropropane	EPA 524.2
2,2-Dichloropropane	EPA 524.2
Bromochloromethane	EPA 524.2
Bromomethane	EPA 524.2
Carbon tetrachloride	EPA 524.2
Chloroethane	EPA 524.2
Chloromethane	EPA 524.2
cis-1,2-Dichloroethene	EPA 524.2
cis-1,3-Dichloropropene	EPA 524.2
Dibromomethane	EPA 524.2
Dichlorodifluoromethane	EPA 524.2
Methylene chloride	EPA 524.2
Tetrachloroethene	EPA 524.2
trans-1,2-Dichloroethene	EPA 524.2
trans-1,3-Dichloropropene	EPA 524.2
Trichloroethene	EPA 524.2
Trichlorofluoromethane	EPA 524.2
Vinyl chloride	EPA 524.2

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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
	EPA 8270E

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Benzidines

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
Endrin	EPA 8081B
Endrin aldehyde	EPA 8081B

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Chlorinated Hydrocarbon Pesticides

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
Hexachloroethane	EPA 8270D
	EPA 8270E

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NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2024
Issued April 01, 2023
Revised April 04, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. CATHERINE L. MOSHER
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:

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 6020A
	EPA 6020B
Cadmium, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
Calcium, Total	EPA 6010C
	EPA 6010D
Chromium, Total	EPA 6010C
	EPA 6010D

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Metals I

Chromium, Total	EPA 6020A
	EPA 6020B
Copper, Total	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 6020A
	EPA 6020B
Nickel, Total	EPA 6020A
	EPA 6020B
Potassium, Total	EPA 6010C
	EPA 6010D
Silver, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B

Metals II

Aluminum, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B

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Metals II

Antimony, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
Arsenic, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
Beryllium, Total	EPA 6010C
	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

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Metals III

Cobalt, Total	EPA 6010D
	EPA 6020A
	EPA 6020B
Molybdenum, Total	EPA 6020A
Thallium, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	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

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Nitroaromatics and Isophorone

Pyridine	EPA 8270E

Nitrosoamines

N-Nitrosodimethylamine	EPA 8270D
	EPA 8270E
N-Nitrosodi-n-propylamine	EPA 8270D
	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

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Phthalate Esters

Di-n-octyl phthalate	EPA 8270E

Polychlorinated Biphenyls

Aroclor 1016 (PCB-1016)	EPA 8082A
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
Benzo(a)anthracene	EPA 8270D

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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

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Priority Pollutant Phenols

2,3,4,6 Tetrachlorophenol	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
Pentachlorophenol	EPA 8270D
	EPA 8270E

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Priority Pollutant Phenols

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
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
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
m/p-Xylenes	EPA 8260D

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Volatile Aromatics

m/p-Xylenes	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

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Volatile Halocarbons

1,1,2,2-Tetrachloroethane	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
2,2-Dichloropropane	EPA 8260D
	EPA 8260C
2-Chloroethylvinyl ether	EPA 8260D
	EPA 8260C

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Volatile Halocarbons

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
Dibromomethane	EPA 8260D
	EPA 8260C
Dichlorodifluoromethane	EPA 8260D
	EPA 8260C
Hexachlorobutadiene, Volatile	EPA 8260D

Serial No.: 67726

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NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2024
Issued April 01, 2023
Revised April 04, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. CATHERINE L. MOSHER — *NY Lab Id No: 10854*
YORK ANALYTICAL LABORATORIES INC
120 RESEARCH DRIVE
STRATFORD, CT 06615

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:

Volatile Halocarbons

Hexachlorobutadiene, Volatile	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
	EPA 8260C
Trichlorofluoromethane	EPA 8260D
	EPA 8260C
Vinyl chloride	EPA 8260D
	EPA 8260C

Volatile 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

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All approved analytes are listed below:

Volatile Organics

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
	EPA 8260C
tert-butyl alcohol	EPA 8260D
	EPA 8260C
Vinyl acetate	EPA 8260D
	EPA 8260C

Sample Preparation Methods

	EPA 5035A-L
	EPA 5035A-H
	EPA 3580A
	EPA 3010A
	EPA 3050B
	EPA 3550C
	EPA 3546
	EPA 3545A
	EPA 9010C

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MR. KRZYSZTOF TRAFALSKI
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 for the category
ENVIRONMENTAL ANALYSES POTABLE WATER
All approved subcategories and/or analytes are listed below:

Perfluorinated Alkyl Acids

11CL-PF3OUDS	EPA 533
	EPA 537.1
4:2FTS	EPA 533
6:2FTS	EPA 533
8:2FTS	EPA 533
9CL-PF3ONS	EPA 533
	EPA 537.1
ADONA	EPA 533
	EPA 537.1
Hexafluoropropylene Oxide Dimer Acic	EPA 533
	EPA 537.1
NETFOSAA	EPA 537.1
NMEFOSAA	EPA 537.1
Nonafluoro-3,6-Dioxaheptanoic Acid	EPA 533
Perflourotridecanoic Acid (PFTRDA)	EPA 537.1
Perfluordecanoic Acid (PFDA)	EPA 533
	EPA 537.1
Perfluoro-3-Methoxypropanoic Acid	EPA 533
Perfluoro-4-Methoxybutanoic Acid	EPA 533
Perfluorobutanesulfonic Acid (PFBS)	EPA 533
	EPA 537.1
Perfluorobutanoic Acid (PFBA)	EPA 533
Perfluorododecanoic Acid (PFDOA)	EPA 533
	EPA 537.1
Perfluoroheptanesulfonic Acid (PFHPS	EPA 533
Perfluoroheptanoic Acid (PFHPA)	EPA 533
	EPA 537.1

Serial No.: 67323

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132-02 89TH AVENUE SUITE 217
RICHMOND HILL, NY 11418

is hereby APPROVED as an Environmental Laboratory for the category
ENVIRONMENTAL ANALYSES POTABLE WATER
All approved subcategories and/or analytes are listed below:

Perfluorinated Alkyl Acids

Perfluorohexanesulfonic Acid (PFHXS	EPA 533
	EPA 537.1
Perfluorohexanoic Acid (PFHXA)	EPA 533
	EPA 537.1
Perfluorononanoic Acid (PFNA)	EPA 533
	EPA 537.1
Perfluorooctanesulfonic Acid (PFOS)	EPA 533
	EPA 537
	EPA 537.1
Perfluorooctanoic Acid (PFOA)	EPA 533
	EPA 537
	EPA 537.1
Perfluoropentanesulfonic Acid (PFPES	EPA 533
Perfluoropentanoic Acid (PFPEA)	EPA 533
Perfluorotetradecanoic Acid (PFTA)	EPA 537.1
Perfluoroundecanoic Acid (PFUNA)	EPA 533
	EPA 537.1
PFEESA	EPA 533

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ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
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
	EPA 8260C

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Volatile Aromatics

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
	EPA 8260C
tert-Butylbenzene	EPA 8260D

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Volatile Aromatics

tert-Butylbenzene	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

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Volatile Halocarbons

1,2-Dibromoethane	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
	EPA 8260C
Chloroform	EPA 8260D
	EPA 8260C
Chloromethane	EPA 8260D
	EPA 8260C

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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
	EPA 8260C
Trichlorofluoromethane	EPA 8260D
	EPA 8260C
Vinyl chloride	EPA 8260D
	EPA 8260C

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All approved analytes are listed below:

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
	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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RICHMOND HILL, NY 11418

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
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

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Volatile Aromatics

1,2,4-Trichlorobenzene, Volatile	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
m/p-Xylenes	EPA 8260D
	EPA 8260C

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ENVIRONMENTAL ANALYSES NON POTABLE WATER
All approved analytes are listed below:

Volatile Aromatics

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

Serial No.: 67324

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NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2024
Issued April 01, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MR. KRZYSZTOF TRAFALSKI
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 NON POTABLE WATER
All approved analytes are listed below:

Volatile Halocarbons

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
2,2-Dichloropropane	EPA 8260D
	EPA 8260C
2-Chloroethylvinyl ether	EPA 8260D
	EPA 8260C
Bromochloromethane	EPA 8260D

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Volatile Halocarbons

Bromochloromethane	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
Dibromomethane	EPA 8260D
	EPA 8260C
Dichlorodifluoromethane	EPA 8260D
	EPA 8260C
Hexachlorobutadiene, Volatile	EPA 8260D
	EPA 8260C

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Volatile Halocarbons

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
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
Carbon Disulfide	EPA 8260D

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All approved analytes are listed below:

Volatiles Organics

Carbon Disulfide	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

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
1,1,2-Trichloro-1,2,2-Trifluoroethane	EPA TO-15
1,1,2-Trichloroethane	EPA TO-15

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ENVIRONMENTAL ANALYSES AIR AND EMISSIONS
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Purgeable Halocarbons

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
Vinyl chloride	EPA TO-15

Volatile Chlorinated Organics

Benzyl chloride	EPA TO-15

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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

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APPENDIX H

REQUEST TO IMPORT/REUSE FILL OR SOIL

NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Request to Import/Reuse Fill or Soil

This form is based on the information required by DER-10, Section 5.4(e) and 6NYCRR Part 360.13. Use of this form is not a substitute for reading the applicable regulations and Technical Guidance document.

SECTION 1 – SITE BACKGROUND

The allowable site use is: Choose an item

Have Ecological Resources been identified? Choose an item

Is this soil originating from the site? Choose an item

How many cubic yards of soil will be imported/reused? Choose an item

If greater than 1000 cubic yards will be imported, enter volume to be imported:

SECTION 2 – MATERIAL OTHER THAN SOIL

Is the material to be imported gravel, rock or stone? Choose an item

Does it contain less than 10%, by weight, material that passes a size 100 sieve? Choose an item

Is this virgin material from a permitted mine or quarry? Choose an item

Is this material recycled concrete or brick from a DEC registered processing facility? Choose an item

SECTION 3 - SAMPLING

Provide a brief description of the number and type of samples collected in the space below:

Example Text: 5 discrete samples were collected and analyzed for VOCs. 2 composite samples were collected and analyzed for SVOCs, Inorganics & PCBs/Pesticides.

If the material meets requirements of DER-10 section 5.4(e)5 (other material), no chemical testing needed.

SECTION 3 CONT'D - SAMPLING

Provide a brief written summary of the sampling results or attach evaluation tables (compare to DER-10, Appendix 5):

Example Text: Arsenic was detected up to 17 ppm in 1 (of 5) samples; the allowable level is 16 ppm.

If Ecological Resources have been identified use the "If Ecological Resources are Present" column in Appendix 5.

SECTION 4 – SOURCE OF FILL

Name of person providing fill and relationship to the source:

Location where fill was obtained:

Identification of any state or local approvals as a fill source:

If no approvals are available, provide a brief history of the use of the property that is the fill source:

Provide a list of supporting documentation included with this request:

The information provided on this form is accurate and complete.

____________________________________ ________________

Signature Date

Print Name

Firm

APPENDIX I

SITE INSPECTION FORMS

SITE INSPECTION CHECKLIST

Site Name: 43-30 24th Street   Location: Long Island City, Queens, New York   Project Number: 170362702

Inspector Name: ________   Date: ________   Weather Conditions: ________

Reason for Inspection (i.e., routine, severe condition, etc.): ________

Check one of the following:
(Y: Yes N: No N/A: Not Applicable)

		Y	N	N/A	Normal Situation	Remarks
	General					
1	What are the current site conditions?	-	-	-		
2	Are all applicable site records (e.g., documentation of construction activity, most current easement, etc.) complete and up to date?					
	Environmental Easement					
3	Has site use (restricted residential) remained the same?					
4	Does it appear that all environmental easement restrictions have been followed?					
	Building Slab					
5	Are there any indications of a breach in the building slab at the time of this inspection?					
6	Are there any cracks in the building slabs?					
7	Are there any cracks in the building walls?					
8	Is there any construction activity, or indication of any construction activity within the past certification year (including any tenant improvements), that included the breaching of the building slab, on-site at the time of this inspection?					
9	If YES to number 7, is there documentation that the Soil Management Plan, HASP, and CAMP for the site was/is being followed?					

***** If the answer to any of the above questions indicate non-compliance with any Institutional Controls (ICs) for the site, additional remarks must be provided and, where applicable, documentation attached to this checklist detailing additional inspection and repair activities.**

Additional remarks: ________

Minimum Inspection Schedule:
- Site-wide inspections will be conducted annually, per certification year, at a minimum.
- Additional inspections will also be conducted at times of severe weather condition events.
- All inspection events will use this checklist.