INTERIM REMEDIAL MEASURES WORK PLAN

for

1487 1st Avenue Redevelopment Site
New York, New York

NYSDEC BCP No. C231152

Prepared For:

CP VII 78th Street Owner, LLC
805 Third Avenue, 20th Floor
New York, New York 10022

Prepared By:

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Langan Project No. 100963701

LANGAN

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CERTIFICATION

I, Stewart Abrams, P.E., certify that I am currently a NYS registered professional engineer as defined in *Title 6 of the New York Codes, Rules and Regulations* (6 NYCRR) Part 375 and that this Interim Remedial Measures Work 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).

Stewart H. Abrams, P.E.
NYS Professional Engineer No. 078833

I, Steven Ciambruschini, certify that I am currently a Qualified Environmental Professional as defined in *Title 6 of the New York Codes, Rules and Regulations* (6 NYCRR) Part 375 and that this Interim Remedial Measures Work Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER-10.

Steven Ciambruschini, P.G.

1.0 INTRODUCTION

1.1 General

This Interim Remedial Measures (IRM) Work Plan was prepared on behalf of CP VII 78th Street Owner, LLC (the Requestor) for the property at 1487 First Avenue (Tax Block 1452, Lot 27 [formerly consisting of Lots 27, 28, 29, and 30]) in the Upper East Side neighborhood of New York, New York (the Site). A Site Location Map is included as Figure 1.

This IRM Work Plan describes procedures for the excavation and off-Site disposal of hot spot source material impacted with chlorinated volatile organic compounds (VOCs) and in-situ groundwater treatment necessary to treat and prevent migration of groundwater impacts. The final remedy will be detailed in the forthcoming Remedial Action Work Plan (RAWP), which will be submitted to the NYSDEC prior to implementation of the proposed remedy.

The scope of work to be completed as part of this IRM Work Plan (IRMWP) includes:

- Remediation of Chlorinated VOCs in Saturated Soil
- In-Situ Chlorinated VOC Groundwater Treatment

The Work Plan was prepared in accordance with the process and requirements of the BCP and the Division of Environmental Remediation (DER) Technical Guidance for Site Investigation and Remediation (DER-10).

1.2 Site Description

The Site is located in the Upper East Side neighborhood of Manhattan, New York and is identified as Lot 27 [formerly Lots 27, 28, 29, and 30]. A Site Location Plan is provided as Figure 1. The Site is an approximately 10,050-square foot parcel bordered by the four-story 354 East 78th Street building to the west, East 78th Street to the north, 1st Avenue to the east, and the nine-story 1485 1st Avenue building to the south. The Site is occupied by two four-story vacant buildings that are currently being demolished in the southern and northwestern portions with the remaining area consisting of vacant land with the former building basements that were previously partially backfilled with demolition

debris from sidewalk level to the assumed depth of the former basement slabs at approximately 8 to 10 feet below sidewalk level (bsl) by the previous owner. The vacant portion of the site was heavily vegetated with uneven topography; however, vegetation was cleared and the remnant demolition debris was graded to a more even surface ranging from 4 to 8 feet bsl. Stone was imported in January 2022 from Clinton Quarry, located in Union Township, New Jersey, in order to grade the Site. Additional clean fill was imported in October and November 2022 from Allocco Recycling Corp. in accordance with the 25 October 2022 NYSDEC approval to level the Site in preparation for the demolition of the Site buildings. A Site Plan is provided as Figure 2.

1.3 Proposed Development

All onsite buildings will be demolished as part of the proposed Site redevelopment. The proposed future use of the Site will consist of demolishing the existing two 4-story vacant buildings and constructing a 35-story mixed-use residential and commercial building. The current zoning designation is commercial (C2-8). The proposed use is consistent with existing zoning for the property. Remediation of the Site beyond that which is described herein will be completed, in accordance with the forthcoming RAWP, subsequent to the IRM Site preparation activities.

1.4 Site Physical Conditions

1.4.1 Topography

According to a survey prepared by Haynes Land Surveyors dated 14 September 2015, the sidewalk elevation slopes from the northwest corner (elevation el 37.97 to the southeast corner (elevation el 36.28). All elevations are North American Vertical Datum of 1988 (NAVD 88). Clean fill was imported in October and November 2022 from Allocco Recycling Corp. in accordance with the 25 October 2022 NYSDEC approval to level the Site in preparation for the demolition of the Site buildings.

1.4.2 Site Geology

Based on borings completed during the November 2021 and January/February 2022 Phase II Environmental Site Investigation (ESI), stratigraphy below the former basements slabs in the vacant lots in the

northern and central portions of the site consists of an approximately 1- to 4-foot thick layer of fill underlain by 6- to 13-foot of native sand and clayey sand.

A preliminary geotechnical investigation completed by Langan in November 2021 documented an about 6-foot-thick layer of fill beneath the sidewalks adjacent to the site, followed by approximately 14 feet of sand and clay underlain by weathered mica schist rock. The top of competent rock was encountered at approximately 22 and 27 feet bsl. Two rock cores completed at LSB-12 and LSB-13 during the January 2022 Phase II EI identified weathered rock from approximately 22 to 27 feet bsl at LSB-12 and from approximately 16.5 to 17 feet bsl at LSB-13. The top of competent rock was encountered at 27 feet bsl at LSB-12 and 17 feet bsl at LSB-13.

1.4.3 Hydrogeologic Conditions

Perched groundwater is present immediately above weathered bedrock and was measured in monitoring wells completed during Langan's Phase II ESI between 13 feet bsl (MW-05) and 15.5 feet bsl (MW-02). Groundwater is assumed to have risen in the bedrock well risers and was measured above the top of the rock interface at 14.5 and 17 feet bsl in the bedrock wells.

1.5 Site History

According to the Phase I ESA completed by Langan in January 2022, historical operations on the subject site included dyeing and cleaning operations between 1920 and 2005 on former Lot 28 and former Lot 30. A solvent tank was identified on the Sanborn Maps from 1951 to 2005 on former Lot 30.

The site was identified in the NY Spills database for a release reported to the NYSDEC on 4 November 2009 and assigned Spill No. 0908776. According to the case narrative, a supply line for two 275-gallon fuel oil aboveground storage tanks (ASTs) was suspected to have leaked. The supply line was replaced and the spill was administratively closed on 2 December 2009.

Two fuel oil ASTs have been documented at the site; one is located in the basement of the vacant building in the northwestern corner of the site and one was found buried in the debris of the building demolished by the previous owners. A release was observed when the AST was discovered and reported to NYSDEC and assigned Spill No. 2109276.

1.6 Previous Environmental Investigation Reports and Findings

The following environmental assessment and investigation reports have been prepared for the site, and were provided in the Remedial Investigation Work Plan as Appendix A.

- Phase II Environmental Site Assessment prepared by Cider Environmental (Cider), dated 23 February 2016;
- Phase I Environmental Site Assessment prepared by Langan, dated 5 January 2021;
- Phase II Environmental Site Investigation Report prepared by Langan, dated 3 March 2022; and,
- Remedial Investigation Work Plan prepared by Langan, dated 16 March 2022 and submitted with the BCP Application.

1.6.1 February 2016 Phase II Environmental Site Assessment, prepared by Cider

The 23 February 2016 Cider Phase II ESA documented the findings of a 21 January 2016 Phase I ESA also prepared by Cider. The Phase I ESA identified the following recognized environmental conditions (RECs):

- REC-1: Historic dyeing and cleaning operations documented between 1920 and 2005 on former Lot 28 and former Lot 30 and a solvent tank identified on former Lot 30 on the Sanborn Fire Insurance Maps from 1951 to 2005; and,
- REC-2: Potential presence of abandoned fuel oil underground storage tanks (USTs) due to historical fuel oil burner application records.

The Phase I ESA the presence of urban fill material at the site.

The Cider Phase II ESA was completed to investigate the RECs and included completion of a geophysical survey in accessible portions of the site, installation of three soil borings and collection of three discrete soil samples and one composite soil sample, and installation of three soil vapor points for collection of three soil vapor samples. Soil borings were advanced with a hand auger to approximately five feet below the former basement slabs in former Lots 28 and 29 (corresponding to approximately 15 feet bsl). The three soil borings and three soil vapor points were advanced on former Lots 28 and 29 in the vicinity of former dry cleaning operations. The geophysical survey identified the presence of one suspected 275-gallon UST of unknown contents in former Lot 29, and one of the three soil borings and one of the three soil vapor points were installed in the vicinity of the suspected UST. Discrete soil samples were collected from 4 to 5 feet below the former basements slabs for analysis of volatile organic compounds (VOCs) and petroleum-related semi-volatile organic compounds (SVOCs), and soil vapor points were sampled from either 2 or 4 feet below the former basement slabs for VOC analysis. One five-point composite soil sample was also collected to characterize impacts in fill at the site for analysis of metals, polychlorinated biphenyls (PCBs), VOCs, SVOCs, and herbicides. Groundwater was not encountered in any of the soil borings.

The Phase II ESA soil analytical results revealed no detections of VOCs or petroleum-related SVOCs. The composite soil sample analytical results revealed the presence of lead marginally above the New York State Department of Environmental Conservation (NYSDEC) Unrestricted Use Soil Cleanup Objective (SCO) at a concentration of 67.4 mg/kg. Soil vapor analytical results revealed the presence of tetrachloroethylene (PCE) at concentrations below New York State Department of Health (NYSDOH) guidance values requiring monitoring or mitigation.

1.6.2 January 2022 Phase I Environmental Site Assessment, prepared by Langan

The Phase I ESA identified the following recognized environmental conditions (RECs), historical RECs (HRECs), and business environmental risks (BERs):

- REC-1: Historical Site Operations. Dyeing and cleaning operations are documented between 1920 and 2005 on former Lot 28 and former Lot 30 and a solvent tank was identified on former Lot 30 on the Sanborn Fire Insurance Maps from 1951 to 2005. Subsequent testing of onsite soil, groundwater, and soil vapor as documented in the Langan Phase II ESI Report revealed impacts to soil, groundwater, and soil vapor from historical site use at concentrations exceeding New York State Department of Environmental Conservation (NYSDEC) and New York State Department of Health (NYSDOH) standards. The concentrations of tetrachloroethylene and associated breakdown compounds detected in soil, groundwater, and soil vapor are indicative of a release from the former solvent tank.

- REC-2: Presence of Contaminated Fill Material. The Langan Phase II ESI revealed the presence of one- to two-foot-thick layer of fill impacted with elevated concentrations of metals above the NYSDEC Soil Cleanup Objectives beneath the former basement slabs.

- HREC-1: Closed Spill 0908776. The spill was reported to NYSDEC on 4 November 2009 when supply line for two 275-gallon fuel oil ASTs was suspected to have leaked. The initial spill report identified that the supply line was located underground, but additional narrative by NYSDEC documented that the supply line was aboveground. The supply line was replaced and the spill was administratively closed on 2 December 2009.

- BER-1: Potential Presence of Undocumented USTs. No evidence of USTs was observed during the site inspection; however, the buildings at the site were historically operated for commercial and

residential purposes and have historically received approvals for fuel oil use. In addition, a UST is suspected to be present on former Lot 29 based on historical geophysical survey results during the Cider Phase II ESA.

- BER-2: Potential Impacts from Current and Historical Operations at Adjacent and Nearby Properties. Potential impacts from current and historical operations conducted at adjacent and nearby properties involving drycleaners and spills and the generation and disposal of hazardous waste have potential for offsite migration of contaminants to impact sub-slab soil, soil vapor, and/or groundwater below the site.

1.6.3 March 2022 Phase II Environmental Site Investigation Report, prepared by Langan

Langan's Phase II ESI Investigation report was prepared for the Requestor. The results of this investigation are summarized on Figures 3 through 5. The data are presented in Tables 1 through 3.

The Phase II Investigation was completed in November 2021 and January/February 2022 and consisted of the following:

- Three test pits excavated in the northern portion of the site (former Lot 30) to assess the potential presence of the former solvent tank;
- Installation of thirteen soil borings (LB-01 through LB-08, LSB-9 through LSB-11, LSB 14, and LSB-15) to between 18 to 23 feet bsl, completion of two soil borings/rock cores (LSB-12 and LSB-13) to 50 feet bsl, and collection of 28 soil samples (including three duplicate samples);
- Installation of five groundwater monitoring wells and collection of seven groundwater samples (including two duplicate samples);
- Installation of two bedrock monitoring wells and collection of five groundwater samples (including one duplicate sample);

- Installation of seven soil vapor sampling points and collection of nine soil vapor samples (including two duplicate samples);

- Completion of two test pits (TP-1 and TP-2) to a depth of approximately 3.5 feet below former basement slab (corresponding to approximately 12 feet bsl) and one test pit (TP-3) to the top of bedrock at approximately 9 feet below former basement slab (corresponding to approximately 17.5 feet bsl). No evidence of a former solvent tank or odors were observed in TP 1 and TP-2. Odors and elevated PID readings (between 14 and 23 ppm) were observed in soil immediately above bedrock in TP-3. The test pits were backfilled with the material in the same order in which the material was excavated.

The following soil borings were advanced at the site:

- LB-02 was completed in the vicinity of the historical solvent tank in former Lot 30;

- LB-03, LB-04, and LB-08 were completed across the former Lot 28 footprint to assess potential impacts from historical dyeing and dry cleaning operations;

- LB-06 and LB-07 were completed in the central portion of the former Lot 29 immediately to the east and west of the suspected UST location reported in the Cider Phase II ESA; and,

- LB-01, LB-05, LSB-9, and LSB-11 through LSB-15 were completed to assess general site conditions throughout the site footprint. LSB-12 and LSB-13 were advanced into rock.

Elevated PID readings were detected between 12 ppm in LB-02 at 8 and 8.5 feet below former basement slab (corresponding to 16.5 to 17 ft bsl) and 21.6 ppm at LSB-13 between 11 and 11.5 feet below former basement slab (corresponding to between 15 and 15.5 feet bsl). Odors and globules potentially associated with the AST that had previously been discovered nearby were also observed at LSB-13. Odors were observed at LB-05 between 8 and 9 feet below former basement slab (corresponding to

17.5 to 18.5 feet bsl). Elevated PID readings and/or odor and staining were not observed in any other soil borings completed as part of the Phase II EI.

Twenty-eight soil samples were collected for chemical analysis during the Phase II ESI. Two discrete soil samples were collected from borings LB-01 through LB-08 and LSB-9 through LSB 11. Soil samples were collected from the fill layer from 0 to 1 feet below former basement slab (corresponding to 9.5 to 10.5 feet bsl) at LB-01, from 0 to 2 feet below former basement slab (corresponding to 9.5 to 11.5 feet bsl) at LB-03, LB-04, LB-06, LB-07, and LB-08, and from 0 to 2 feet below former basement slab (corresponding to 8 to 10 feet bsl) at LSB-9 through LSB-11. Soil samples were collected from the interval exhibiting the highest level of impacts as determined by PID screening results and odors at LB-02 from 8 to 10 feet below former basement slab (corresponding to 16.5 to 18.5 feet bsl) and LB-05 from 8 to 9 feet below former basement slab (corresponding to 17.5 to 18.5 feet bsl). One soil sample was collected from the 2-foot interval immediately above inferred groundwater at all eleven soil borings.

Three soil samples were collected from LSB-12 from 15 to 17 feet bsl, 18 to 20 feet bsl, and 20 to 22 feet bsl; refusal on bedrock was encountered at 22 feet bsl at this location. One sample from 15 to 17 feet bsl was collected from each LSB-13, LSB-14, and LSB-15 immediately above refusal on bedrock.

Soil samples collected from LB-01 through LB-05 and LB-08 were submitted for NYSDEC Part 375-specified VOCs, polycyclic aromatic hydrocarbons (PAHs), metals, and hexavalent chromium analysis. Soil samples collected from LB-06 and LB-07 were also submitted for PCB analysis. Soil samples from LSB-9 through LSB-11 were submitted for NYSDEC Part 375-specified VOCs, SVOCs, and metals. LSB-12 through LSB-15 were submitted for NYSDEC Part 375-specified VOCs, SVOCs, PCBs, pesticides, herbicides, TAL metals, hexavalent chromium, total cyanide, perfluoroalkyl substances (PFAS), and 1,4-dioxane.

Soil borings LB-01, LB-02, LB-03, LB-08, and LSB-9 were completed as groundwater monitoring wells (MW-01 through MW-05, respectively) in perched water immediately above bedrock (to between 18 and 23.5 feet bsl). MW-02 was installed at LB-02 to assess groundwater conditions in the vicinity of the former solvent tank in former Lot 30, MW-03 and MW-04 were installed at LB-03 and LB-08, respectively, to assess for impacts from historical dyeing and dry cleaning operations in former Lot 28, and MW-01 and MW-05 were installed at LB-01 and LB-05, respectively, to assess general site conditions and to assess for impacts from historical dyeing and dry cleaning operations. A groundwater sample was collected from each well in addition to two duplicate samples. No evidence of sheen, odors, or free product were observed during purging or sampling activities in any of the wells. All groundwater samples were analyzed for VOCs and metals; samples for PAH analysis were also collected at MW-03, MW-04, and MW-05.

Soil borings LSB-12 and LSB-13 were advanced into bedrock to 50 feet bsl and completed as open-hole groundwater monitoring wells (MW-6 and MW-7, respectively) to assess for impacts within bedrock from historical dyeing and dry cleaning operations. Two groundwater samples from each well for VOC analysis, in addition to one duplicate sample; samples were collected from 28 and 45 feet bsl in MW-6 and from 20 and 28 bsl in MW-7.

Seven soil vapor points were installed and nine soil vapor samples (including two duplicate samples) were collected. SV-01 was installed to assess general site conditions and to assess for impacts form historical dyeing and dry cleaning operations on former Lot 30, SV-03 and SV-04 were installed to assess for impacts from historical dyeing and dry cleaning operations in former Lot 28, and SV-02 was installed to assess soil vapor conditions in the vicinity of the former solvent tank in former Lot 30. SV-5, SV-6, and SV-7 were installed adjacent to LSB-9, LSB-10, and LSB-11, respectively, to assess sub-slab soil vapor conditions below the building on former Lot 27. All soil vapor points were installed to approximately 2-feet above the observed groundwater interface as measured in the installed monitoring wells and were sampled for VOC analysis.

The primary contaminants of concern identified during the Phase II Investigation are chlorinated VOCs and metals detected in soil at concentrations exceeding NYSDEC Unrestricted Use SCOs, Restricted-Residential Restricted Use SCOs (RUSCOs), and Protection of Groundwater SCOs, chlorinated VOCs and metals in groundwater at concentrations exceeding NYSDEC Ambient Water Quality Standards and Guidance Value (SGVs) in perched water and in groundwater within the bedrock, and chlorinated VOCs in soil vapor at concentrations exceeding NYSDOH Final Guidance on Soil Vapor Intrusion, October 2006 (Revised May 2017) for required mitigation.

Laboratory analytical results identified subsurface chlorinated VOC impacts in the vicinity of the solvent tank formerly located in the approximately center of former Lot 30. PCE was detected in soil from 6 to 8 feet below the former basement slab (corresponding to between 14.5 and 16.5 feet bsl) at this location (LB-02) in exceedance of the Unrestricted Use SCOs and Protection of Groundwater SCOs. Perched groundwater analytical results at this location (MW-02) revealed cis-1,2-dichloroethene (cis-1,2-DCE), PCE, and trichloroethylene (TCE) in exceedance of the NYSDEC SGVs. Chlorinated VOCs detected in soil vapor at this location that are included in the NYSDOH Soil Vapor/Indoor Air Decision Matrices A through C include cis-1,2-DCE, TCE, and PCE, all of which were detected at concentrations that require mitigation according to the NYSDOH Final Guidance on Soil Vapor Intrusion, October 2006 and Revised May 2017.

Laboratory analytical results also identified subsurface chlorinated VOC impacts in the eastern portion of the site to the south of the former solvent tank. Cis-1,2-DCE was detected above the NYSDEC SGVs in MW-03 and cis-1,2-DCE, PCE, and TCE were detected above the NYSDEC SGVs in both MW-04 and MW-05. Groundwater analytical results in bedrock wells MW-6 and MW-7 revealed the presence of chloroform, cis-1,2-DCE, PCE, and TCE in exceedance of the NYSDEC SGVs in all samples collected from 20, 28, and 45 feet bsl; the highest concentrations in each well were detected at 28 feet bsl. Chlorinated VOCs were detected in soil vapor in SV 03, SV-04 SV-5, and SV-6, but at concentrations below requiring further

action according to the NYSDOH Final Guidance on Soil Vapor Intrusion, October 2006 and Revised May 2017.

PCE was also detected in groundwater at MW-01 and in soil vapor at SV-01 and SV-07, which are located in the western portion of former Lot 29 and to the south of the former dying and dry cleaning facility in the northwestern corner of the site, but at concentrations below the NYSDEC SGVs in groundwater and below the threshold requiring further action in soil vapor according to the NYSDOH Final Guidance on Soil Vapor Intrusion, October 2006 and Revised May 2017. Chlorinated VOCs were not detected in any other soil samples collected at the site.

Metals including barium, copper, trivalent chromium, lead, nickel, silver, and zinc were detected at concentrations exceeding the Unrestricted Use SCOs in the fill and native soil in all but two soil borings. Lead and barium were also detected at concentrations above the Protection of Groundwater and/or Restricted Residential RUSCOs. Petroleum-related VOCs, PAHs, and PCBs were not detected in any of the soil samples collected. Metals including total chromium, iron, lead, magnesium, manganese, nickel, selenium, and/or sodium were detected in exceedance of the NYSDEC SGVs at all perched monitoring well locations. Detections of total metals in groundwater are likely attributable to sediment entrainment in the samples or naturally occurring background conditions.

Based on the results of the Due Diligence Phase II EI, the presence of contaminated fill and subsurface impacts to soil, groundwater, and soil vapor from historical site use were identified.

1.6.4 March 2022 Remedial Investigation Work Plan, prepared by Langan

A Remedial Investigation Work Plan (RIWP) dated March 2022 and last revised on 26 July 2022 in response to the 21 July 2022 RIWP comments issued by NYSDEC was prepared by Langan for CP VII 78th Street Owner, LLC and submitted to the NYSDEC with the BCP Application. The scope of work for the remedial investigation presented in the RIWP consisted of:

- Advancement of fifteen soil borings (LSB-16 through LSB-30) and collection of up to 31 soil samples for laboratory analysis.

- Installation of groundwater monitoring wells across the central and eastern side of the Site to evaluate the extents of impacts and potential remedial options based on subsurface conditions.
    - Installation five permanent groundwater monitoring wells (LMW-6 through LMW 10) in the perched groundwater layer above bedrock and collection of five groundwater samples for laboratory analysis.
    - Installation of six permanent bedrock monitoring wells (LMW-8R-S through LMW 13R-S) to 50 feet bsl. Two existing wells (LMW-6R-S [formerly referred to as MW-6] and LMW-7R-S [formerly referred to MW-7]) may also be reinstalled if the wells are determined to be damaged prior to mobilization for the RI.
    - Installation of eight permanent bedrock monitoring wells (LMW-6R-D through LMW-13R-D) to 85 feet bsl.
    - Downhole geophysical evaluation of the bedrock wells, hydraulic conductivity testing of specific fracture zones by packer testing, and additional groundwater sample collection and analysis for the completion of a treatability study.
    - Collection of up to two samples from each of the 16 bedrock wells for a total of up to 32 groundwater samples for laboratory analysis. The number of samples collected will depend on the results of the geophysical evaluation and hydraulic conductivity testing.
- Installation of six soil vapor sampling points (LSV-8 through LSV-13) and collection of six soil vapor samples.

Langan will conduct a bench-scale treatability study to demonstrate the effectiveness of zero valent iron (ZVI) and carbon substrate injections at the Site to treat chlorinated VOCs following completion of the RI.

1.6.5 Remedial Investigation

A Remedial Investigation (RI) was completed in August 2022 in accordance with the NYSDEC-approved RIWP. A Draft Remedial Investigation Report was prepared by Langan for CP VII 78th Street Owner, LLC and submitted to the NYSDEC on 8 November 2022.

1.6.6 Change of Use Form

A NYSDEC 60-Day Advanced Notification of Site Change of Use Form was prepared for the demolition of the on-Site buildings and submitted on 21 October 2022. The demolition of the on-Site buildings began in October 2022 and will accommodate the implementation of this IRMWP and the forthcoming Remedial Action Work Plan in conjunction with site redevelopment. Demolition of the onsite buildings is ongoing.

2.0 SUMMARY OF INTERIM REMEDIAL MEASURES

This IRM Work Plan consists of the following tasks:

1. Continuous screening of soil/fill disturbed during drilling;
2. Work Zone and Perimeter Air Monitoring for Dust, Vapor and Nuisance Odors;
3. Excavation for the removal of chlorinated VOC-impacted source material in saturated soil within perched groundwater and associated confirmation soil sample collection and analysis; and,
4. Implementation of an in-situ groundwater treatment technology (e.g. injection of zero-valent iron and carbon substrate) to reduce chlorinated VOCs in groundwater.

The IRM described herein will be performed in accordance with applicable federal, state, and city regulations. A construction health and safety plan (CHASP) is provided as Appendix A.

2.1 Objectives and Rationale

The objective of the IRM Work Plan is to reduce concentrations of chlorinated VOCs. The proposed IRM will prevent additional environmental impacts to Site media (soil, groundwater, and soil vapor) through the treatment of source areas and impacted groundwater at the Site. All activities that will result in soil disturbance will be completed in accordance with requirements of the Construction Health and Safety Plan (CHASP) and the Community Air Monitoring Plan (CAMP) in a manner to prevent exposure of potential impacts to site workers and the surrounding community.

2.2 Interim Remedial Measures Program

2.2.1 Site Preparation

Site preparation measures will be completed by the Contractor prior to the implementation of and as a part of the IRM and will include, but not be limited to, the establishment of work zones, mobilization of support facilities, construction of decontamination facilities, and implementation of site security measures (i.e., erection of security fencing around the Site and staging areas). Soil erosion control and sediment control measures are not anticipated to be required for implementation the IRMWP.

The Contractor will ensure that all necessary permits are obtained prior to the commencement of any task included in the proposed IRM.

Prior to intrusive activities, Dig Safely New York (811) will be contacted by the Contractor a minimum of three business days in advance of the work. Dig Safely New York will be informed of the nature of the work and the intent to drill at the Site.

2.2.2 Remediation of Chlorinated VOC Source Material in Saturated Soil within Perched Groundwater

PCE was detected in soil from 6 to 8 feet below the former basement slab (corresponding to between 14.5 and 16.5 feet bsl) at LB-02 at a concentration of 1.6 mg/kg, which is in exceedance of the Unrestricted Use SCOs and Protection of Groundwater SCOs. Perched groundwater analytical results at this location (MW-02) revealed cis-1,2-dichloroethene

(cis-1,2-DCE) (9.32 µg/l), PCE (2,660 µg/l), and trichloroethylene (TCE) (209 µg/l) in exceedance of the NYSDEC SGVs.

Soil borings were advanced during the Remedial Investigation to the north, west, and east of PCE impacts previously detected in LB-02 and MW-02 to delineate for remedial excavation. Delineation to the south has been achieved via the analytical results of LB-07 and LSB-12, which did not contain chlorinated VOCs. A minimum approximately 30-foot by 20-foot area will be excavated from the current ground surface (approximately 9-feet bsl) to the top of bedrock (approximately 18.5 feet bsl) for the removal of chlorinated VOCs in saturated soil within perched groundwater in this contamination source area. The excavation will encompass the location of the former solvent tank. All soil removed from 14 feet bsl to the top of bedrock will be disposed of off-Site as hot spot chlorinated VOC source material. The proposed remedial excavation extents are presented on Figure 6. Support-of-excavation installation may be required depending on the final extents of the source material excavation.

The excavation will be backfilled with clean imported material accordance with the soils/materials management procedures detailed in Section 2.4.6 of this Work Plan. Material present from street level to 14 feet bsl may be disposed of or may be placed back into the excavation in the order in which it as removed in accordance with Section 2.4.7 of this Work Plan.

Excavation will be conducted using conventional hydraulic excavation equipment. Excavated soil will be screened with a PID equipped with an 11.8 electron-volt (eV) lamp. Soil/ fill that is not reused will be disposed of at an off-Site permitted disposal facility capable of receiving this type of solid waste and transported by 6 NYCRR Part 364-permitted waste haulers. Proposed disposal facility documentation will be presented to the NYSDEC prior to disposal activities.

2.2.3 Confirmation Soil Sampling

Post-excavation soil samples will be collected from immediately above the bedrock interface to document the quality of the soil removed as part of the remedial excavation. Five samples will be collected and will consist of one sample per excavation sidewall and a sample from the excavation

base, plus quality assurance/quality controls samples. The excavation base sample will be analyzed for the Part 375 list of VOCs, SVOCs, PCBs, pesticides/herbicides, cyanide, metals including hexavalent and trivalent chromium, PFAS, and 1,4-dioxane. The excavation sidewall samples will be analyzed for VOCs. A Quality Assurance Project Plan is included as Appendix B.

2.2.4 In-Situ Groundwater Treatment

Based on the analytical results documented in Langan's March 2022 Phase II ESI, groundwater treatment with zero-valent iron (ZVI) and carbon substrate via injection points has been selected as the interim remedy to reduce chlorinated VOC impacts in perched groundwater and bedrock prior to the start of foundation construction. Based on the results of the Phase II ESI completed onsite, groundwater concentrations of chlorinated VOCs including cis-1,2-DCE, PCE, and TCE were detected in exceedance of the NYSDEC SGVs in perched groundwater overlying weathered bedrock, and in bedrock wells in samples collected at 20, 28, and 45 feet bsl along the eastern half of the Site as shown on Figure 4.

The Remedial Investigation included the following tasks which further defined the treatment and monitoring area

- Installation five permanent groundwater monitoring wells (LMW-6 through LMW 10) in the perched groundwater layer above bedrock and collection of five groundwater samples for laboratory analysis.

- Installation of six permanent bedrock monitoring wells (LMW-8R-S through LMW 13R-S) to 50 feet bsl. Existing wells LMW-6R-S (formerly referred to as MW-6), and LMW-7R-S (formerly referred to MW-7) may also be reinstalled if the wells are determined to be damaged prior to mobilization for the RI.

- Installation of eight permanent bedrock monitoring wells (LMW-6R-D through LMW-13R-D) to 85 feet bsl.

- Downhole geophysical evaluation of the bedrock wells, hydraulic conductivity testing of specific fracture zones by packer testing,

and additional groundwater sample collection and analysis for the completion of a treatability study.

- Collection of groundwater samples from bedrock wells for laboratory analysis. The number of samples collected will depend on the results of the geophysical evaluation and hydraulic conductivity testing.

Langan will conduct a bench-scale treatability study to demonstrate the effectiveness of ZVI and organic carbon substrate injections to treat chlorinated VOCs in site groundwater, as well as confirm dosages of the ZVI and carbon additives. Groundwater samples collected as described above will be used to conduct microcosm tests in the laboratory in which different concentrations of ZVI (commercial formulations of ZVI and carbon substrate) will be introduced. The treatability work will be performed directly by Langan scientists at the Langan Treatability Facility located at the New Jersey Institute of Technology (NJIT) in Newark, NJ. The results of the bench-scale treatability study, in conjunction with the additional data on bedrock fracture conditions determined during he proposed RI, will be used to finalize the full-scale design (i.e., injection requirements in specific fractures such as selected reagent, dosages, and monitoring requirements, injection spacing interval, and pressure, radius of influence, etc.). A technical memorandum summarizing the results of the RI groundwater sampling and design of the injections will be submitted with appropriate figures depicting the layout of the injection and monitoring well network to the Department for review and approval prior to implementation of this IRM Work Plan.

Additional wells will be installed for performance monitoring and/or injections to optimize the treatment and monitoring. Specific locations and installation depths of the wells will depend on the findings of the RI and will be included in the technical memorandum submitted for NYSDEC review and approval.

Following the injections, groundwater monitoring events will be performed three months and six months post-injection to evaluate remedial effectiveness, which will be presented in detail in the RAWP.

The proposed horizontal extent of remediation treatment zone is shown on Figure 7. Based on the available data, it is anticipated that treatment may be required in bedrock up to 50 feet bsl; however, the horizontal and vertical extents requiring remediation will be determined based on the findings of the laboratory analysis of groundwater samples, downhole geophysical assessment, and packer testing that will be completed during the RI. The final proposed treatment zone will be presented in the technical memorandum summarizing the results of the RI groundwater sampling and design of the injections that will be submitted to the Department for review and approval prior to implementation of this IRM Work Plan.

2.2.5 Community Air Monitoring Plan

Community air monitoring will be conducted in compliance with the NYSDOH Generic CAMP outlined below and provided as Appendix C.

The CAMP will include real-time monitoring for VOCs and particulates at the downwind perimeter of each designated work area when ground-intrusive work is in progress. Continuous monitoring will be required for all ground-intrusive work. Ground-intrusive work includes, but is not limited to, drilling, site grading, etc. Periodic monitoring for VOCs may be required during non-intrusive work such as the collection of soil samples. "Periodic" monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location and taking a reading prior to leaving a sample location.

Upwind concentrations of VOCs and dust will be monitored continuously each day to establish background concentrations. Langan will monitor VOCs and dust at the downwind perimeter of the work zone, which will be established at a point on the Site where the general public or site employees may be present. CAMP monitoring of total VOC levels will be conducted using PIDs, and monitoring for particulates will be conducted using particulate sensors equipped with filters that can detect airborne particulates less than 10 microns in diameter (PM10). Monitoring for particulates and odors will be conducted during ground-intrusive work by a field engineer, scientist, or geologist under the supervision of the RE. The work zone is defined as the general area in which machinery is

operating in support of remediation. A portable PID will be used to monitor the work zone and for periodic monitoring of total VOC levels during work such as soil sampling. The Site perimeter will be visually monitored for fugitive dust emissions.

The following actions will be taken based on total VOC levels measured:

- If total VOC levels exceed 5 ppm above background for the 15-minute average at the perimeter, work will be temporarily halted and monitoring continued. If levels readily decrease (per instantaneous readings) below 5 ppm above background, work will resume with continued monitoring.

- If total VOC levels at the downwind perimeter of the work zone persist at levels in excess of 5 ppm above background but less than 25 ppm, work will be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work will resume provided that the total VOC 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, work will be shut down until the cause of the VOC vapors has been addressed.

The following actions will be taken based on dust levels measured or visual dust observations:

- If the downwind particulate level is 100 µg/m³ greater than background level 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 µg/m³ 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 µg/m³ 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 µg/m³ of the background level and in preventing visible dust migration.

Exceedance of the CAMP action levels for VOCs or PM10 and the reason for the exceedances will be reported to the NYSDEC and NYSDOH Project Managers and included in the daily report. In addition, a map showing the location of the downwind and work zone CAMP stations will be included in the daily report.

2.2.6 Dust, Vapor and Nuisance Odor Control Plan

Dust, odor, and nuisance control will be accomplished by the remediation contractor as described in this section.

2.2.6.1 Odor Control Plan

This odor control plan is capable of controlling emissions of nuisance odors off-Site. Specific odor control methods to be used on a routine basis (if needed) will include application of foam suppressants or tarps over the odor or VOC source areas, if encountered. If nuisance odors are identified, work will be halted and the source of odors will be identified and corrected. Work will not resume until all nuisance odors have been abated. NYSDEC and NYSDOH will be notified of all odor events and of all other complaints about the project. Implementation of all odor controls, including the halt of work, will be the responsibility of the Requestor's RE, who is responsible for certifying the Final Engineering Report (FER). Application of odor controls is the responsibility of the Remedial Contractor.

All necessary means will be employed to prevent on- and off-Site nuisances. At a minimum, procedures will include: (a) limiting the area of open excavations; (b) shrouding open excavations with tarps and other covers; and (c) using non-PFAS foams to cover exposed odorous soils or PFAS containing foams that will be remediated immediately after use. If

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

Although not anticipated, 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.

2.2.6.2 Dust Control Plan

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

- Dust suppression will be achieved through the use of a dedicated water distribution system or on-Site water truck for road wetting, or an alternate source with suitable supply and pressure for use in dust control.
- Stockpiles shall be maintained in accordance with Section 2.4.2.
- Gravel will be used on roadways to provide a clean and dust-free road surface.
- On-Site roads will be limited in total area to minimize the area required for water spraying.

2.2.6.3 Other Nuisances

A plan for rodent control will be developed and used by the remediation contractor during Site preparation (including clearing and grubbing) and during remedial work.

A plan for noise control will be developed and used by the remediation contractor during Site preparation and remedial work.

2.3 Interim Remedial Measures Oversight

The Remediation Engineer (RE), Stew Abrams, P.E. of Langan, will oversee implementation of the IRM. The RE is responsible for documenting that the activities completed as part of this IRM Work Plan are performed in accordance with their intended objectives. The documentation collected will be provided to the NYSDEC as part of the Construction Completion Report (CCR) or Final Engineering Report (FER). A field engineer/scientist/geologist, under the supervision of the RE, will provide full-time oversight during implementation of the IRM Work Plan. Work conducted in accordance with this IRM Work Plan will be properly documented in daily field reports, monthly BCP progress reports, and in the CCR or FER.

2.4 Soil/Materials Management

Soil/materials management activities specific to the handling as well as transportation/disposal materials generated during IRMWP are described in this section. A Langan representative will monitor and document handling of material exported from the Site that is transported and disposed of in accordance with applicable laws and regulations. Excavated material will be screened by visual and olfactory methods and with a PID, to identify if soil is impacted with VOCs. Excavated material will be stockpiled onsite. Excavation extents included in this Work Plan are limited to those required to remedial the chlorinated VOC hot spot source area. Remedial excavation for the removal and off-Site disposal of contaminated fill elsewhere on the Site will be completed as part of the final remedy and will be included in the forthcoming RAWP. Fill material overlying the chlorinated VOC hotspot (approximately 9 to 14 feet bsl) will be managed separately to avoid comingling.

2.4.1 Soil Screening Methods

Visual, olfactory, and instrumental soil screening will be performed using a PID equipped with an 11.8 electron volt (eV) bulb that will be calibrated daily. Soil screening will take place during excavation and invasive work performed as part of the interim remedy and development-related construction including, but not limited to, excavating for remediation, SOE installation, foundation construction, and utility work. Visibly impacted

material will be segregated and placed on polyethylene sheeting for off-Site disposal.

2.4.2 Soil Stockpiles

Stockpiles will be constructed as necessary to separate and stage excavated material pending loading or characterization sampling. Stockpile areas will meet the following minimum requirements:

- Separate stockpile areas will be constructed to avoid comingling materials of differing waste types. If stockpiles must be staged in an area of the Site that is characterized as a different waste type, stockpiles will be placed onto a minimum thickness of 6 mil low-permeability liner of sufficient strength and thickness to prevent puncture during use; separate stockpiles will be created where material types are different (e.g., petroleum-impacted material stockpiled in a contaminated soil area). The use of multiple layers of thinner liners is permissible.
- Equipment and procedures will be used to place and remove the soil that will minimize the potential to jeopardize the integrity of the liner;
- Stockpiles will be covered upon reaching their capacity (i.e., about 1,000 cubic yards) until ready for loading. Stockpiles that have not reached their capacity, whether active or inactive, will be covered at the end of each workday.
- Stockpiles at or above sidewalk grade will be encircled with silt fences and hay bales, as needed, to contain and filter particulates from any rainwater that has drained off the soils and to mitigate the potential for surface water run-off;
- Stockpiles will be inspected at a minimum once each week and after every storm event and any deficiencies will be promptly addressed – any damaged tarps or coverings will be promptly replaced; and,

- Results of inspections will be recorded in a logbook to be maintained at the Site and made available for inspection by NYSDEC upon request.

2.4.3 Material Excavation and Load Out

The Requestor and its contractors are solely responsible for safe execution of ground-intrusive and other remedial work performed under this IRMWP. The Requestor and its contractors are solely responsible for the identification of utilities and/or easements that might be affected by the work conducted under this IRMWP.

Loaded vehicles leaving the Site will be appropriately lined (as needed), securely covered, manifested, and placarded in accordance with the appropriate federal, state, and local requirements, including applicable transportation requirements (i.e., New York State Department of Transportation [NYSDOT] and NYCDOT requirements). Trucks hauling fill material will not be lined unless free liquids are present or the material is grossly impacted.

Additionally, the Requestor and its contractor will set up an outbound-truck inspection station close to the Site exit. Before exiting the Site, trucks will be required to stop at the truck inspection station and will be examined for evidence of contaminated soil on the undercarriage, body, and wheels. Soil and debris will be removed. Brooms, shovels and clean water will be utilized for the removal of soil from vehicles and equipment, as necessary. Measures will be taken to ensure that all egress points for truck and equipment transport from the site will be kept clean of project related soils, fill and debris. Locations where vehicles enter or exit the Site will be inspected daily for evidence of off-Site sediment tracking.

The Requestor and associated parties preparing the remedial documents submitted to New York State, and the parties performing this work, are responsible for the safe performance of ground-intrusive work, the structural integrity of excavations, and for structures that may be affected by excavations (such as building foundations and bridge footings).

Development-related grading cuts and fills will not be performed without NYSDEC approval and will not interfere with, or otherwise impair or compromise, the performance of remediation required by this IRMWP.

Mechanical processing of historic fill and contaminated soil on-Site is prohibited unless otherwise approved by NYSDEC.

Primary contaminant sources (including, but not limited to, tanks and hotspots) identified during Site characterization, the RI, and implementation of the remedy will be located via field measurements to the nearest permanent structures or property lines. The information will be shown on maps to be included with the CCR.

UST removal contractors (if necessary) will provide the appropriate permits, certifications, and written commitments from disposal facilities to accept the material generated from the UST removal contingency included in this IRM.

2.4.4 Material Transport Off-Site

Non-hazardous, impacted material will be handled, transported and disposed by a licensed hauler in accordance with applicable 6 NYCRR Part 360, General Provisions and 6 NYCRR Part 364, Waste Transporter Permits regulations and other applicable federal, state and local regulations. The trucking entrance will be determined prior to the initiation of the remedy. All trucks loaded with Site materials exit the vicinity of the Site using only approved truck routes.

Truck routes are shown on Figure 8. Trucks will be prohibited from excessive stopping and idling in the neighborhood outside of the Site.

Egress points for truck and equipment transport from the Site will be kept clean of dirt and other materials during remediation and development.

To the extent possible, queuing of trucks will be performed on-Site in order to minimize off-Site disturbance. Off-Site queuing will be minimized.

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

2.4.5 Material Off-Site Disposal

Waste characterization investigation will be completed prior to transporting any soil/fill for off-Site disposal. Sampling and analytical methods, sampling frequency, analytical results, and QA/QC results will be reported in the CCR. Data available for excavated material to be disposed of at a given facility will be submitted to the disposal facility with suitable explanation prior to shipment and receipt.

Disposal facilities will be determined at a later date and will be reported to the NYSDEC Project Manager prior to off-Site transport and disposal of excavated material. Soil/fill/solid waste excavated and removed from the Site will be handled, transported and disposed in accordance with local, State (including 6 NYCRR Part 360) and Federal regulations. If disposal of soil/fill from this Site is proposed for unregulated disposal (i.e., clean soil removed for development purposes), a formal request with an associated plan will be made to NYSDEC's Project Manager. Unregulated off-Site management of materials from this Site is prohibited without formal NYSDEC approval.

The following documentation will be obtained and reported by the RE for each disposal location used in this project to fully demonstrate and document that the disposal of material derived from the Site conforms to applicable laws:

a. A letter from the RE to the receiving facility describing the material to be disposed and requesting formal written acceptance of the material. This letter will state that material to be disposed is contaminated material generated at an environmental remediation Site in New York State. The letter will provide the project identity and the name and phone number of the RE. The letter will include as an attachment a summary of all chemical data for the material being transported (including waste characterization data).

b. A letter from all receiving facilities stating it is in receipt of the correspondence (above) and is approved to accept the material.

These documents will be included in the CCR.

Non-hazardous contaminated fill material and soil transported off-Site will be handled, at a minimum, as a solid waste per 6 NYCRR Part 360. Contaminated fill and soil excavated from the Site are prohibited from being disposed of at Part 360 Registration Facilities (also known as Soil Recycling Facilities).

Soil that is contaminated but non-hazardous and is being removed from the Site may be sent to a permitted Part 360 landfill. This material is prohibited from being sent or redirected to a Part 360-15 Registration Facility.

The CCR will include an accounting of the destination of material removed from the Site during implementation of the remedy, including excavated soil, contaminated soil, historic fill, solid waste, hazardous waste, non-regulated material, and fluids. Documentation associated with disposal of each material type must also include records and approvals for receipt of the material. This information will also be presented in a table to be included in the CCR.

A "Bill of Lading" system or equivalent will be used for off-Site movement of non-hazardous wastes and contaminated soils. This information will be reported in the CCR. Hazardous wastes derived from the Site, if any, will be stored, transported, and disposed of in compliance with applicable local, state, and federal regulations.

Appropriately licensed haulers, in compliance with applicable local, state, and federal regulations, will be used to transport the material removed from this Site.

2.4.6 Backfill From Off-Site Sources

Materials proposed for import onto the Site will be approved by the RE and will be in compliance with the provisions in this IRMWP prior to receipt at the Site. Imported soil for backfill must meet the Restricted Residential

RUSCOs or other acceptable fill material such as virgin, native stone from a quarry or RCA. Material from industrial Sites, spill Sites, other environmental remediation Sites, or other potentially contaminated Sites will not be imported to the Site. Solid waste will not be imported onto the Site.

If RCA is imported to the Site, it will be from a NYSDEC-registered facility in compliance with 6 NYCRR Part 360 registration and permitting requirements for the period of acquisition of RCA. RCA imported from compliant facilities will not require chemical testing, unless required by the NYSDEC under the terms for operation of the facility. RCA imported to the Site must be derived from recognizable and uncontaminated concrete, with no more than 10% by weight passing through a No. 80 sieve. RCA is not acceptable for and will not be used as cover or drainage material or to fill areas beneath the groundwater table. Crushed virgin stone from a permitted mine or quarry may also be imported without chemical testing is sieve analysis shows no more than 10% by weight passing through a No. 80 sieve.

Imported soil will meet the Restricted Residential RUSCOs. Non-compliant soils will not be imported to the Site. Clean fill will be segregated at a source/facility that is free of environmental contaminants. Qualified environmental personnel will collect representative samples at a frequency consistent with NYSDEC DER-10 Table 5.4(e)10 – Recommended Number of Soil Samples for Soil Imported To or Exported From a Site. The samples will be analyzed for Part 375 VOCs, SVOCs, pesticides/herbicides, PCBs, cyanide, metals including trivalent and hexavalent chromium and PFAS, and 1,4-dioxane by a NYSDOH ELAP-certified laboratory. Upon meeting these criteria, the certified-clean fill will be transported to the Site and segregated from impacted material, as necessary, on plastic sheeting until it is used as backfill.

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 the NYSDEC. The contents of this RAWP and NYSDEC approval of this RAWP should not be construed as an approval for this purpose.

Trucks entering the Site with imported soils will be secured with tight fitting covers.

2.4.7 Material Reuse On-Site

Soil/fill excavated from above the chlorinated VOC hot spot source area (approximately 9 to 14 feet bsl) that will excavated during the IRM may be replaced back into the excavation overlying imported clean fill for removal during implementation of the forthcoming RAWP unless gross impacts are identified. Grossly-impacted soil will not be reused. Material deemed unfit for reuse will be transported for off-Site disposal.

2.5 Contingent IRM Work Plan Activities

The potential exists that unforeseen structures or impacts that would require immediate action by the RE may be encountered during implementation of the IRM. In order to address this potential, the following section provides contingency measures for addressing petroleum impacted or otherwise grossly impacted material and USTs should they be encountered during soil disturbance activities.

2.5.1 Petroleum and/or Grossly-Impacted Soil Removal

The location of any petroleum and/or grossly-impacted material (i.e., areas of heavily stained and/or odorous soil observed during soil disturbance activities) identified as result of the IRM will be properly documented to allow for inclusion in the forthcoming remedial action.

2.5.2 Underground Storage Tank (UST) Removal Contingency Plan

While it is not anticipated that USTs will be encountered during IRM activities, if they are encountered or grossly impacted soil is encountered that may be associated with tanks at the Site, their removal and closure may be necessary. If so, removal of the tanks and impacted soil will be completed in accordance with NYSDEC CP-51 Soil Cleanup Guidance and other applicable NYSDEC UST closure requirements.

Following removal of any UST(s), affidavits of closure will be submitted to the FDNY, and PBS registration/de-registration applications will be submitted to NYSDEC.

2.6 Construction Health and Safety Plan

The RE prepared a site-specific CHASP for the IRM, which is included as Appendix A. The CHASP provides a mechanism for establishing on-site safe working conditions, safety organization, procedures, and personal protective equipment (PPE) requirements. The CHASP meets the requirements of 29 CFR 1910 and 29 CFR 1926 (which includes 29 CFR 1910.120 and 29 CFR 1926.65). The CHASP includes, but is not limited to, the following components listed below:

- Organization and Identification of key personnel;
- Training requirements;
- Medical surveillance requirements;
- List of site hazards;
- Excavation safety;
- Work zone descriptions and monitoring procedures;
- Personal safety equipment and protective clothing requirements;
- Decontamination requirements;
- Standard operating procedures;
- Contingency Plan; and
- Material Safety Data Sheets.

2.7 Notification

The NYSDEC will be notified at least 10 days prior to commencement of IRM-related work. A preconstruction meeting will be coordinated between the RE, the Remediation Contractor, and the NYSDEC. This meeting must be coordinated prior to the implementation of this IRM Work Plan.

3.0 REPORTING

Upon completion of the IRM, a CCR will be prepared and submitted to the NYSDEC. The RE responsible for certifying all reports will be an individual licensed to practice engineering in the State of New York. Stewart Abrams, P.E. of Langan will have this responsibility. Should Mr. Abrams become unable to fulfill this responsibility, another

suitably qualified New York State professional engineer will take his place. All project reports will be submitted to the NYSDEC electronically as PDFs. Laboratory analytical data for documentation samples will be submitted in an electronic data deliverable (EDD) format that complies with the NYSDEC's electronic data warehouse standards.

3.1 Daily Reports

Daily reports will be prepared for the project file and for review by the NYSDEC and NYSDOH Project Managers by the end of the following work day. Daily reports will include:

- An update of progress made during the reporting day;
- Locations of work and quantities of material imported and remediation waste exported from the site;
- References to map for site activities;
- A summary of any and all complaints with relevant details (names, phone numbers);
- A summary of CAMP results, including STEL exceedances; and,
- An explanation of notable site conditions.

Daily reports are not intended to be the mode of communication for notification to the NYSDEC of emergencies (accident, spill), requests for changes to the IRM Work Plan or other sensitive or time critical information; however, such conditions will also be included in the daily reports. Emergency conditions and changes to the IRM Work Plan will be addressed directly to the NYSDEC Project Manager via personal communication. Daily reports will be included as an appendix in the CCR or FER. If site conditions warrant, the RE may request to change from daily to weekly reports that include the above information.

3.2 Construction Completion Report

A CCR will be submitted to the NYSDEC Project Managers after completion of the interim remedial action. The CCR will document the implementation of the IRM and will be incorporated into and referenced in the FER. The CCR will provide the following information:

1. The RE will certify that:

    a. The remedial work conformed to the IRM Work Plan;

    b. Dust, odor, and vapor control measures were implemented during invasive work and conformed with the IRM Work Plan with any deviations noted in the report; and,

    c. Remediation waste was transported and disposed in accordance with the IRM Work Plan.

2. Description of the work completed under the IRM;

3. Description of any problems encountered and their resolutions;

4. Description of changes in the IRM from the elements provided in the IRM Work Plan and associated design documents and the reasons for them;

5. Description of the deviations from the approved IRM Work Plan;

6. Drawings presenting the groundwater treatment implemented;

7. Listing of waste streams, quantity of materials disposed, and where they were disposed;

8. List of the remediation standards applied to the remedial actions;

9. Documentation of NYSDEC Petroleum Bulk Storage PBS database registry and closure, if necessary;

10. A tabular summary of all sampling results and all material characterization results and other sampling and chemical analysis performed as part of the IRM;

11. Written and photographic documentation of all work performed under this Work Plan;

12. Copies of all the submitted progress reports;

13. Certifications, manifests, and bills of lading for excavated materials transported off-site;

14. An accounting of the destination of all material removed from the site; and,

15. Documentation associated with disposal of all material must also include records and approvals for receipt of the material.

4.0 SCHEDULE

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

Activity	Months (following approval of IRMWP)							
	1	2	3	4	5	6	7	8
NYSDEC Review and Approval of the Bench-Scale Treatability Study								
In-Situ Groundwater Treatment								

TABLES

Table 1
Phase II Environmental Site Investigation Report
Soil Sample Analytical Results

1487 First Avenue
New York City, New York
Langan Project No.: 100963701

Analyte	CAS Number	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Protection of Groundwater SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	Location	LB-01	LB-01	LB-02	LB-02	LB-3	LB-3	LB-04	LB-04	LB-05	LB-05	LB-06	LB-06
					Sample Name	009_LB-01_0-1	010_LB-01_6.5-8.5	007_LB-02_6-8	008_LB-02_8-10	004_LB-3_0-2	005_LB-3_7-9	016_LB-04_0-2_20211110	017_LB-04_6.5-7.5_20211110	018_LB-05_6.5-8_20211110	019_LB-05_8-9_20211110	011_LB-06_0-2	012_LB-06_6-8
					Sample Date	11/09/2021	11/09/2021	11/09/2021	11/09/2021	11/09/2021	11/09/2021	11/10/2021	11/10/2021	11/10/2021	11/10/2021	11/09/2021	11/09/2021
					Sample Depth (fbfbs)	0-1	6.5-8.5	6-8	8-10	0-2	7-9	0-2	6.5-7.5	6.5-8	8-9	0-2	6-8
					Sample Depth (fbsl)	9.5-10.5	16-18	14.5-16.5	16.5-18.5	9.5-11.5	16.5-18.5	9.5-11.5	16-17	16-17.5	17.5-18.5	9.5-11.5	15.5-17.5
					Fill/Native	Fill	Native	Native	Native	Fill	Native	Fill	Native	Native	Native	Fill	Native
					Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Volatile Organic Compounds																	
1,1,1,2-Tetrachloroethane	630-20-6	NS	NS	NS	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U
1,1,1-Trichloroethane	71-55-6	0.68	0.68	100	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U
1,1,2,2-Tetrachloroethane	79-34-5	NS	NS	NS	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	NS	NS	NS	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U
1,1,2-Trichloroethane	79-00-5	NS	NS	NS	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U
1,1-Dichloroethane	75-34-3	0.27	0.27	26	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U
1,1-Dichloroethene	75-35-4	0.33	0.33	100	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U
1,1-Dichloropropene	563-58-6	NS	NS	NS	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U
1,2,3-Trichlorobenzene	87-61-6	NS	NS	NS	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U
1,2,3-Trichloropropane	96-18-4	NS	NS	NS	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U
1,2,4-Trichlorobenzene	120-82-1	NS	NS	NS	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U
1,2,4-Trimethylbenzene	95-63-6	3.6	3.6	52	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U
1,2-Dibromo-3-Chloropropane	96-12-8	NS	NS	NS	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U
1,2-Dibromoethane (Ethylene Dibromide)	106-93-4	NS	NS	NS	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U
1,2-Dichlorobenzene	95-50-1	1.1	1.1	100	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U
1,2-Dichloroethane	107-06-2	0.02	0.02	3.1	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U
1,2-Dichloropropane	78-87-5	NS	NS	NS	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U
1,3,5-Trimethylbenzene (Mesitylene)	108-67-8	8.4	8.4	52	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U
1,3-Dichlorobenzene	541-73-1	2.4	2.4	49	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U
1,3-Dichloropropane	142-28-9	NS	NS	NS	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U
1,4-Dichlorobenzene	106-46-7	1.8	1.8	13	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U
1,4-Dioxane (P-Dioxane)	123-91-1	0.1	0.1	13	mg/kg	<0.061 U	<0.043 U	<0.046 U	<0.044 U	<0.051 U	<0.046 U	<0.053 U	<0.045 U	<0.029 U	<0.043 U	<0.053 U	<0.044 U
2,2-Dichloropropane	594-20-7	NS	NS	NS	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U
2-Chlorotoluene	95-49-8	NS	NS	NS	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U
2-Hexanone (MBK)	591-78-6	NS	NS	NS	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U
4-Chlorotoluene	106-43-4	NS	NS	NS	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U
Acetone	67-64-1	**0.05**	0.05	100	mg/kg	<0.0061 U	0.0099	<0.0046 U	<0.0044 U	<0.0051 U	<0.0046 U	<0.0053 U	<0.0045 U	0.017	0.0069 J	<0.0053 U	<0.0044 U
Acrolein	107-02-8	NS	NS	NS	mg/kg	<0.0061 U	<0.0043 U	<0.0046 U	<0.0044 U	<0.0051 U	<0.0046 U	<0.0053 U	<0.0045 U	<0.0029 U	<0.0043 U	<0.0053 U	<0.0044 U
Acrylonitrile	107-13-1	NS	NS	NS	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U
Benzene	71-43-2	0.06	0.06	4.8	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U
Bromobenzene	108-86-1	NS	NS	NS	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U
Bromochloromethane	74-97-5	NS	NS	NS	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U
Bromodichloromethane	75-27-4	NS	NS	NS	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U
Bromoform	75-25-2	NS	NS	NS	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U
Bromomethane	74-83-9	NS	NS	NS	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U
Carbon Disulfide	75-15-0	NS	NS	NS	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U
Carbon Tetrachloride	56-23-5	0.76	0.76	2.4	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U
Chlorobenzene	108-90-7	1.1	1.1	100	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U
Chloroethane	75-00-3	NS	NS	NS	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U
Chloroform	67-66-3	0.37	0.37	49	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U
Chloromethane	74-87-3	NS	NS	NS	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U
Cis-1,2-Dichloroethene	156-59-2	0.25	0.25	100	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U
Cis-1,3-Dichloropropene	10061-01-5	NS	NS	NS	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U
Cyclohexane	110-82-7	NS	NS	NS	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U
Dibromochloromethane	124-48-1	NS	NS	NS	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U
Dibromomethane	74-95-3	NS	NS	NS	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U
Dichlorodifluoromethane	75-71-8	NS	NS	NS	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U
Ethylbenzene	100-41-4	1	1	41	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U
Hexachlorobutadiene	87-68-3	NS	NS	NS	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U
Isopropylbenzene (Cumene)	98-82-8	NS	NS	NS	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U
M,P-Xylene	179601-23-1	NS	NS	NS	mg/kg	<0.0061 U	<0.0043 U	<0.0046 U	<0.0044 U	<0.0051 U	<0.0046 U	<0.0053 U	<0.0045 U	<0.0029 U	<0.0043 U	<0.0053 U	<0.0044 U
Methyl Acetate	79-20-9	NS	NS	NS	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U
Methyl Ethyl Ketone (2-Butanone)	78-93-3	0.12	0.12	100	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	0.0039	<0.0021 U	<0.0027 U	<0.0022 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	108-10-1	NS	NS	NS	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U
Methylcyclohexane	108-87-2	NS	NS	NS	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U
Methylene Chloride	75-09-2	0.05	0.05	100	mg/kg	0.015	0.01	0.015	0.015	0.017	0.015	0.0065 J	0.011	0.0049 J	0.011	0.045	0.014
n-Butylbenzene	104-51-8	12	12	100	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U
n-Propylbenzene	103-65-1	3.9	3.9	100	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U
o-Xylene (1,2-Dimethylbenzene)	95-47-6	NS	NS	NS	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U
p-Cymene (p-Isopropyltoluene)	CYMP	NS	NS	NS	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U
Sec-Butylbenzene	135-98-8	11	11	100	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	0.0056	<0.0021 U	<0.0027 U	<0.0022 U
Styrene	100-42-5	NS	NS	NS	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U
T-Butylbenzene	98-06-6	5.9	5.9	100	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U
Tert-Butyl Alcohol	75-65-0	NS	NS	NS	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U
Tert-Butyl Methyl Ether	1634-04-4	0.93	0.93	100	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U
Tetrachloroethene (PCE)	127-18-4	**1.3**	1.3	19	mg/kg	<0.0031 U	<0.0022 U	**1.6 D**	0.59 D	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U
Toluene	108-88-3	0.7	0.7	100	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U
Total Xylenes	1330-20-7	0.26	1.6	100	mg/kg	<0.0092 U	<0.0065 U	<0.0069 U	<0.0066 U	<0.0077 U	<0.0069 U	<0.0079 U	<0.0068 U	<0.0044 U	<0.0064 U	<0.008 U	<0.0067 U
Trans-1,2-Dichloroethene	156-60-5	0.19	0.19	100	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U
Trans-1,3-Dichloropropene	10061-02-6	NS	NS	NS	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U
Trichloroethene (TCE)	79-01-6	0.47	0.47	21	mg/kg	<0.0031 U	<0.0022 U	0.058	0.025	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U
Trichlorofluoromethane	75-69-4	NS	NS	NS	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U
Vinyl Acetate	108-05-4	NS	NS	NS	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U
Vinyl Chloride	75-01-4	0.02	0.02	0.9	mg/kg	<0.0031 U	<0.0022 U	<0.0023 U	<0.0022 U	<0.0026 U	<0.0023 U	<0.0026 U	<0.0023 U	<0.0015 U	<0.0021 U	<0.0027 U	<0.0022 U

Table 1
Phase II Environmental Site Investigation Report
Soil Sample Analytical Results

1487 First Avenue
New York City, New York
Langan Project No.: 100963701

Analyte	CAS Number	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Protection of Groundwater SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	Location	LB-01	LB-01	LB-02	LB-02	LB-3	LB-3	LB-04	LB-04	LB-05	LB-05	LB-06	LB-06
					Sample Name	009_LB-01_0-1	010_LB-01_6.5-8.5	007_LB-02_6-8	008_LB-02_8-10	004_LB-3_0-2	005_LB-3_7-9	016_LB-04_0-2_20211110	017_LB-04_6.5-7.5_20211110	018_LB-05_6.5-8_20211110	019_LB-05_8-9_20211110	011_LB-06_0-2	012_LB-06_6-8
					Sample Date	11/09/2021	11/09/2021	11/09/2021	11/09/2021	11/09/2021	11/09/2021	11/10/2021	11/10/2021	11/10/2021	11/10/2021	11/09/2021	11/09/2021
					Sample Depth (fbfbs)	0-1	6.5-8.5	6-8	8-10	0-2	7-9	0-2	6.5-7.5	6.5-8	8-9	0-2	6-8
					Sample Depth (fbsl)	9.5-10.5	16-18	14.5-16.5	16.5-18.5	9.5-11.5	16.5-18.5	9.5-11.5	16-17	16-17.5	17.5-18.5	9.5-11.5	15.5-17.5
					Fill/Native	Fill	Native	Native	Native	Fill	Native	Fill	Native	Native	Native	Fill	Native
					Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Semi-Volatile Organic Compounds																	
1,2,4,5-Tetrachlorobenzene	95-94-3	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	120-82-1	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	95-50-1	1.1	1.1	100	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Diphenylhydrazine	122-66-7	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	541-73-1	2.4	2.4	49	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	106-46-7	1.8	1.8	13	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dioxane (P-Dioxane)	123-91-1	0.1	0.1	13	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,6-Tetrachlorophenol	58-90-2	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	95-95-4	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	88-06-2	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	120-83-2	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	105-67-9	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	51-28-5	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	121-14-2	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	606-20-2	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	91-58-7	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol	95-57-8	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	91-57-6	NS	NS	NS	mg/kg	<0.045 U	<0.0467 U	<0.0481 U	<0.0453 U	<0.0454 U	<0.0475 U	<0.0501 U	<0.0471 U	<0.0467 U	<0.0479 U	<0.0462 U	<0.0465 U
2-Methylphenol (o-Cresol)	95-48-7	0.33	0.33	100	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitroaniline	88-74-4	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitrophenol	88-75-5	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3 & 4 Methylphenol (m&p Cresol)	65794-96-9	0.33	0.33	100	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	91-94-1	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitroaniline	99-09-2	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-Methylphenol	534-52-1	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyl Phenyl Ether	101-55-3	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-Methylphenol	59-50-7	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	106-47-8	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl Phenyl Ether	7005-72-3	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroaniline	100-01-6	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol	100-02-7	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	83-32-9	20	98	100	mg/kg	<0.045 U	<0.0467 U	<0.0481 U	<0.0453 U	<0.0454 U	<0.0475 U	<0.0501 U	<0.0471 U	<0.0467 U	<0.0479 U	<0.0462 U	<0.0465 U
Acenaphthylene	208-96-8	100	107	100	mg/kg	<0.045 U	<0.0467 U	<0.0481 U	<0.0453 U	<0.0454 U	<0.0475 U	<0.0501 U	<0.0471 U	<0.0467 U	<0.0479 U	<0.0462 U	<0.0465 U
Acetophenone	98-86-2	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aniline (Phenylamine, Aminobenzene)	62-53-3	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	120-12-7	100	1000	100	mg/kg	<0.045 U	<0.0467 U	<0.0481 U	<0.0453 U	<0.0454 U	<0.0475 U	<0.0501 U	<0.0471 U	<0.0467 U	<0.0479 U	<0.0462 U	<0.0465 U
Atrazine	1912-24-9	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzaldehyde	100-52-7	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzidine	92-87-5	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	56-55-3	1	1	1	mg/kg	0.124 D	<0.0467 U	<0.0481 U	<0.0453 U	<0.0454 U	<0.0475 U	<0.0501 U	<0.0471 U	<0.0467 U	<0.0479 U	<0.0462 U	<0.0465 U
Benzo(a)pyrene	50-32-8	1	22	1	mg/kg	0.103 D	<0.0467 U	<0.0481 U	<0.0453 U	<0.0454 U	<0.0475 U	<0.0501 U	<0.0471 U	<0.0467 U	<0.0479 U	<0.0462 U	<0.0465 U
Benzo(b)fluoranthene	205-99-2	1	1.7	1	mg/kg	0.0819 JD	<0.0467 U	<0.0481 U	<0.0453 U	<0.0454 U	<0.0475 U	<0.0501 U	<0.0471 U	<0.0467 U	<0.0479 U	<0.0462 U	<0.0465 U
Benzo(g,h,i)Perylene	191-24-2	100	1000	100	mg/kg	0.0539 JD	<0.0467 U	<0.0481 U	<0.0453 U	<0.0454 U	<0.0475 U	<0.0501 U	<0.0471 U	<0.0467 U	<0.0479 U	<0.0462 U	<0.0465 U
Benzo(k)fluoranthene	207-08-9	0.8	1.7	3.9	mg/kg	0.0948 D	<0.0467 U	<0.0481 U	<0.0453 U	<0.0454 U	<0.0475 U	<0.0501 U	<0.0471 U	<0.0467 U	<0.0479 U	<0.0462 U	<0.0465 U
Benzoic Acid	65-85-0	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzyl Alcohol	100-51-6	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzyl Butyl Phthalate	85-68-7	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Biphenyl (Diphenyl)	92-52-4	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroethoxy) methane	111-91-1	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroethyl) ether (2-chloroethyl ether)	111-44-4	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroisopropyl) ether	108-60-1	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-ethylhexyl) phthalate	117-81-7	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Caprolactam	105-60-2	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	86-74-8	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	218-01-9	1	1	3.9	mg/kg	0.118 D	<0.0467 U	<0.0481 U	<0.0453 U	<0.0454 U	<0.0475 U	<0.0501 U	<0.0471 U	<0.0467 U	<0.0479 U	<0.0462 U	<0.0465 U
Dibenz(a,h)anthracene	53-70-3	0.33	1000	0.33	mg/kg	<0.045 U	<0.0467 U	<0.0481 U	<0.0453 U	<0.0454 U	<0.0475 U	<0.0501 U	<0.0471 U	<0.0467 U	<0.0479 U	<0.0462 U	<0.0465 U
Dibenzofuran	132-64-9	7	210	59	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibutyl phthalate	84-74-2	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diethyl phthalate	84-66-2	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl phthalate	131-11-3	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dioctyl phthalate	117-84-0	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	206-44-0	100	1000	100	mg/kg	0.198 D	<0.0467 U	<0.0481 U	<0.0453 U	<0.0454 U	<0.0475 U	<0.0501 U	<0.0471 U	<0.0467 U	<0.0479 U	<0.0462 U	<0.0465 U
Fluorene	86-73-7	30	386	100	mg/kg	<0.045 U	<0.0467 U	<0.0481 U	<0.0453 U	<0.0454 U	<0.0475 U	<0.0501 U	<0.0471 U	<0.0467 U	<0.0479 U	<0.0462 U	<0.0465 U
Hexachlorobenzene	118-74-1	0.33	3.2	1.2	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobutadiene	87-68-3	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	77-47-4	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	67-72-1	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	193-39-5	0.5	8.2	0.5	mg/kg	<0.045 U	<0.0467 U	<0.0481 U	<0.0453 U	<0.0454 U	<0.0475 U	<0.0501 U	<0.0471 U	<0.0467 U	<0.0479 U	<0.0462 U	<0.0465 U
Isophorone	78-59-1	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	91-20-3	12	12	100	mg/kg	<0.045 U	<0.0467 U	<0.0481 U	<0.0453 U	<0.0454 U	<0.0475 U	<0.0501 U	<0.0471 U	<0.0467 U	<0.0479 U	<0.0462 U	<0.0465 U
Nitrobenzene	98-95-3	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodimethylamine	62-75-9	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodi-N-Propylamine	621-64-7	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodiphenylamine	86-30-6	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	87-86-5	0.8	0.8	6.7	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	85-01-8	100	1000	100	mg/kg	0.0618 JD	<0.0467 U	<0.0481 U	<0.0453 U	<0.0454 U	<0.0475 U	<0.0501 U	<0.0471 U	<0.0467 U	<0.0479 U	<0.0462 U	<0.0465 U
Phenol	108-95-2	0.33	0.33	100	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	129-00-0	100	1000	100	mg/kg	0.173 D	<0.0467 U	<0.0481 U	<0.0453 U	<0.0454 U	<0.0475 U	<0.0501 U	<0.0471 U	0.0499 JD	<0.0479 U	<0.0462 U	<0.0465 U
Pyridine	110-86-1	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 1
Phase II Environmental Site Investigation Report
Soil Sample Analytical Results

1487 First Avenue
New York City, New York
Langan Project No.: 100963701

Analyte	CAS Number	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Protection of Groundwater SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	Location	LB-01	LB-01	LB-02	LB-02	LB-3	LB-3	LB-04	LB-04	LB-05	LB-05	LB-06	LB-06
					Sample Name	009_LB-01_0-1	010_LB-01_6.5-8.5	007_LB-02_6-8	008_LB-02_8-10	004_LB-3_0-2	005_LB-3_7-9	016_LB-04_0-2_20211110	017_LB-04_6.5-7.5_20211110	018_LB-05_6.5-8_20211110	019_LB-05_8-9_20211110	011_LB-06_0-2	012_LB-06_6-8
					Sample Date	11/09/2021	11/09/2021	11/09/2021	11/09/2021	11/09/2021	11/09/2021	11/10/2021	11/10/2021	11/10/2021	11/10/2021	11/09/2021	11/09/2021
					Sample Depth (fbfbs)	0-1	6.5-8.5	6-8	8-10	0-2	7-9	0-2	6.5-7.5	6.5-8	8-9	0-2	6-8
					Sample Depth (fbsl)	9.5-10.5	16-18	14.5-16.5	16.5-18.5	9.5-11.5	16.5-18.5	9.5-11.5	16-17	16-17.5	17.5-18.5	9.5-11.5	15.5-17.5
					Fill/Native	Fill	Native	Native	Native	Fill	Native	Fill	Native	Native	Native	Fill	Native
					Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Pesticides																	
4,4'-DDD	72-54-8	0.0033	14	13	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDE	72-55-9	0.0033	17	8.9	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDT	50-29-3	0.0033	136	7.9	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aldrin	309-00-2	0.005	0.19	0.097	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Alpha BHC (Alpha Hexachlorocyclohexane)	319-84-6	0.02	0.02	0.48	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Alpha Chlordane	5103-71-9	0.094	2.9	4.2	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Alpha Endosulfan	959-98-8	2.4	102	24	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beta Bhc (Beta Hexachlorocyclohexane)	319-85-7	0.036	0.09	0.36	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beta Endosulfan	33213-65-9	2.4	102	24	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chlordane (alpha and gamma)	57-74-9	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Delta Bhc (Delta Hexachlorocyclohexane)	319-86-8	0.04	0.25	100	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dieldrin	60-57-1	0.005	0.1	0.2	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan Sulfate	1031-07-8	2.4	1000	24	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin	72-20-8	0.014	0.06	11	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin Aldehyde	7421-93-4	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin Ketone	53494-70-5	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gamma Bhc (Lindane)	58-89-9	0.1	0.1	1.3	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gamma-Chlordane	5566-34-7	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor	76-44-8	0.042	0.38	2.1	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor Epoxide	1024-57-3	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methoxychlor	72-43-5	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toxaphene	8001-35-2	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Herbicides																	
2,4,5-T (Trichlorophenoxyacetic Acid)	93-76-5	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-D (Dichlorophenoxyacetic Acid)	94-75-7	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silvex (2,4,5-Tp)	93-72-1	3.8	3.8	100	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Polychlorinated Biphenyl																	
PCB-1016 (Aroclor 1016)	12674-11-2	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.0185 U	<0.0187 U
PCB-1221 (Aroclor 1221)	11104-28-2	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.0185 U	<0.0187 U
PCB-1232 (Aroclor 1232)	11141-16-5	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.0185 U	<0.0187 U
PCB-1242 (Aroclor 1242)	53469-21-9	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.0185 U	<0.0187 U
PCB-1248 (Aroclor 1248)	12672-29-6	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.0185 U	<0.0187 U
PCB-1254 (Aroclor 1254)	11097-69-1	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.0185 U	<0.0187 U
PCB-1260 (Aroclor 1260)	11096-82-5	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.0185 U	<0.0187 U
Total PCBs	1336-36-3	0.1	3.2	1	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.0185 U	<0.0187 U
Metals																	
Aluminum	7429-90-5	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	7440-36-0	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	7440-38-2	13	16	16	mg/kg	5.81	<1.7 U	<1.74 U	<1.66 U	<1.65 U	<1.73 U	<1.81 U	<1.72 U	<1.69 U	<1.75 U	4.5	<1.7 U
Barium	7440-39-3	**350**	820	400	mg/kg	332	149	140	104	166	60.2	128	68.3	116	**451**	194	144
Beryllium	7440-41-7	7.2	47	72	mg/kg	<0.055 U	<0.057 U	<0.058 U	<0.055 U	<0.055 U	<0.058 U	<0.06 U	<0.057 U	<0.056 U	<0.058 U	<0.057 U	<0.057 U
Cadmium	7440-43-9	2.5	7.5	4.3	mg/kg	1.1	0.344	0.36	<0.332 U	0.462	<0.346 U	<0.362 U	<0.344 U	<0.337 U	0.78	0.42	0.383
Calcium	7440-70-2	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium, Hexavalent	18540-29-9	1	19	110	mg/kg	NA	NA	<0.579 U	NA	<0.551 U	NA	<0.603 U	NA	NA	NA	<0.569 U	NA
Chromium, Total	7440-47-3	**30**	NS	180	mg/kg	25.6	**36.5**	**41.4**	28.5	25.5	17.3	23.9	19.6	**50.7**	**140**	25.4	**41.2**
Cobalt	7440-48-4	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	7440-50-8	**50**	1720	270	mg/kg	**81.8**	42.7	47.6	25.2	**53.8**	20.3	25.6	22	38.4	**50.7**	48.5	48.1
Cyanide	57-12-5	27	40	27	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	7439-89-6	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	7439-92-1	**63**	450	400	mg/kg	**421**	9.17	8.9	6.92	**303**	32.6	33	6.64	32	18	**345**	13.2
Magnesium	7439-95-4	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	7439-96-5	1600	2000	2000	mg/kg	348	216	290	303	324	144	1,260	92.2	266	539	357	282
Mercury	7439-97-6	**0.18**	0.73	0.81	mg/kg	<0.0364 U	<0.0374 U	<0.0382 U	<0.0365 U	0.101	<0.0381 U	<0.0398 U	<0.0378 U	<0.0371 U	<0.0385 U	<0.0375 U	<0.0373 U
Nickel	7440-02-0	**30**	130	310	mg/kg	**35.2**	**39.8**	**55.8**	27	26.8	18.4	20.8	**44.4**	**44.4**	**65.1**	24.4	**47.3**
Potassium	7440-09-7	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	7782-49-2	3.9	4	180	mg/kg	<2.76 U	<2.93 U	<2.89 U	<2.76 U	<2.76 U	<2.89 U	<3.02 U	<2.87 U	<2.81 U	<2.93 U	<2.84 U	<2.93 U
Silver	7440-22-4	**2**	8.3	180	mg/kg	0.633	1.31	1.34	1.01	0.862	<0.577 U	0.757	<0.573 U	<0.562 U	**3.19**	0.825	0.928
Sodium	7440-23-5	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	7440-28-0	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	7440-62-2	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	7440-66-6	**109**	2480	10000	mg/kg	**383**	59.9	73.2	53.4	**287**	42.5	43.7	59.3	69.4	**136**	**156**	71.3
General Chemistry																	
Solids, Percent	SOLID	NS	NS	NS	Percent	90.7	88.3	86.4	90.5	90.8	86.6	82.9	87.2	88.9	85.6	87.9	88.4
Perfluorooctanoic acids																	
N-ethyl perfluorooctane- sulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-methyl perfluorooctane- sulfonamidoacetic Acid (NMeFOSAA)	2355-31-9	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorobutanoic acid (PFBA)	375-22-4	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorodecanoic Acid (PFDA)	335-76-2	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorododecanoic Acid (PFDoA)	307-55-1	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluoroheptanoic acid (PFHpA)	375-85-9	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorohexanoic Acid (PFHxA)	307-24-4	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorononanoic Acid (PFNA)	375-95-1	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorooctanesulfonamide (FOSA)	754-91-6	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	0.00088	0.0037	0.044	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorooctanoic Acid (PFOA)	335-67-1	0.00066	0.0011	0.033	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluoropentanoic Acid (PFPeA)	2706-90-3	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorotetradecanoic Acid (PFTA)	376-06-7	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium 1H,1H,2H,2H-Perfluorodecane Sulfonate (8:2) (8:2FTS)	39108-34-4	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium 1H,1H,2H,2H-Perfluorooctane Sulfonate (6:2) (6:2FTS)	27619-97-2	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 1
Phase II Environmental Site Investigation Report
Soil Sample Analytical Results

1487 First Avenue
New York City, New York
Langan Project No.: 100963701

Analyte	CAS Number	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Protection of Groundwater SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	Location	LB-07	LB-07	LB-08	LB-08	LB-08	LSB-9	LSB-9	LSB-10	LSB-10	LSB-10	LSB-11	LSB-11	LSB-12	LSB-12	LSB-13	LSB-14	LSB-15	LSB-15
					Sample Name	015_LB-07_0-2_20211110	014_LB-07_5-7_20211110	001_LB-08_0-2	002_LB-08_7.5-9.5	003_DUP-1	037_LSB-9_0-2	038_LSB-9_4-6	039_LSB-10_0-2	040_DUP-1	041_LSB-10_4-6	042_LSB-11_0-2	043_LSB-11_2-4	046_LSB-12_15-17	047_LSB-12_18-20	055_LSB-13_15-17	056_LSB-14_15-17	058_LSB-15_15-17	057_DUP_4
					Sample Date	11/10/2021	11/10/2021	11/09/2021	11/09/2021	11/09/2021	01/25/2022	01/25/2022	01/25/2022	01/25/2022	01/25/2022	01/25/2022	01/25/2022	01/26/2022	01/26/2022	01/28/2022	02/01/2022	02/01/2022	02/01/2022
					Sample Depth (fbfbs)	0-2	5-7	0-2	7.5-9.5	7.5-9.5	0-2	4-6	0-2	0-2	4-6	0-2	2-4	7-9	10-12	11-13	9-11	9-11	9-11
					Sample Depth (fbsl)	9.5-11.5	14.5-16.5	9.5-11.5	17-19	17-19	8-10	12-14	8-10	8-10	12-14	8-10	10-12	15-17	18-20	15-17	15-17	15-17	15-17
					Fill/Native	Fill	Native	Fill	Native	Native	Fill	Native	Native	Native	Native	Fill	Native	Native	Native	Native	Native	Native	Native
					Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Volatile Organic Compounds																							
1,1,1,2-Tetrachloroethane	630-20-6	NS	NS	NS	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
1,1,1-Trichloroethane	71-55-6	0.68	0.68	100	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
1,1,2,2-Tetrachloroethane	79-34-5	NS	NS	NS	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	NS	NS	NS	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
1,1,2-Trichloroethane	79-00-5	NS	NS	NS	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
1,1-Dichloroethane	75-34-3	0.27	0.27	26	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
1,1-Dichloroethene	75-35-4	0.33	0.33	100	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
1,1-Dichloropropene	563-58-6	NS	NS	NS	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
1,2,3-Trichlorobenzene	87-61-6	NS	NS	NS	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
1,2,3-Trichloropropane	96-18-4	NS	NS	NS	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
1,2,4-Trichlorobenzene	120-82-1	NS	NS	NS	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
1,2,4-Trimethylbenzene	95-63-6	3.6	3.6	52	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
1,2-Dibromo-3-Chloropropane	96-12-8	NS	NS	NS	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
1,2-Dibromoethane (Ethylene Dibromide)	106-93-4	NS	NS	NS	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
1,2-Dichlorobenzene	95-50-1	1.1	1.1	100	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
1,2-Dichloroethane	107-06-2	0.02	0.02	3.1	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
1,2-Dichloropropane	78-87-5	NS	NS	NS	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
1,3,5-Trimethylbenzene (Mesitylene)	108-67-8	8.4	8.4	52	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
1,3-Dichlorobenzene	541-73-1	2.4	2.4	49	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
1,3-Dichloropropane	142-28-9	NS	NS	NS	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
1,4-Dichlorobenzene	106-46-7	1.8	1.8	13	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
1,4-Dioxane (P-Dioxane)	123-91-1	0.1	0.1	13	mg/kg	<0.04 U	<0.047 U	<0.058 U	<0.045 U	<0.046 U	<0.048 U	<0.043 U	<0.043 U	<0.048 U	<0.04 U	<0.038 U	<0.047 U	<0.053 U	<0.048 U	<0.044 U	<0.04 U	<0.039 U	<0.04 U
2,2-Dichloropropane	594-20-7	NS	NS	NS	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
2-Chlorotoluene	95-49-8	NS	NS	NS	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
2-Hexanone (MBK)	591-78-6	NS	NS	NS	mg/kg	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0023 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U	
4-Chlorotoluene	106-43-4	NS	NS	NS	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
Acetone	67-64-1	**0.05**	0.05	100	mg/kg	<0.004 U	<0.0047 U	<0.0058 U	<0.0045 U	<0.0046 U	<0.0048 U	<0.0043 U	0.0083 J	0.011	0.0042 J	<0.0038 U	**0.085**	0.0055 J	0.025	<0.0044 U	0.005 J	0.0094	0.0088
Acrolein	107-02-8	NS	NS	NS	mg/kg	<0.004 U	<0.0047 U	<0.0058 U	<0.0045 U	<0.0046 U	<0.0048 U	<0.0043 U	<0.0043 U	<0.0048 U	<0.004 U	<0.0038 U	<0.0047 U	<0.0053 U	<0.0048 U	<0.0044 U	<0.004 U	<0.0039 U	<0.004 U
Acrylonitrile	107-13-1	NS	NS	NS	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
Benzene	71-43-2	0.06	0.06	4.8	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
Bromobenzene	108-86-1	NS	NS	NS	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
Bromochloromethane	74-97-5	NS	NS	NS	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
Bromodichloromethane	75-27-4	NS	NS	NS	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
Bromoform	75-25-2	NS	NS	NS	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
Bromomethane	74-83-9	NS	NS	NS	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
Carbon Disulfide	75-15-0	NS	NS	NS	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
Carbon Tetrachloride	56-23-5	0.76	0.76	2.4	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
Chlorobenzene	108-90-7	1.1	1.1	100	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
Chloroethane	75-00-3	NS	NS	NS	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
Chloroform	67-66-3	0.37	0.37	49	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
Chloromethane	74-87-3	NS	NS	NS	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
Cis-1,2-Dichloroethene	156-59-2	0.25	0.25	100	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
Cis-1,3-Dichloropropene	10061-01-5	NS	NS	NS	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
Cyclohexane	110-82-7	NS	NS	NS	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
Dibromochloromethane	124-48-1	NS	NS	NS	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
Dibromomethane	74-95-3	NS	NS	NS	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
Dichlorodifluoromethane	75-71-8	NS	NS	NS	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
Ethylbenzene	100-41-4	1	1	41	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
Hexachlorobutadiene	87-68-3	NS	NS	NS	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
Isopropylbenzene (Cumene)	98-82-8	NS	NS	NS	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
M,P-Xylene	179601-23-1	NS	NS	NS	mg/kg	<0.004 U	<0.0047 U	<0.0058 U	<0.0045 U	<0.0046 U	<0.0048 U	<0.0043 U	<0.0043 U	<0.0048 U	<0.004 U	<0.0038 U	<0.0047 U	<0.0053 U	<0.0048 U	<0.0044 U	<0.004 U	<0.0039 U	<0.004 U
Methyl Acetate	79-20-9	NS	NS	NS	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
Methyl Ethyl Ketone (2-Butanone)	78-93-3	0.12	0.12	100	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	108-10-1	NS	NS	NS	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
Methylcyclohexane	108-87-2	NS	NS	NS	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
Methylene Chloride	75-09-2	0.05	0.05	100	mg/kg	0.0084	0.015	0.014	0.013	0.012	0.0085 J	0.0044 J	<0.0043 U	<0.0048 U	0.0057 J	0.005 J	0.0047 J	0.046	0.0068 J	<0.0044 U	<0.004 U	<0.0039 U	0.0056 J
n-Butylbenzene	104-51-8	12	12	100	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
n-Propylbenzene	103-65-1	3.9	3.9	100	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
o-Xylene (1,2-Dimethylbenzene)	95-47-6	NS	NS	NS	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
p-Cymene (p-Isopropyltoluene)	CYMP	NS	NS	NS	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
Sec-Butylbenzene	135-98-8	11	11	100	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
Styrene	100-42-5	NS	NS	NS	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
T-Butylbenzene	98-06-6	5.9	5.9	100	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
Tert-Butyl Alcohol	75-65-0	NS	NS	NS	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
Tert-Butyl Methyl Ether	1634-04-4	0.93	0.93	100	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
Tetrachloroethene (PCE)	127-18-4	**1.3**	1.3	19	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	0.035	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
Toluene	108-88-3	0.7	0.7	100	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
Total Xylenes	1330-20-7	0.26	1.6	100	mg/kg	<0.0059 U	<0.007 U	<0.0087 U	<0.0068 U	<0.007 U	<0.0073 U	<0.0064 U	<0.0065 U	<0.0071 U	<0.006 U	<0.0056 U	<0.007 U	<0.008 U	<0.0071 U	<0.0067 U	<0.006 U	<0.0058 U	<0.0061 U
Trans-1,2-Dichloroethene	156-60-5	0.19	0.19	100	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
Trans-1,3-Dichloropropene	10061-02-6	NS	NS	NS	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
Trichloroethene (TCE)	79-01-6	0.47	0.47	21	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	0.0067	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
Trichlorofluoromethane	75-69-4	NS	NS	NS	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
Vinyl Acetate	108-05-4	NS	NS	NS	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U
Vinyl Chloride	75-01-4	0.02	0.02	0.9	mg/kg	<0.002 U	<0.0023 U	<0.0029 U	<0.0023 U	<0.0023 U	<0.0024 U	<0.0021 U	<0.0022 U	<0.0024 U	<0.002 U	<0.0019 U	<0.0023 U	<0.0027 U	<0.0024 U	<0.0022 U	<0.002 U	<0.0019 U	<0.002 U

Table 1
Phase II Environmental Site Investigation Report
Soil Sample Analytical Results

1487 First Avenue
New York City, New York
Langan Project No.: 100963701

Analyte	CAS Number	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Protection of Groundwater SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	Location	LB-07	LB-07	LB-08	LB-08	LB-08	LSB-9	LSB-9	LSB-10	LSB-10	LSB-10	LSB-11	LSB-11	LSB-12	LSB-12	LSB-13	LSB-14	LSB-15	LSB-15
					Sample Name	015_LB-07_0-2_20211110	014_LB-07_5-7_20211110	001_LB-08_0-2	002_LB-08_7.5-9.5	003_DUP-1	037_LSB-9_0-2	038_LSB-9_4-6	039_LSB-10_0-2	040_DUP-1	041_LSB-10_4-6	042_LSB-11_0-2	043_LSB-11_2-4	046_LSB-12_15-17	047_LSB-12_18-20	055_LSB-13_15-17	056_LSB-14_15-17	058_LSB-15_15-17	057_DUP_4
					Sample Date	11/10/2021	11/10/2021	11/09/2021	11/09/2021	11/09/2021	01/25/2022	01/25/2022	01/25/2022	01/25/2022	01/25/2022	01/25/2022	01/25/2022	01/26/2022	01/26/2022	01/28/2022	02/01/2022	02/01/2022	02/01/2022
					Sample Depth (fbfbs)	0-2	5-7	0-2	7.5-9.5	7.5-9.5	0-2	4-6	0-2	0-2	4-6	0-2	2-4	7-9	10-12	11-13	9-11	9-11	9-11
					Sample Depth (fbsl)	9.5-11.5	14.5-16.5	9.5-11.5	17-19	17-19	8-10	12-14	8-10	8-10	12-14	8-10	10-12	15-17	18-20	15-17	15-17	15-17	15-17
					Fill/Native	Fill	Native	Fill	Native	Native	Fill	Native	Native	Native	Native	Fill	Native	Native	Native	Native	Native	Native	Native
					Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Semi-Volatile Organic Compounds																							
1,2,4,5-Tetrachlorobenzene	95-94-3	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	<0.105 U	<0.095 U	<0.0973 U	<0.101 U	<0.0933 U	<0.0948 U	<0.103 U	<0.0928 U	<0.0997 U	<0.0946 U	<0.094 U	<0.0977 U	<0.0969 U
1,2,4-Trichlorobenzene	120-82-1	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	<0.0465 U	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
1,2-Dichlorobenzene	95-50-1	1.1	1.1	100	mg/kg	NA	NA	NA	NA	NA	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	<0.0465 U	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
1,2-Diphenylhydrazine	122-66-7	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	<0.0465 U	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
1,3-Dichlorobenzene	541-73-1	2.4	2.4	49	mg/kg	NA	NA	NA	NA	NA	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	<0.0465 U	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
1,4-Dichlorobenzene	106-46-7	1.8	1.8	13	mg/kg	NA	NA	NA	NA	NA	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	<0.0465 U	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
1,4-Dioxane (P-Dioxane)	123-91-1	0.1	0.1	13	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.0196 U	<0.019 U	<0.0198 U	<0.0192 U	<0.0192 U	<0.0192 U
2,3,4,6-Tetrachlorophenol	58-90-2	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	<0.105 U	<0.095 U	<0.0973 U	<0.101 U	<0.0933 U	<0.0948 U	<0.103 U	<0.0928 U	<0.0997 U	<0.0946 U	<0.094 U	<0.0977 U	<0.0969 U
2,4,5-Trichlorophenol	95-95-4	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	<0.0465 U	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
2,4,6-Trichlorophenol	88-06-2	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	<0.0465 U	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
2,4-Dichlorophenol	120-83-2	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	<0.0465 U	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
2,4-Dimethylphenol	105-67-9	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	<0.0465 U	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
2,4-Dinitrophenol	51-28-5	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	<0.105 U	<0.095 U	<0.0973 U	<0.101 U	<0.0933 U	<0.0948 U	<0.103 U	<0.0928 U	<0.0997 U	<0.0946 U	<0.094 U	<0.0977 U	<0.0969 U
2,4-Dinitrotoluene	121-14-2	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	<0.0465 U	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
2,6-Dinitrotoluene	606-20-2	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	<0.0465 U	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
2-Chloronaphthalene	91-58-7	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	<0.0465 U	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
2-Chlorophenol	95-57-8	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	<0.0465 U	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
2-Methylnaphthalene	91-57-6	NS	NS	NS	mg/kg	<0.0473 U	<0.045 U	<0.0457 U	<0.0472 U	<0.048 U	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	<0.0465 U	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
2-Methylphenol (o-Cresol)	95-48-7	0.33	0.33	100	mg/kg	NA	NA	NA	NA	NA	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	<0.0465 U	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
2-Nitroaniline	88-74-4	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	<0.105 U	<0.095 U	<0.0973 U	<0.101 U	<0.0933 U	<0.0948 U	<0.103 U	<0.0928 U	<0.0997 U	<0.0946 U	<0.094 U	<0.0977 U	<0.0969 U
2-Nitrophenol	88-75-5	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	<0.0465 U	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
3 & 4 Methylphenol (m&p Cresol)	65794-96-9	0.33	0.33	100	mg/kg	NA	NA	NA	NA	NA	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	<0.0465 U	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
3,3'-Dichlorobenzidine	91-94-1	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	<0.0465 U	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
3-Nitroaniline	99-09-2	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	<0.105 U	<0.095 U	<0.0973 U	<0.101 U	<0.0933 U	<0.0948 U	<0.103 U	<0.0928 U	<0.0997 U	<0.0946 U	<0.094 U	<0.0977 U	<0.0969 U
4,6-Dinitro-2-Methylphenol	534-52-1	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	<0.105 U	<0.095 U	<0.0973 U	<0.101 U	<0.0933 U	<0.0948 U	<0.103 U	<0.0928 U	<0.0997 U	<0.0946 U	<0.094 U	<0.0977 U	<0.0969 U
4-Bromophenyl Phenyl Ether	101-55-3	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	<0.0465 U	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
4-Chloro-3-Methylphenol	59-50-7	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	<0.0465 U	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
4-Chloroaniline	106-47-8	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	<0.0465 U	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
4-Chlorophenyl Phenyl Ether	7005-72-3	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	<0.0465 U	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
4-Nitroaniline	100-01-6	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	<0.105 U	<0.095 U	<0.0973 U	<0.101 U	<0.0933 U	<0.0948 U	<0.103 U	<0.0928 U	<0.0997 U	<0.0946 U	<0.094 U	<0.0977 U	<0.0969 U
4-Nitrophenol	100-02-7	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	<0.105 U	<0.095 U	<0.0973 U	<0.101 U	<0.0933 U	<0.0948 U	<0.103 U	<0.0928 U	<0.0997 U	<0.0946 U	<0.094 U	<0.0977 U	<0.0969 U
Acenaphthene	83-32-9	20	98	100	mg/kg	<0.0473 U	<0.045 U	<0.0457 U	<0.0472 U	<0.048 U	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	<0.0465 U	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
Acenaphthylene	208-96-8	100	107	100	mg/kg	<0.0473 U	<0.045 U	<0.0457 U	<0.0472 U	<0.048 U	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	<0.0465 U	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
Acetophenone	98-86-2	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	<0.0465 U	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
Aniline (Phenylamine, Aminobenzene)	62-53-3	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	<0.21 U	<0.19 U	<0.195 U	<0.203 U	<0.187 U	<0.19 U	<0.206 U	<0.186 U	<0.2 U	<0.189 U	<0.188 U	<0.196 U	<0.194 U
Anthracene	120-12-7	100	1000	100	mg/kg	<0.0473 U	<0.045 U	<0.0457 U	<0.0472 U	<0.048 U	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	<0.0465 U	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
Atrazine	1912-24-9	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	<0.0465 U	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
Benzaldehyde	100-52-7	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	<0.0465 U	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
Benzidine	92-87-5	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	<0.21 U	<0.19 U	<0.195 U	<0.203 U	<0.187 U	<0.19 U	<0.206 U	<0.186 U	<0.2 U	<0.189 U	<0.188 U	<0.196 U	<0.194 U
Benzo(a)anthracene	56-55-3	1	1	1	mg/kg	<0.0473 U	<0.045 U	<0.0457 U	<0.0472 U	<0.048 U	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	<0.0465 U	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
Benzo(a)pyrene	50-32-8	1	22	1	mg/kg	<0.0473 U	<0.045 U	<0.0457 U	<0.0472 U	<0.048 U	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	<0.0465 U	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
Benzo(b)fluoranthene	205-99-2	1	1.7	1	mg/kg	<0.0473 U	<0.045 U	<0.0457 U	<0.0472 U	<0.048 U	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	<0.0465 U	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
Benzo(g,h,i)Perylene	191-24-2	100	1000	100	mg/kg	<0.0473 U	<0.045 U	<0.0457 U	<0.0472 U	<0.048 U	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	<0.0465 U	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
Benzo(k)fluoranthene	207-08-9	0.8	1.7	3.9	mg/kg	<0.0473 U	<0.045 U	<0.0457 U	<0.0472 U	<0.048 U	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	<0.0465 U	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
Benzoic Acid	65-85-0	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	<0.0465 U	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
Benzyl Alcohol	100-51-6	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	<0.0465 U	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
Benzyl Butyl Phthalate	85-68-7	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	<0.0465 U	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
Biphenyl (Diphenyl)	92-52-4	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	<0.0465 U	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
Bis(2-chloroethoxy) methane	111-91-1	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	<0.0465 U	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
Bis(2-chloroethyl) ether (2-chloroethyl ether)	111-44-4	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	<0.0465 U	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
Bis(2-chloroisopropyl) ether	108-60-1	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	<0.0465 U	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
Bis(2-ethylhexyl) phthalate	117-81-7	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	0.24 D	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
Caprolactam	105-60-2	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	<0.105 U	<0.095 U	<0.0973 U	<0.101 U	<0.0933 U	<0.0948 U	<0.103 U	<0.0928 U	<0.0997 U	<0.0946 U	<0.094 U	<0.0977 U	<0.0969 U
Carbazole	86-74-8	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	<0.0465 U	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
Chrysene	218-01-9	1	1	3.9	mg/kg	<0.0473 U	<0.045 U	<0.0457 U	<0.0472 U	<0.048 U	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	<0.0465 U	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
Dibenz(a,h)anthracene	53-70-3	0.33	1000	0.33	mg/kg	<0.0473 U	<0.045 U	<0.0457 U	<0.0472 U	<0.048 U	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	<0.0465 U	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
Dibenzofuran	132-64-9	7	210	59	mg/kg	NA	NA	NA	NA	NA	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	<0.0465 U	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
Dibutyl phthalate	84-74-2	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	<0.0465 U	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
Diethyl phthalate	84-66-2	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	<0.0465 U	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
Dimethyl phthalate	131-11-3	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	<0.0465 U	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
Dioctyl phthalate	117-84-0	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	<0.0465 U	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
Fluoranthene	206-44-0	100	1000	100	mg/kg	<0.0473 U	<0.045 U	<0.0457 U	<0.0472 U	<0.048 U	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	<0.0465 U	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
Fluorene	86-73-7	30	386	100	mg/kg	<0.0473 U	<0.045 U	<0.0457 U	<0.0472 U	<0.048 U	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	<0.0465 U	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
Hexachlorobenzene	118-74-1	0.33	3.2	1.2	mg/kg	NA	NA	NA	NA	NA	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	<0.0465 U	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
Hexachlorobutadiene	87-68-3	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	<0.0465 U	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
Hexachlorocyclopentadiene	77-47-4	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	<0.0465 U	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
Hexachloroethane	67-72-1	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	<0.0465 U	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
Indeno(1,2,3-cd)pyrene	193-39-5	0.5	8.2	0.5	mg/kg	<0.0473 U	<0.045 U	<0.0457 U	<0.0472 U	<0.048 U	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	<0.0465 U	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
Isophorone	78-59-1	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	<0.0465 U	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
Naphthalene	91-20-3	12	12	100	mg/kg	<0.0473 U	<0.045 U	<0.0457 U	<0.0472 U	<0.048 U	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	<0.0465 U	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
Nitrobenzene	98-95-3	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	<0.0465 U	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
n-Nitrosodimethylamine	62-75-9	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	<0.0465 U	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
n-Nitrosodi-N-Propylamine	621-64-7	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	<0.0465 U	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
n-Nitrosodiphenylamine	86-30-6	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	<0.0465 U	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
Pentachlorophenol	87-86-5	0.8	0.8	6.7	mg/kg	NA	NA	NA	NA	NA	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	<0.0465 U	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
Phenanthrene	85-01-8	100	1000	100	mg/kg	<0.0473 U	<0.045 U	<0.0457 U	<0.0472 U	<0.048 U	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	<0.0465 U	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
Phenol	108-95-2	0.33	0.33	100	mg/kg	NA	NA	NA	NA	NA	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	<0.0465 U	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
Pyrene	129-00-0	100	1000	100	mg/kg	<0.0473 U	<0.045 U	<0.0457 U	<0.0472 U	<0.048 U	<0.0524 U	<0.0476 U	<0.0488 U	<0.0508 U	<0.0467 U	<0.0475 U	<0.0516 U	<0.0465 U	<0.05 U	<0.0474 U	<0.0471 U	<0.049 U	<0.0486 U
Pyridine	110-86-1	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	<0.21 U	<0.19 U	<0.195 U	<0.203 U	<0.187 U	<0.19 U	<0.206 U	<0.186 U	<0.2 U	<0.189 U	<0.188 U	<0.196 U	<0.194 U

Table 1
Phase II Environmental Site Investigation Report
Soil Sample Analytical Results

1487 First Avenue
New York City, New York
Langan Project No.: 100963701

Analyte	CAS Number	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Protection of Groundwater SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	Location	LB-07	LB-07	LB-08	LB-08	LB-08	LSB-9	LSB-9	LSB-10	LSB-10	LSB-10	LSB-11	LSB-11	LSB-12	LSB-12	LSB-13	LSB-14	LSB-15	LSB-15
					Sample Name	015_LB-07_0-2_20211110	014_LB-07_5-7_20211110	001_LB-08_0-2	002_LB-08_7.5-9.5	003_DUP-1	037_LSB-9_0-2	038_LSB-9_4-6	039_LSB-10_0-2	040_DUP-1	041_LSB-10_4-6	042_LSB-11_0-2	043_LSB-11_2-4	046_LSB-12_15-17	047_LSB-12_18-20	055_LSB-13_15-17	056_LSB-14_15-17	058_LSB-15_15-17	057_DUP_4
					Sample Date	11/10/2021	11/10/2021	11/09/2021	11/09/2021	11/09/2021	01/25/2022	01/25/2022	01/25/2022	01/25/2022	01/25/2022	01/25/2022	01/25/2022	01/26/2022	01/26/2022	01/28/2022	02/01/2022	02/01/2022	02/01/2022
					Sample Depth (fbfbs)	0-2	5-7	0-2	7.5-9.5	7.5-9.5	0-2	4-6	0-2	0-2	4-6	0-2	2-4	7-9	10-12	11-13	9-11	9-11	9-11
					Sample Depth (fbsl)	9.5-11.5	14.5-16.5	9.5-11.5	17-19	17-19	8-10	12-14	8-10	8-10	12-14	8-10	10-12	15-17	18-20	15-17	15-17	15-17	15-17
					Fill/Native	Fill	Native	Fill	Native	Native	Fill	Native	Native	Native	Native	Fill	Native	Native	Native	Native	Native	Native	Native
					Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Pesticides																							
4,4'-DDD	72-54-8	0.0033	14	13	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.00184 U	<0.00195 U	<0.00189 U	<0.00188 U	<0.00192 U	<0.0019 U
4,4'-DDE	72-55-9	0.0033	17	8.9	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.00184 U	<0.00195 U	<0.00189 U	<0.00188 U	<0.00192 U	<0.0019 U
4,4'-DDT	50-29-3	0.0033	136	7.9	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.00184 U	<0.00195 U	<0.00189 U	<0.00188 U	<0.00192 U	<0.0019 U
Aldrin	309-00-2	0.005	0.19	0.097	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.00184 U	<0.00195 U	<0.00189 U	<0.00188 U	<0.00192 U	<0.0019 U
Alpha BHC (Alpha Hexachlorocyclohexane)	319-84-6	0.02	0.02	0.48	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.00184 U	<0.00195 U	<0.00189 U	<0.00188 U	<0.00192 U	<0.0019 U
Alpha Chlordane	5103-71-9	0.094	2.9	4.2	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.00184 U	<0.00195 U	<0.00189 U	<0.00188 U	<0.00192 U	<0.0019 U
Alpha Endosulfan	959-98-8	2.4	102	24	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.00184 U	<0.00195 U	<0.00189 U	<0.00188 U	<0.00192 U	<0.0019 U
Beta Bhc (Beta Hexachlorocyclohexane)	319-85-7	0.036	0.09	0.36	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.00184 U	<0.00195 U	<0.00189 U	<0.00188 U	<0.00192 U	<0.0019 U
Beta Endosulfan	33213-65-9	2.4	102	24	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.00184 U	<0.00195 U	<0.00189 U	<0.00188 U	<0.00192 U	<0.0019 U
Chlordane (alpha and gamma)	57-74-9	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.0369 U	<0.0389 U	<0.0378 U	<0.0376 U	<0.0384 U	<0.0381 U
Delta Bhc (Delta Hexachlorocyclohexane)	319-86-8	0.04	0.25	100	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.00184 U	<0.00195 U	<0.00189 U	<0.00188 U	<0.00192 U	<0.0019 U
Dieldrin	60-57-1	0.005	0.1	0.2	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.00184 U	<0.00195 U	<0.00189 U	<0.00188 U	<0.00192 U	<0.0019 U
Endosulfan Sulfate	1031-07-8	2.4	1000	24	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.00184 U	<0.00195 U	<0.00189 U	<0.00188 U	<0.00192 U	<0.0019 U
Endrin	72-20-8	0.014	0.06	11	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.00184 U	<0.00195 U	<0.00189 U	<0.00188 U	<0.00192 U	<0.0019 U
Endrin Aldehyde	7421-93-4	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.00184 U	<0.00195 U	<0.00189 U	<0.00188 U	<0.00192 U	<0.0019 U
Endrin Ketone	53494-70-5	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.00184 U	<0.00195 U	<0.00189 U	<0.00188 U	<0.00192 U	<0.0019 U
Gamma Bhc (Lindane)	58-89-9	0.1	0.1	1.3	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.00184 U	<0.00195 U	<0.00189 U	<0.00188 U	<0.00192 U	<0.0019 U
Gamma-Chlordane	5566-34-7	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.00184 U	<0.00195 U	<0.00189 U	<0.00188 U	<0.00192 U	<0.0019 U
Heptachlor	76-44-8	0.042	0.38	2.1	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.00184 U	<0.00195 U	<0.00189 U	<0.00188 U	<0.00192 U	<0.0019 U
Heptachlor Epoxide	1024-57-3	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.00184 U	<0.00195 U	<0.00189 U	<0.00188 U	<0.00192 U	<0.0019 U
Methoxychlor	72-43-5	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.00184 U	<0.00195 U	<0.00189 U	<0.00188 U	<0.00192 U	<0.0019 U
Toxaphene	8001-35-2	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.184 U	<0.195 U	<0.189 U	<0.188 U	<0.192 U	<0.19 U
Herbicides																							
2,4,5-T (Trichlorophenoxyacetic Acid)	93-76-5	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.022 U	<0.0235 U	<0.0228 U	<0.0229 U	<0.0233 U	<0.0231 U
2,4-D (Dichlorophenoxyacetic Acid)	94-75-7	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.022 U	<0.0235 U	<0.0228 U	<0.0229 U	<0.0233 U	<0.0231 U
Silvex (2,4,5-Tp)	93-72-1	3.8	3.8	100	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.022 U	<0.0235 U	<0.0228 U	<0.0229 U	<0.0233 U	<0.0231 U
Polychlorinated Biphenyl																							
PCB-1016 (Aroclor 1016)	12674-11-2	NS	NS	NS	mg/kg	<0.0189 U	<0.018 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.0186 U	<0.0197 U	<0.0191 U	<0.019 U	<0.0194 U	<0.0192 U
PCB-1221 (Aroclor 1221)	11104-28-2	NS	NS	NS	mg/kg	<0.0189 U	<0.018 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.0186 U	<0.0197 U	<0.0191 U	<0.019 U	<0.0194 U	<0.0192 U
PCB-1232 (Aroclor 1232)	11141-16-5	NS	NS	NS	mg/kg	<0.0189 U	<0.018 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.0186 U	<0.0197 U	<0.0191 U	<0.019 U	<0.0194 U	<0.0192 U
PCB-1242 (Aroclor 1242)	53469-21-9	NS	NS	NS	mg/kg	<0.0189 U	<0.018 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.0186 U	<0.0197 U	<0.0191 U	<0.019 U	<0.0194 U	<0.0192 U
PCB-1248 (Aroclor 1248)	12672-29-6	NS	NS	NS	mg/kg	<0.0189 U	<0.018 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.0186 U	<0.0197 U	<0.0191 U	<0.019 U	<0.0194 U	<0.0192 U
PCB-1254 (Aroclor 1254)	11097-69-1	NS	NS	NS	mg/kg	<0.0189 U	<0.018 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.0186 U	<0.0197 U	<0.0191 U	<0.019 U	<0.0194 U	<0.0192 U
PCB-1260 (Aroclor 1260)	11096-82-5	NS	NS	NS	mg/kg	<0.0189 U	<0.018 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.0186 U	<0.0197 U	<0.0191 U	<0.019 U	<0.0194 U	<0.0192 U
Total PCBs	1336-36-3	0.1	3.2	1	mg/kg	<0.0189 U	<0.018 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.0186 U	<0.0197 U	<0.0191 U	<0.019 U	<0.0194 U	<0.0192 U
Metals																							
Aluminum	7429-90-5	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	21,900	9,880	13,700	10,700	7,800	10,600	15,400	13,300	8,040	31,200 B	15,000	11,500	9,590
Antimony	7440-36-0	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	5.65	3.33	<2.92 U	<3.07 U	<2.81 U	<2.86 U	3.34	4.6	<3.02 U	11.6	6.86	3.95	3.26
Arsenic	7440-38-2	13	16	16	mg/kg	6.28	<1.64 U	5.01	<1.72 U	<1.74 U	<1.89 U	<1.71 U	2.23	2.45	<1.68 U	<1.72 U	1.98	<1.7 U	4.42	<1.72 U	<1.72 U	<1.77 U	<1.76 U
Barium	7440-39-3	**350**	820	400	mg/kg	145	46.3	228	111	116	161	89.5	68.8	82.9	50.3	50.3	48.9	132	93	333	131	91.6	70.9
Beryllium	7440-41-7	7.2	47	72	mg/kg	<0.058 U	<0.055 U	<0.055 U	<0.057 U	<0.058 U	<0.063 U	<0.057 U	<0.059 U	<0.061 U	<0.056 U	<0.057 U	<0.062 U	<0.057 U	<0.06 U	<0.057 U	<0.057 U	<0.059 U	<0.059 U
Cadmium	7440-43-9	2.5	7.5	4.3	mg/kg	0.817	<0.329 U	0.552	<0.343 U	<0.348 U	<0.378 U	<0.343 U	<0.351 U	<0.368 U	<0.337 U	<0.343 U	<0.373 U	<0.34 U	<0.362 U	<0.345 U	0.395	<0.355 U	<0.352 U
Calcium	7440-70-2	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	1,200	1,740	5,260	10,700	1,230	1,610	1,810	14,300 B	49,500 B	2,700 B	2,430 B	1,950 B	2,270 B
Chromium, Hexavalent	18540-29-9	1	19	110	mg/kg	NA	NA	<0.552 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.77	<0.604 U	<0.575 U	<0.575 U	<0.591 U	<0.587 U
Chromium, Total	7440-47-3	**30**	NS	180	mg/kg	**34.5**	19	21.2	**32.8**	**34**	**35.2**	24.3	17.9	14.7	17.3	21.9	20	**39**	20.6	**78.5**	**42.2**	26.4	25.7
Cobalt	7440-48-4	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	18.6	12.6	4.81	4.83	9.79	8.21	4.55	10.5	7.91	22.5	15.8	12.2	8.29
Copper	7440-50-8	**50**	1720	270	mg/kg	25.5	11.8	29.4	29.8	28.2	38.5	27.7	13	12.2	28	20.8	17.3	33.9	20	42.6	35.6	24	19.7
Cyanide	57-12-5	27	40	27	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.566 U	<0.604 U	<0.575 U	<0.575 U	<0.591 U	<0.587 U
Iron	7439-89-6	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	28,600	20,600	13,400	12,500	18,700	13,800	25,400	21,900	13,400	37,000	29,600	21,500	21,000
Lead	7439-92-1	**63**	450	400	mg/kg	**206**	3.67	**474**	8.78	8.43	15.3	7.3	37	41.4	7.33	9.54	8.44	17.4	25.9	43.8	10.1	8.21	9.46
Magnesium	7439-95-4	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	5,410	4,150	1,510	1,890	2,090	2,470	2,180	7,110	8,730	13,500 B	7,420 B	4,200 B	3,120 B
Manganese	7439-96-5	1600	2000	2000	mg/kg	1,410	96.8	406	207	205	881	192	113	171	302	300	56.5	230	275	395	249	152	114
Mercury	7439-97-6	**0.18**	0.73	0.81	mg/kg	<0.0381 U	<0.0361 U	<0.0364 U	<0.0377 U	<0.0383 U	<0.0378 U	<0.0343 U	<0.0351 U	**0.269**	<0.0337 U	<0.0343 U	0.0932	<0.034 U	<0.0362 U	<0.0345 U	<0.0345 U	<0.0355 U	<0.0352 U
Nickel	7440-02-0	**30**	130	310	mg/kg	26.8	13.1	20.2	**32.6**	**35.3**	**36.2**	**34.8**	12.1	11.1	25.3	20.7	16.6	27.8	16.8	**43.8**	**36.7**	29	25.7
Potassium	7440-09-7	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	4,320 B	3,410 B	1,010 B	1,040 B	1,380 B	1,780 B	1,050 B	5,070 B	2,500 B	15,700	6,630 B	3,740 B	2,660 B
Selenium	7782-49-2	3.9	4	180	mg/kg	<2.89 U	<2.74 U	<2.76 U	<2.86 U	<2.9 U	<3.15 U	<2.86 U	<2.93 U	<3.07 U	<2.81 U	<2.86 U	<3.11 U	<2.83 U	<3.02 U	<2.87 U	<2.87 U	<2.96 U	<2.93 U
Silver	7440-22-4	**2**	8.3	180	mg/kg	<0.577 U	<0.548 U	0.617	1.2	1.08	0.944	<0.571 U	<0.586 U	<0.614 U	<0.561 U	<0.572 U	<0.621 U	1.33	1.05	**4.57**	1.79	1	0.904
Sodium	7440-23-5	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	253	127	109	134	67.7	63.1	74.3	186	192	341	321 B	148 B	124 B
Thallium	7440-28-0	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	<3.15 U	<2.86 U	<2.93 U	<3.07 U	<2.81 U	<2.86 U	<3.11 U	<2.83 U	<3.02 U	<2.87 U	<2.87 U	<2.96 U	<2.93 U
Vanadium	7440-62-2	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	48.4	28	34.4	22.5	22.8	28.1	29.3	52.4	37.4	77.3	51.9	38.8	29.6
Zinc	7440-66-6	**109**	2480	10000	mg/kg	**366**	29.8	**247**	62.5	62.4	72.5	49.5	35.5	47.7	35.6	33.3	26.5	68.5	48.7	107	60.9	43.6	37.4
General Chemistry																							
Solids, Percent	SOLID	NS	NS	NS	Percent	86.6	91.3	90.6	87.4	86.3	79.4	87.5	85.4	81.4	89.1	87.4	80.5	88.4	82.8	87	87	84.5	85.2
Perfluorooctanoic acids																							
N-ethyl perfluorooctane- sulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.000266 U	<0.000252 U	<0.000275 U	<0.00028 U	<0.000276 U	<0.000286 U
N-methyl perfluorooctane- sulfonamidoacetic Acid (NMeFOSAA)	2355-31-9	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.000266 U	<0.000252 U	<0.000275 U	<0.00028 U	<0.000276 U	<0.000286 U
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.000266 U	<0.000252 U	<0.000275 U	<0.00028 U	<0.000276 U	<0.000286 U
Perfluorobutanoic acid (PFBA)	375-22-4	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.000266 U	0.000712	<0.000275 U	<0.00028 U	<0.000276 U	<0.000286 U
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.000266 U	<0.000252 U	<0.000275 U	<0.00028 U	<0.000276 U	<0.000286 U
Perfluorodecanoic Acid (PFDA)	335-76-2	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.000266 U	<0.000252 U	<0.000275 U	<0.00028 U	<0.000276 U	<0.000286 U
Perfluorododecanoic Acid (PFDoA)	307-55-1	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.000266 U	<0.000252 U	<0.000275 U	<0.00028 U	<0.000276 U	<0.000286 U
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.000266 U	<0.000252 U	<0.000275 U	<0.00028 U	<0.000276 U	<0.000286 U
Perfluoroheptanoic acid (PFHpA)	375-85-9	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.000266 U	<0.000252 U	<0.000275 U	<0.00028 U	<0.000276 U	<0.000286 U
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.000266 U	<0.000252 U	<0.000275 U	<0.00028 U	<0.000276 U	<0.000286 U
Perfluorohexanoic Acid (PFHxA)	307-24-4	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.000266 U	<0.000252 U	<0.000275 U	<0.00028 U	<0.000276 U	<0.000286 U
Perfluorononanoic Acid (PFNA)	375-95-1	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.000266 U	<0.000252 U	<0.000275 U	<0.00028 U	<0.000276 U	<0.000286 U
Perfluorooctanesulfonamide (FOSA)	754-91-6	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.000266 U	<0.000252 U	<0.000275 U	<0.00028 U	<0.000276 U	<0.000286 U
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	0.00088	0.0037	0.044	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.000266 U	<0.000252 U	<0.000275 U	<0.00028 U	<0.000276 U	<0.000286 U
Perfluorooctanoic Acid (PFOA)	335-67-1	0.00066	0.0011	0.033	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.000266 U	<0.000252 U	<0.000275 U	<0.00028 U	<0.000276 U	<0.000286 U
Perfluoropentanoic Acid (PFPeA)	2706-90-3	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.000266 U	<0.000252 U	<0.000275 U	<0.00028 U	<0.000276 U	<0.000286 U
Perfluorotetradecanoic Acid (PFTA)	376-06-7	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.000266 U	<0.000252 U	<0.000275 U	<0.00028 U	<0.000276 U	<0.000286 U
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.000266 U	<0.000252 U	<0.000275 U	<0.00028 U	<0.000276 U	<0.000286 U
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.000266 U	<0.000252 U	<0.000275 U	<0.00028 U	<0.000276 U	<0.000286 U
Sodium 1H,1H,2H,2H-Perfluorodecane Sulfonate (8:2) (8:2FTS)	39108-34-4	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.000266 U	<0.000252 U	<0.000275 U	<0.00028 U	<0.000276 U	<0.000286 U
Sodium 1H,1H,2H,2H-Perfluorooctane Sulfonate (6:2) (6:2FTS)	27619-97-2	NS	NS	NS	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.000266 U	<0.000252 U	<0.000275 U	<0.00028 U	<0.000276 U	<0.000286 U

Table 1
Phase II Environmental Site Investigation Report
Soil Sample Analytical Results

1487 First Avenue
New York City, New York
Langan Project No.: 100963701

Notes:
CAS - Chemical Abstract Service
NS - No standard
mg/kg - milligram per kilogram
NA - Not analyzed
RL - Reporting limit
<RL - Not detected
Sample Depth (fbfbs) - sample depth in feet below former basement slab
Sample Depth (fbsl) - sample depth in feet below sidewalk level

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 Unrestricted Use, Protection of Groundwater, and Restricted Use Restricted-Residential Soil Cleanup Objectives (SCO).

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.
E - The result is estimated and cannot be accurately reported due to levels encountered or interferences. (York)
J - The analyte was detected above the method detection limit (MDL), but below the RL; therefore, the result is an estimated concentration.
U - The analyte was analyzed for, but was not detected at a level greater than or equal to the RL; the value shown in the table is the RL.
B - The analyte was found in the associated analysis batch blank.

Exceedance Summary:
10 - Result exceeds Unrestricted Use SCOs
10 - Result exceeds Protection of Groundwater SCOs
10 - Result exceeds Restricted Use Restricted-Residential SCOs

Table 2
Phase II Environmental Site Investigation Report
Groundwater Sample Analytical Results

1487 First Avenue
New York City, New York
Langan Project No.: 100963701

Analyte	CAS Number	NYSDEC SGVs	Location	MW01	MW02	MW-03	MW-03	MW04	MW05	MW05	MW-6	MW-6	MW-7	MW-7	MW-7
			Sample Name	024_MW01_20211110	023_MW02_20211110	020_MW-03_20211110	021_GWDUP_20211110	022_MW04_20211110	050_MW05	051_DUP-3	064_MW-6_28	065_MW-6_45	061_MW-7_20	062_MW-7_28	063_DUP-5
			Sample Date	11/10/2021	11/10/2021	11/10/2021	11/10/2021	11/10/2021	01/27/2022	01/27/2022	02/02/2022	02/02/2022	02/01/2022	02/02/2022	02/02/2022
			Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Volatile Organic Compounds															
1,1,1,2-Tetrachloroethane	630-20-6	5	ug/l	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,1,1-Trichloroethane	71-55-6	5	ug/l	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,1,2,2-Tetrachloroethane	79-34-5	5	ug/l	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	5	ug/l	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,1,2-Trichloroethane	79-00-5	1	ug/l	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,1-Dichloroethane	75-34-3	5	ug/l	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,1-Dichloroethene	75-35-4	5	ug/l	<0.2 U	<0.2 U	<0.2 U	<0.2 U	0.32 J	0.22 J	0.54	0.43 J	0.29 J	<0.2 U	0.37 J	0.39 J
1,1-Dichloropropene	563-58-6	5	ug/l	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,2,3-Trichlorobenzene	87-61-6	5	ug/l	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,2,3-Trichloropropane	96-18-4	0.04	ug/l	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,2,4-Trichlorobenzene	120-82-1	5	ug/l	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,2,4-Trimethylbenzene	95-63-6	5	ug/l	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,2-Dibromo-3-Chloropropane	96-12-8	0.04	ug/l	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,2-Dibromoethane (Ethylene Dibromide)	106-93-4	0.0006	ug/l	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,2-Dichlorobenzene	95-50-1	3	ug/l	<0.2 U	0.29 J	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	0.27 J	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,2-Dichloroethane	107-06-2	0.6	ug/l	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,2-Dichloropropane	78-87-5	1	ug/l	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,3,5-Trimethylbenzene (Mesitylene)	108-67-8	5	ug/l	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,3-Dichlorobenzene	541-73-1	3	ug/l	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,3-Dichloropropane	142-28-9	5	ug/l	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,4-Dichlorobenzene	106-46-7	3	ug/l	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,4-Dioxane (P-Dioxane)	123-91-1	NS	ug/l	<40 U	<40 U	<40 U	<40 U	<40 U	<40 U	<40 U	<40 U	<40 U	<40 U	<40 U	<40 U
2,2-Dichloropropane	594-20-7	5	ug/l	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
2-Chlorotoluene	95-49-8	5	ug/l	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
2-Hexanone (MBK)	591-78-6	50	ug/l	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
4-Chlorotoluene	106-43-4	5	ug/l	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Acetone	67-64-1	50	ug/l	4.42	5.57	<1 U	1.19 J	1.39 J	3.61	1.52 J	1.84 J	1.94 J	2.67	2.06	2.27
Acrolein	107-02-8	5	ug/l	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Acrylonitrile	107-13-1	5	ug/l	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Benzene	71-43-2	1	ug/l	<0.2 U	0.38 J	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	0.6	0.72	0.68
Bromobenzene	108-86-1	5	ug/l	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Bromochloromethane	74-97-5	5	ug/l	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Bromodichloromethane	75-27-4	50	ug/l	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	0.27 J	<0.2 U	<0.2 U	<0.2 U
Bromoform	75-25-2	50	ug/l	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Bromomethane	74-83-9	5	ug/l	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Carbon Disulfide	75-15-0	60	ug/l	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Carbon Tetrachloride	56-23-5	5	ug/l	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Chlorobenzene	108-90-7	5	ug/l	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Chloroethane	75-00-3	5	ug/l	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Chloroform	67-66-3	**7**	ug/l	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	0.98	<0.2 U	**11.3**	**15**	**10.5**	**10.2**	**10.1**
Chloromethane	74-87-3	5	ug/l	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Cis-1,2-Dichloroethene	156-59-2	**5**	ug/l	<0.2 U	**9.32**	**6.79**	**6.33**	**61.1**	**43.9**	**101**	**85**	**59**	**53.7**	**96.8**	**103**
Cis-1,3-Dichloropropene	10061-01-5	0.4	ug/l	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Cyclohexane	110-82-7	NS	ug/l	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Dibromochloromethane	124-48-1	50	ug/l	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Dibromomethane	74-95-3	5	ug/l	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Dichlorodifluoromethane	75-71-8	5	ug/l	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	0.74	0.74	<0.2 U	<0.2 U	<0.2 U
Ethylbenzene	100-41-4	5	ug/l	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	0.23 J	<0.2 U	0.41 J	0.55	0.56
Hexachlorobutadiene	87-68-3	0.5	ug/l	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Isopropylbenzene (Cumene)	98-82-8	5	ug/l	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
M,P-Xylene	179601-23-1	5	ug/l	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
Methyl Acetate	79-20-9	NS	ug/l	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Methyl Ethyl Ketone (2-Butanone)	78-93-3	50	ug/l	0.8	2.37	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	10.4	7.18	6.48	<0.2 U	12.5
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	108-10-1	NS	ug/l	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Methylcyclohexane	108-87-2	NS	ug/l	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Methylene Chloride	75-09-2	5	ug/l	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	1.01 J	1.76 J	1.92 J	1.73 J
n-Butylbenzene	104-51-8	5	ug/l	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
n-Propylbenzene	103-65-1	5	ug/l	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
o-Xylene (1,2-Dimethylbenzene)	95-47-6	5	ug/l	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
p-Cymene (p-Isopropyltoluene)	CYMP	NS	ug/l	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Sec-Butylbenzene	135-98-8	5	ug/l	<0.2 U	0.26 J	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Styrene	100-42-5	5	ug/l	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	0.27 J	<0.2 U	0.51	0.71	0.76
T-Butylbenzene	98-06-6	5	ug/l	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Tert-Butyl Alcohol	75-65-0	NS	ug/l	2.7	3.65	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
Tert-Butyl Methyl Ether	1634-04-4	10	ug/l	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Tetrachloroethene (PCE)	127-18-4	**5**	ug/l	1.48	**2,660 D**	3.87	3.45	**124**	**24.5**	**60**	**425 D**	**232 D**	**24.9**	**65.3**	**67.1**
Toluene	108-88-3	5	ug/l	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	0.67	0.69	0.77	0.69	0.7
Total Xylenes	1330-20-7	5	ug/l	<0.6 U	<0.6 U	<0.6 U	<0.6 U	<0.6 U	<0.6 U	<0.6 U	<0.6 U	<0.6 U	<0.6 U	<0.6 U	<0.6 U
Trans-1,2-Dichloroethene	156-60-5	5	ug/l	<0.2 U	0.21 J	<0.2 U	<0.2 U	0.39 J	0.3 J	0.58	0.56	0.36 J	0.48 J	0.85	0.9
Trans-1,3-Dichloropropene	10061-02-6	0.4	ug/l	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Trichloroethene (TCE)	79-01-6	**5**	ug/l	<0.2 U	**209 D**	3.59	3.24	**60.6**	**47.2**	**112**	**151**	**96.9**	**54.1**	**94.6**	**99.2**
Trichlorofluoromethane	75-69-4	5	ug/l	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Vinyl Acetate	108-05-4	NS	ug/l	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Vinyl Chloride	75-01-4	2	ug/l	<0.2 U	<0.2 U	<0.2 U	<0.2 U	1.03	0.3 J	0.75	1.94	1.34	0.41 J	0.76	0.8

Table 2
Phase II Environmental Site Investigation Report
Groundwater Sample Analytical Results

1487 First Avenue
New York City, New York
Langan Project No.: 100963701

Analyte	CAS Number	NYSDEC SGVs	Location	MW01	MW02	MW-03	MW-03	MW04	MW05	MW05	MW-6	MW-6	MW-7	MW-7	MW-7
			Sample Name	024_MW01_20211110	023_MW02_20211110	020_MW-03_20211110	021_GWDUP_20211110	022_MW04_20211110	050_MW05	051_DUP-3	064_MW-6_28	065_MW-6_45	061_MW-7_20	062_MW-7_28	063_DUP-5
			Sample Date	11/10/2021	11/10/2021	11/10/2021	11/10/2021	11/10/2021	01/27/2022	01/27/2022	02/02/2022	02/02/2022	02/01/2022	02/02/2022	02/02/2022
			Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Semi-Volatile Organic Compounds															
1,2,4,5-Tetrachlorobenzene	95-94-3	5	ug/l	NA	NA	NA	NA	NA	<2.7 U	<2.56 U	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	120-82-1	5	ug/l	NA	NA	NA	NA	NA	<2.7 U	<2.56 U	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	95-50-1	3	ug/l	NA	NA	NA	NA	NA	<2.7 U	<2.56 U	NA	NA	NA	NA	NA
1,2-Diphenylhydrazine	122-66-7	0	ug/l	NA	NA	NA	NA	NA	<2.7 U	<2.56 U	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	541-73-1	3	ug/l	NA	NA	NA	NA	NA	<2.7 U	<2.56 U	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	106-46-7	3	ug/l	NA	NA	NA	NA	NA	<2.7 U	<2.56 U	NA	NA	NA	NA	NA
2,3,4,6-Tetrachlorophenol	58-90-2	NS	ug/l	NA	NA	NA	NA	NA	<2.7 U	<2.56 U	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	95-95-4	NS	ug/l	NA	NA	NA	NA	NA	<2.7 U	<2.56 U	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	88-06-2	NS	ug/l	NA	NA	NA	NA	NA	<2.7 U	<2.56 U	NA	NA	NA	NA	NA
2,4-Dichlorophenol	120-83-2	1	ug/l	NA	NA	NA	NA	NA	<2.7 U	<2.56 U	NA	NA	NA	NA	NA
2,4-Dimethylphenol	105-67-9	1	ug/l	NA	NA	NA	NA	NA	<2.7 U	<2.56 U	NA	NA	NA	NA	NA
2,4-Dinitrophenol	51-28-5	1	ug/l	NA	NA	NA	NA	NA	<2.7 U	<2.56 U	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	121-14-2	5	ug/l	NA	NA	NA	NA	NA	<2.7 U	<2.56 U	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	606-20-2	5	ug/l	NA	NA	NA	NA	NA	<2.7 U	<2.56 U	NA	NA	NA	NA	NA
2-Chloronaphthalene	91-58-7	10	ug/l	NA	NA	NA	NA	NA	<2.7 U	<2.56 U	NA	NA	NA	NA	NA
2-Chlorophenol	95-57-8	NS	ug/l	NA	NA	NA	NA	NA	<2.7 U	<2.56 U	NA	NA	NA	NA	NA
2-Methylnaphthalene	91-57-6	NS	ug/l	NA	NA	<2.76 U	<2.76 U	<2.76 U	<2.7 U	<2.56 U	NA	NA	NA	NA	NA
2-Methylphenol (o-Cresol)	95-48-7	NS	ug/l	NA	NA	NA	NA	NA	<2.7 U	<2.56 U	NA	NA	NA	NA	NA
2-Nitroaniline	88-74-4	5	ug/l	NA	NA	NA	NA	NA	<2.7 U	<2.56 U	NA	NA	NA	NA	NA
2-Nitrophenol	88-75-5	NS	ug/l	NA	NA	NA	NA	NA	<2.7 U	<2.56 U	NA	NA	NA	NA	NA
3 & 4 Methylphenol (m&p Cresol)	65794-96-9	NS	ug/l	NA	NA	NA	NA	NA	<2.7 U	<2.56 U	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	91-94-1	5	ug/l	NA	NA	NA	NA	NA	<2.7 U	<2.56 U	NA	NA	NA	NA	NA
3-Nitroaniline	99-09-2	5	ug/l	NA	NA	NA	NA	NA	<2.7 U	<2.56 U	NA	NA	NA	NA	NA
4,6-Dinitro-2-Methylphenol	534-52-1	NS	ug/l	NA	NA	NA	NA	NA	<2.7 U	<2.56 U	NA	NA	NA	NA	NA
4-Bromophenyl Phenyl Ether	101-55-3	NS	ug/l	NA	NA	NA	NA	NA	<2.7 U	<2.56 U	NA	NA	NA	NA	NA
4-Chloro-3-Methylphenol	59-50-7	NS	ug/l	NA	NA	NA	NA	NA	<2.7 U	<2.56 U	NA	NA	NA	NA	NA
4-Chloroaniline	106-47-8	5	ug/l	NA	NA	NA	NA	NA	<2.7 U	<2.56 U	NA	NA	NA	NA	NA
4-Chlorophenyl Phenyl Ether	7005-72-3	NS	ug/l	NA	NA	NA	NA	NA	<2.7 U	<2.56 U	NA	NA	NA	NA	NA
4-Nitroaniline	100-01-6	5	ug/l	NA	NA	NA	NA	NA	<2.7 U	<2.56 U	NA	NA	NA	NA	NA
4-Nitrophenol	100-02-7	NS	ug/l	NA	NA	NA	NA	NA	<5.41 U	<5.13 U	NA	NA	NA	NA	NA
Acenaphthene	83-32-9	20	ug/l	NA	NA	<0.05 U	<0.05 U	<0.05 U	<0.0541 U	<0.0513 U	NA	NA	NA	NA	NA
Acenaphthylene	208-96-8	NS	ug/l	NA	NA	<0.05 U	<0.05 U	<0.05 U	<0.0541 U	<0.0513 U	NA	NA	NA	NA	NA
Acetophenone	98-86-2	NS	ug/l	NA	NA	NA	NA	NA	<2.7 U	<2.56 U	NA	NA	NA	NA	NA
Aniline (Phenylamine, Aminobenzene)	62-53-3	5	ug/l	NA	NA	NA	NA	NA	<2.7 U	<2.56 U	NA	NA	NA	NA	NA
Anthracene	120-12-7	50	ug/l	NA	NA	<0.05 U	<0.05 U	<0.05 U	<0.0541 U	<0.0513 U	NA	NA	NA	NA	NA
Atrazine	1912-24-9	7.5	ug/l	NA	NA	NA	NA	NA	<0.541 U	<0.513 U	NA	NA	NA	NA	NA
Benzaldehyde	100-52-7	NS	ug/l	NA	NA	NA	NA	NA	<2.7 U	<2.56 U	NA	NA	NA	NA	NA
Benzidine	92-87-5	5	ug/l	NA	NA	NA	NA	NA	<5.41 U	<5.13 U	NA	NA	NA	NA	NA
Benzo(a)anthracene	56-55-3	0.002	ug/l	NA	NA	<0.05 U	<0.05 U	<0.05 U	<0.0541 U	<0.0513 U	NA	NA	NA	NA	NA
Benzo(a)pyrene	50-32-8	0	ug/l	NA	NA	<0.05 U	<0.05 U	<0.05 U	<0.0541 U	<0.0513 U	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	205-99-2	0.002	ug/l	NA	NA	<0.05 U	<0.05 U	<0.05 U	<0.0541 U	<0.0513 U	NA	NA	NA	NA	NA
Benzo(g,h,i)Perylene	191-24-2	NS	ug/l	NA	NA	<0.05 U	<0.05 U	<0.05 U	<0.0541 U	<0.0513 U	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	207-08-9	0.002	ug/l	NA	NA	<0.05 U	<0.05 U	<0.05 U	<0.0541 U	<0.0513 U	NA	NA	NA	NA	NA
Benzoic Acid	65-85-0	NS	ug/l	NA	NA	NA	NA	NA	<2.7 U	5.28	NA	NA	NA	NA	NA
Benzyl Alcohol	100-51-6	NS	ug/l	NA	NA	NA	NA	NA	<2.7 U	<2.56 U	NA	NA	NA	NA	NA
Benzyl Butyl Phthalate	85-68-7	50	ug/l	NA	NA	NA	NA	NA	<2.7 U	<2.56 U	NA	NA	NA	NA	NA
Biphenyl (Diphenyl)	92-52-4	5	ug/l	NA	NA	NA	NA	NA	<2.7 U	<2.56 U	NA	NA	NA	NA	NA
Bis(2-chloroethoxy) methane	111-91-1	5	ug/l	NA	NA	NA	NA	NA	<2.7 U	<2.56 U	NA	NA	NA	NA	NA
Bis(2-chloroethyl) ether (2-chloroethyl ether)	111-44-4	1	ug/l	NA	NA	NA	NA	NA	<1.08 U	<1.03 U	NA	NA	NA	NA	NA
Bis(2-chloroisopropyl) ether	108-60-1	5	ug/l	NA	NA	NA	NA	NA	<2.7 U	<2.56 U	NA	NA	NA	NA	NA
Bis(2-ethylhexyl) phthalate	117-81-7	5	ug/l	NA	NA	NA	NA	NA	<0.541 U	<0.513 U	NA	NA	NA	NA	NA
Caprolactam	105-60-2	NS	ug/l	NA	NA	NA	NA	NA	<2.7 U	<2.56 U	NA	NA	NA	NA	NA
Carbazole	86-74-8	NS	ug/l	NA	NA	NA	NA	NA	<2.7 U	<2.56 U	NA	NA	NA	NA	NA
Chrysene	218-01-9	0.002	ug/l	NA	NA	<0.05 U	<0.05 U	<0.05 U	<0.0541 U	<0.0513 U	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	53-70-3	NS	ug/l	NA	NA	<0.05 U	<0.05 U	<0.05 U	<0.0541 U	<0.0513 U	NA	NA	NA	NA	NA
Dibenzofuran	132-64-9	NS	ug/l	NA	NA	NA	NA	NA	<2.7 U	<2.56 U	NA	NA	NA	NA	NA
Dibutyl phthalate	84-74-2	50	ug/l	NA	NA	NA	NA	NA	<2.7 U	<2.56 U	NA	NA	NA	NA	NA
Diethyl phthalate	84-66-2	50	ug/l	NA	NA	NA	NA	NA	<2.7 U	<2.56 U	NA	NA	NA	NA	NA
Dimethyl phthalate	131-11-3	50	ug/l	NA	NA	NA	NA	NA	<2.7 U	<2.56 U	NA	NA	NA	NA	NA
Dioctyl phthalate	117-84-0	50	ug/l	NA	NA	NA	NA	NA	<2.7 U	<2.56 U	NA	NA	NA	NA	NA
Fluoranthene	206-44-0	50	ug/l	NA	NA	<0.05 U	<0.05 U	<0.05 U	<0.0541 U	<0.0513 U	NA	NA	NA	NA	NA
Fluorene	86-73-7	50	ug/l	NA	NA	<0.05 U	<0.05 U	<0.05 U	<0.0541 U	0.297	NA	NA	NA	NA	NA
Hexachlorobenzene	118-74-1	0.04	ug/l	NA	NA	NA	NA	NA	<0.0216 U	<0.0205 U	NA	NA	NA	NA	NA
Hexachlorobutadiene	87-68-3	0.5	ug/l	NA	NA	NA	NA	NA	<0.541 U	<0.513 U	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	77-47-4	5	ug/l	NA	NA	NA	NA	NA	<5.41 U	<5.13 U	NA	NA	NA	NA	NA
Hexachloroethane	67-72-1	5	ug/l	NA	NA	NA	NA	NA	<0.541 U	<0.513 U	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	193-39-5	0.002	ug/l	NA	NA	<0.05 U	<0.05 U	<0.05 U	<0.0541 U	<0.0513 U	NA	NA	NA	NA	NA
Isophorone	78-59-1	50	ug/l	NA	NA	NA	NA	NA	<2.7 U	<2.56 U	NA	NA	NA	NA	NA
Naphthalene	91-20-3	10	ug/l	NA	NA	<0.05 U	<0.05 U	<0.05 U	<0.0541 U	<0.0513 U	NA	NA	NA	NA	NA
Nitrobenzene	98-95-3	0.4	ug/l	NA	NA	NA	NA	NA	<0.27 U	<0.256 U	NA	NA	NA	NA	NA
n-Nitrosodimethylamine	62-75-9	NS	ug/l	NA	NA	NA	NA	NA	<0.541 U	<0.513 U	NA	NA	NA	NA	NA
n-Nitrosodi-N-Propylamine	621-64-7	NS	ug/l	NA	NA	NA	NA	NA	<2.7 U	<2.56 U	NA	NA	NA	NA	NA
n-Nitrosodiphenylamine	86-30-6	50	ug/l	NA	NA	NA	NA	NA	<2.7 U	<2.56 U	NA	NA	NA	NA	NA
Pentachlorophenol	87-86-5	1	ug/l	NA	NA	NA	NA	NA	<0.27 U	<0.256 U	NA	NA	NA	NA	NA
Phenanthrene	85-01-8	50	ug/l	NA	NA	<0.05 U	<0.05 U	<0.05 U	<0.0541 U	<0.0513 U	NA	NA	NA	NA	NA
Phenol	108-95-2	1	ug/l	NA	NA	NA	NA	NA	<2.7 U	<2.56 U	NA	NA	NA	NA	NA
Pyrene	129-00-0	50	ug/l	NA	NA	<0.05 U	<0.05 U	<0.05 U	<0.0541 U	0.0513	NA	NA	NA	NA	NA
Pyridine	110-86-1	50	ug/l	NA	NA	NA	NA	NA	<2.7 U	<2.56 U	NA	NA	NA	NA	NA

Table 2
Phase II Environmental Site Investigation Report
Groundwater Sample Analytical Results

1487 First Avenue
New York City, New York
Langan Project No.: 100963701

Analyte	CAS Number	NYSDEC SGVs	Location	MW01	MW02	MW-03	MW-03	MW04	MW05	MW05	MW-6	MW-6	MW-7	MW-7	MW-7
			Sample Name	024_MW01_20211110	023_MW02_20211110	020_MW-03_20211110	021_GWDUP_20211110	022_MW04_20211110	050_MW05	051_DUP-3	064_MW-6_28	065_MW-6_45	061_MW-7_20	062_MW-7_28	063_DUP-5
			Sample Date	11/10/2021	11/10/2021	11/10/2021	11/10/2021	11/10/2021	01/27/2022	01/27/2022	02/02/2022	02/02/2022	02/01/2022	02/02/2022	02/02/2022
			Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Metals															
Aluminum	7429-90-5	NS	ug/l	NA	NA	NA	NA	NA	20,100 B	34,600 B	NA	NA	NA	NA	NA
Antimony	7440-36-0	3	ug/l	NA	NA	NA	NA	NA	<1.11 U	<1.11 U	NA	NA	NA	NA	NA
Arsenic	7440-38-2	25	ug/l	1.75	5.54	<1.11 U	<1.11 U	<1.11 U	4.07	6.91	NA	NA	NA	NA	NA
Barium	7440-39-3	1,000	ug/l	97.6	137	36.3	35.6	61.5	283	498	NA	NA	NA	NA	NA
Beryllium	7440-41-7	3	ug/l	<0.333 U	0.335	<0.333 U	<0.333 U	<0.333 U	0.587	0.975	NA	NA	NA	NA	NA
Cadmium	7440-43-9	5	ug/l	<0.556 U	1.79	<0.556 U	<0.556 U	<0.556 U	<0.556 U	<0.556 U	NA	NA	NA	NA	NA
Calcium	7440-70-2	NS	ug/l	NA	NA	NA	NA	NA	275,000 B	243,000 B	NA	NA	NA	NA	NA
Chromium, Total	7440-47-3	**50**	ug/l	16.9	**61.8**	1.18	<1.11 U	8.36	**79.4**	**146**	NA	NA	NA	NA	NA
Cobalt	7440-48-4	NS	ug/l	NA	NA	NA	NA	NA	34.8	53.1	NA	NA	NA	NA	NA
Copper	7440-50-8	200	ug/l	34.4	57.4	5.68	5.06	15.4	83.8	158	NA	NA	NA	NA	NA
Iron	7439-89-6	**300**	ug/l	NA	NA	NA	NA	NA	**34,100**	**61,000**	NA	NA	NA	NA	NA
Lead	7439-92-1	**25**	ug/l	**25.5**	**41**	2.52	2.27	14.5	**25.8 B**	**45.6 B**	NA	NA	NA	NA	NA
Magnesium	7439-95-4	**35,000**	ug/l	NA	NA	NA	NA	NA	**96,400**	**104,000**	NA	NA	NA	NA	NA
Manganese	7439-96-5	**300**	ug/l	**1,690 D**	**25,100 D**	**2,950 D**	**2,980 D**	**4,990 D**	**5,650**	**6,060**	NA	NA	NA	NA	NA
Mercury	7439-97-6	0.7	ug/l	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	NA	NA	NA	NA	NA
Nickel	7440-02-0	**100**	ug/l	66.1	**156**	16.4	15.6	**113**	94.5	**146**	NA	NA	NA	NA	NA
Potassium	7440-09-7	NS	ug/l	NA	NA	NA	NA	NA	28,900	34,400	NA	NA	NA	NA	NA
Selenium	7782-49-2	**10**	ug/l	8.17	8.81	2.48	2.59	4	**23.1**	**30.3**	NA	NA	NA	NA	NA
Silver	7440-22-4	50	ug/l	<1.11 U	<1.11 U	<1.11 U	<1.11 U	<1.11 U	<5.56 U	<5.56 U	NA	NA	NA	NA	NA
Sodium	7440-23-5	**20,000**	ug/l	NA	NA	NA	NA	NA	**130,000**	**112,000**	NA	NA	NA	NA	NA
Thallium	7440-28-0	0.5	ug/l	NA	NA	NA	NA	NA	<1.11 U	<1.11 U	NA	NA	NA	NA	NA
Vanadium	7440-62-2	NS	ug/l	NA	NA	NA	NA	NA	48.7	90.3	NA	NA	NA	NA	NA
Zinc	7440-66-6	2,000	ug/l	89.1	138	27.2	25.5	63.6	204	357	NA	NA	NA	NA	NA

Table 2
Phase II Environmental Site Investigation Report
Groundwater Sample Analytical Results

1487 First Avenue
New York City, New York
Langan Project No.: 100963701

Notes:

CAS - Chemical Abstract Service
NS - No standard
ug/l - microgram per liter
NA - Not analyzed
RL - Reporting limit
<RL - Not detected

Groundwater 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 703.5 and the NYSDEC Technical and Operational Guidance Series (TOGS) 1.1.1 Ambient Water Quality Standards and Guidance Values for Class GA Water (herein collectively referenced as "NYSDEC SGVs").

The criteria comparison for total metals (Chromium, Total) is provided for reference. The promulgated SGV shown is for hexavalent chromium.

Qualifiers:

D - The concentration reported is a result of a diluted sample.
E - The result is estimated and cannot be accurately reported due to levels encountered or interferences. (York)
J - The analyte was detected above the method detection limit (MDL), but below the RL; therefore, the result is
U - The analyte was analyzed for, but was not detected at a level greater than or equal to the RL; the value
B - The analyte was found in the associated analysis batch blank.

Exceedance Summary:

10 - Result exceeds NYSDEC SGVs

Table 3
Phase II Environmental Site Investigation Report
Soil Vapor Sample Analytical Results

1487 First Avenue
New York City, New York
Langan Project No.: 100963701

Analyte	CAS Number	NYSDOH Decision Matrices Minimum	Location	SV-01	SV-01	SV-02	SV-03	SV-04	SV-5	SV-6	SV-7	SV-7
			Sample Name	027_SV-01_20211110	026_SVDUP_20211110	025_SV-02_20211110	028_SV-03_20211110	029_SV-04_20211110	033_SV-5	034_SV-6	035_SV-7	036_DUP-2
			Sample Date	11/10/2021	11/10/2021	11/10/2021	11/10/2021	11/10/2021	01/25/2022	01/25/2022	01/25/2022	01/25/2022
			Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result
Volatile Organic Compounds												
1,1,1,2-Tetrachloroethane	630-20-6	NS	ug/m3	<1.21 U	<1 U	<12.4 U	<1.32 U	<4.16 U	NA	NA	NA	NA
1,1,1-Trichloroethane	71-55-6	100	ug/m3	<0.961 U	<0.796 U	<9.85 U	<1.05 U	<3.31 U	<1.09 U	<1.09 U	<1.09 U	<1.09 U
1,1,2,2-Tetrachloroethane	79-34-5	NS	ug/m3	<1.21 U	<1 U	<12.4 U	<1.32 U	<4.16 U	<1.37 U	<1.37 U	<1.37 U	<1.37 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	NS	ug/m3	<1.35 U	<1.12 U	<13.8 U	<1.48 U	<4.65 U	<1.53 U	<1.53 U	<1.53 U	<1.53 U
1,1,2-Trichloroethane	79-00-5	NS	ug/m3	<0.961 U	<0.796 U	<9.85 U	<1.05 U	<3.31 U	<1.09 U	<1.09 U	<1.09 U	<1.09 U
1,1-Dichloroethane	75-34-3	NS	ug/m3	<0.713 U	<0.59 U	<7.31 U	<0.781 U	<2.45 U	<0.809 U	<0.809 U	<0.809 U	<0.809 U
1,1-Dichloroethene	75-35-4	6	ug/m3	<0.349 U	<0.289 U	<3.58 U	<0.382 U	<1.2 U	<0.793 U	<0.793 U	<0.793 U	<0.793 U
1,2,4-Trichlorobenzene	120-82-1	NS	ug/m3	<1.31 U	<1.08 U	<13.4 U	<1.43 U	<4.5 U	<1.48 U	<1.48 U	<1.48 U	<1.48 U
1,2,4-Trimethylbenzene	95-63-6	NS	ug/m3	13.8 D	12.5 D	18.6 D	21.9 D	16.7 D	20.6	10.9	6.05	7.57
1,2-Dibromoethane (Ethylene Dibromide)	106-93-4	NS	ug/m3	<1.35 U	<1.12 U	<13.9 U	<1.48 U	<4.66 U	<1.54 U	<1.54 U	<1.54 U	<1.54 U
1,2-Dichlorobenzene	95-50-1	NS	ug/m3	<1.06 U	<0.877 U	<10.9 U	<1.16 U	<3.65 U	<1.2 U	<1.2 U	<1.2 U	<1.2 U
1,2-Dichloroethane	107-06-2	NS	ug/m3	<0.713 U	<0.59 U	<7.31 U	<0.781 U	<2.45 U	<0.809 U	<0.809 U	<0.809 U	<0.809 U
1,2-Dichloropropane	78-87-5	NS	ug/m3	<0.814 U	<0.674 U	<8.35 U	<0.891 U	<2.8 U	<0.924 U	<0.924 U	<0.924 U	<0.924 U
1,2-Dichlorotetrafluoroethane	76-14-2	NS	ug/m3	<1.23 U	<1.02 U	<12.6 U	<1.35 U	<4.24 U	<1.4 U	<1.4 U	<1.4 U	<1.4 U
1,3,5-Trimethylbenzene (Mesitylene)	108-67-8	NS	ug/m3	1.65 D	3.01 D	<8.88 U	5.12 D	<2.98 U	5.6	2.68	1.6	1.93
1,3-Butadiene	106-99-0	NS	ug/m3	<1.17 U	<0.968 U	<12 U	<1.28 U	<4.02 U	0.509	<0.442 U	0.611	0.58
1,3-Dichlorobenzene	541-73-1	NS	ug/m3	<1.06 U	<0.877 U	<10.9 U	<1.16 U	<3.65 U	<1.2 U	<1.2 U	<1.2 U	<1.2 U
1,3-Dichloropropane	142-28-9	NS	ug/m3	<0.814 U	<0.674 U	<8.35 U	<0.891 U	<2.8 U	NA	NA	NA	NA
1,4-Dichlorobenzene	106-46-7	NS	ug/m3	<1.06 U	<0.877 U	<10.9 U	<1.16 U	<3.65 U	<1.2 U	<1.2 U	<1.2 U	<1.2 U
1,4-Dioxane (P-Dioxane)	123-91-1	NS	ug/m3	<1.27 U	<1.05 U	<13 U	<1.39 U	<4.37 U	<0.721 U	<0.721 U	<0.721 U	<0.721 U
2,2,4-Trimethylpentane	540-84-1	NS	ug/m3	NA	NA	NA	NA	NA	9.72	1.51	2.82	2.68
2-Hexanone (MBK)	591-78-6	NS	ug/m3	<1.44 U	<1.19 U	<14.8 U	<1.58 U	<4.97 U	9.71	<0.82 U	<0.82 U	<0.82 U
4-Ethyltoluene	622-96-8	NS	ug/m3	12.2 D	11.5 D	17.8 D	20 D	14.6 D	6.19	3.17	1.96	2.56
Acetone	67-64-1	NS	ug/m3	69.8 D	68.6 D	23.6 D	109 D	63.2 D	87.7	57	173	161
Acrylonitrile	107-13-1	NS	ug/m3	<0.382 U	<0.316 U	<3.92 U	<0.419 U	<1.32 U	NA	NA	NA	NA
Allyl Chloride (3-Chloropropene)	107-05-1	NS	ug/m3	<2.76 U	<2.28 U	<28.3 U	<3.02 U	<9.49 U	<0.626 U	<0.626 U	<0.626 U	<0.626 U
Benzene	71-43-2	NS	ug/m3	2.76 D	2.65 D	<5.77 U	1.79 D	2.13 D	14.8	1.63	3.45	3.35
Benzyl Chloride	100-44-7	NS	ug/m3	<0.912 U	<0.755 U	<9.35 U	<0.999 U	<3.14 U	<1.04 U	<1.04 U	<1.04 U	<1.04 U
Bromodichloromethane	75-27-4	NS	ug/m3	<1.18 U	<0.977 U	<12.1 U	<1.29 U	<4.06 U	<1.34 U	<1.34 U	10.5	10.7
Bromoethene	593-60-2	NS	ug/m3	<0.771 U	<0.638 U	<7.9 U	<0.844 U	<2.65 U	<0.874 U	<0.874 U	<0.874 U	<0.874 U
Bromoform	75-25-2	NS	ug/m3	<1.82 U	<1.51 U	<18.7 U	<1.99 U	<6.27 U	<2.07 U	<2.07 U	<2.07 U	<2.07 U
Bromomethane	74-83-9	NS	ug/m3	<0.684 U	<0.566 U	<7.01 U	<0.749 U	<2.35 U	<0.777 U	<0.777 U	<0.777 U	<0.777 U
Carbon Disulfide	75-15-0	NS	ug/m3	48.6 D	49.2 D	<5.62 U	25.4 D	4.72 D	6.38	7.79	6.79	6.48
Carbon Tetrachloride	56-23-5	6	ug/m3	0.443 D	0.367 D	<2.84 U	0.364 D	<0.954 U	<1.26 U	<1.26 U	<1.26 U	<1.26 U
Chlorobenzene	108-90-7	NS	ug/m3	<0.811 U	<0.671 U	<8.31 U	<0.888 U	<2.79 U	<0.921 U	<0.921 U	<0.921 U	<0.921 U
Chloroethane	75-00-3	NS	ug/m3	<0.465 U	<0.385 U	<4.77 U	<0.509 U	<1.6 U	<0.528 U	<0.528 U	<0.528 U	<0.528 U
Chloroform	67-66-3	NS	ug/m3	1.81 D	1.71 D	<8.82 U	4.24 D	2.96 D	1.04	12.2	249	241
Chloromethane	74-87-3	NS	ug/m3	<0.364 U	<0.301 U	<3.73 U	<0.398 U	<1.25 U	<0.413 U	<0.413 U	0.981	1.07
Cis-1,2-Dichloroethene	156-59-2	**6**	ug/m3	<0.349 U	<0.289 U	**6.44 D**	<0.382 U	<1.2 U	<0.793 U	<0.793 U	<0.793 U	<0.793 U
Cis-1,3-Dichloropropene	10061-01-5	NS	ug/m3	<0.8 U	<0.662 U	<8.2 U	<0.876 U	<2.75 U	<0.908 U	<0.908 U	<0.908 U	<0.908 U
Cyclohexane	110-82-7	NS	ug/m3	0.667 D	0.703 D	33.6 D	4.45 D	<2.09 U	4.89	<0.688 U	2.25	2.03
Dibromochloromethane	124-48-1	NS	ug/m3	<1.5 U	<1.24 U	<15.4 U	<1.64 U	<5.17 U	<1.7 U	<1.7 U	<1.7 U	<1.7 U
Dichlorodifluoromethane	75-71-8	NS	ug/m3	54.6 D	52.9 D	34.8 D	85.7 D	1,180 D	2.59	2.54	2.51	2.65
Ethanol	64-17-5	NS	ug/m3	NA	NA	NA	NA	NA	41.1	<9.42 U	11.2	10.6
Ethyl Acetate	141-78-6	NS	ug/m3	<1.27 U	<1.05 U	<13 U	<1.39 U	<4.37 U	<1.8 U	<1.8 U	<1.8 U	<1.8 U
Ethylbenzene	100-41-4	NS	ug/m3	7.96 D	7.47 D	13.3 D	12.8 D	10.3 D	12.3	7.12	6.34	6.82
Hexachlorobutadiene	87-68-3	NS	ug/m3	<1.88 U	<1.55 U	<19.3 U	<2.06 U	<6.47 U	<2.13 U	<2.13 U	<2.13 U	<2.13 U
Isopropanol	67-63-0	NS	ug/m3	2.17 D	1.97 D	<8.88 U	1.09 D	<2.98 U	29.7	4.92	32.2	25.6
M,P-Xylene	179601-23-1	NS	ug/m3	43.1 D	40.1 D	69.8 D	70 D	56.9 D	45.6	28.6	24.5	27.1
Methyl Ethyl Ketone (2-Butanone)	78-93-3	NS	ug/m3	8.47 D	8.21 D	<5.33 U	11.5 D	3.58 D	36.6	5.66	6.4	5.66
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	108-10-1	NS	ug/m3	<0.722 U	<0.597 U	<7.4 U	<0.79 U	<2.48 U	<2.05 U	<2.05 U	<2.05 U	<2.05 U
Methyl Methacrylate	80-62-6	NS	ug/m3	0.721 D	<0.597 U	<7.39 U	<0.79 U	<2.48 U	NA	NA	NA	NA
Methylene Chloride	75-09-2	100	ug/m3	<1.22 U	2.43 D	<12.5 U	2.95 D	<4.21 U	<1.74 U	<1.74 U	2.34	2.71
Naphthalene	91-20-3	NS	ug/m3	<1.85 U	<1.53 U	<18.9 U	<2.02 U	<6.36 U	NA	NA	NA	NA
n-Heptane	142-82-5	NS	ug/m3	2.53 D	2.57 D	<7.4 U	3.16 D	<2.49 U	11.7	13.5	3.83	3.66
n-Hexane	110-54-3	NS	ug/m3	6.65 D	6.73 D	<6.37 U	6.66 D	2.99 D	14	9.97	4.86	4.97
o-Xylene (1,2-Dimethylbenzene)	95-47-6	NS	ug/m3	12.5 D	11.7 D	23.5 D	20.5 D	15.8 D	15.7	9.51	8.17	9.03
Propylene	115-07-1	NS	ug/m3	32.1 D	31.3 D	<3.11 U	<0.332 U	16.4 D	NA	NA	NA	NA
Styrene	100-42-5	NS	ug/m3	<0.751 U	<0.621 U	<7.69 U	<0.822 U	<2.58 U	1.68	1.15	0.984	1.06
Tert-Butyl Alcohol	75-65-0	NS	ug/m3	NA	NA	NA	NA	NA	1.53	<1.52 U	2.09	<1.52 U
Tert-Butyl Methyl Ether	1634-04-4	NS	ug/m3	<0.635 U	<0.526 U	<6.51 U	<0.695 U	<2.19 U	<0.721 U	<0.721 U	<0.721 U	<0.721 U
Tetrachloroethene (PCE)	127-18-4	**100**	ug/m3	4.78 D	4.65 D	**8,610 D**	8.5 D	13.2 D	3.68	2.62	1.95	1.95
Tetrahydrofuran	109-99-9	NS	ug/m3	<1.04 U	<0.86 U	<10.7 U	<1.14 U	<3.58 U	2.31	<1.47 U	1.57	<1.47 U
Toluene	108-88-3	NS	ug/m3	27.9 D	25.7 D	45.6 D	39.5 D	35.6 D	45.6	21	24	23.3
Total Xylenes	1330-20-7	NS	ug/m3	NA	NA	NA	NA	NA	61.2	38.1	32.7	36.1
Trans-1,2-Dichloroethene	156-60-5	NS	ug/m3	<0.699 U	<0.578 U	<7.16 U	<0.765 U	<2.4 U	<0.793 U	<0.793 U	<0.793 U	<0.793 U
Trans-1,3-Dichloropropene	10061-02-6	NS	ug/m3	<0.8 U	<0.662 U	<8.2 U	<0.876 U	<2.75 U	<0.908 U	<0.908 U	<0.908 U	<0.908 U
Trichloroethene (TCE)	79-01-6	**6**	ug/m3	0.663 D	0.627 D	**489 D**	0.518 D	<0.815 U	<1.07 U	<1.07 U	<1.07 U	<1.07 U
Trichlorofluoromethane	75-69-4	NS	ug/m3	1.68 D	1.56 D	<10.1 U	1.84 D	<3.41 U	1.31	1.25	1.25	1.33
Vinyl Acetate	108-05-4	NS	ug/m3	<0.62 U	<0.513 U	<6.36 U	<0.679 U	<2.14 U	NA	NA	NA	NA
Vinyl Chloride	75-01-4	6	ug/m3	<0.225 U	<0.186 U	<2.31 U	<0.247 U	<0.775 U	<0.511 U	<0.511 U	<0.511 U	<0.511 U
Total BTEX	BTEX	NS	ug/m3	38.62	35.82	58.9	54.09	48.03	133.9	67.85	66.49	69.57

Table 3
Phase II Environmental Site Investigation Report
Soil Vapor Sample Analytical Results

1487 First Avenue
New York City, New York
Langan Project No.: 100963701

Notes:

SV - Soil Vapor
CAS - Chemical Abstract Service
NS - No standard
ug/m3 - microgram per cubic meter
NA - Not analyzed
RL - Reporting limit
<RL - Not detected
Soil vapor sample analytical results are compared to the minimum soil vapor concentrations at which mitigation is recommended as set forth in the New York State Department of Health (NYSDOH) October 2006 Guidance for Evaluating Soil Vapor Intrusion in the State of New York Decision Matrices for Sub-Slab Vapor and Indoor Air and subsequent updates (2017).

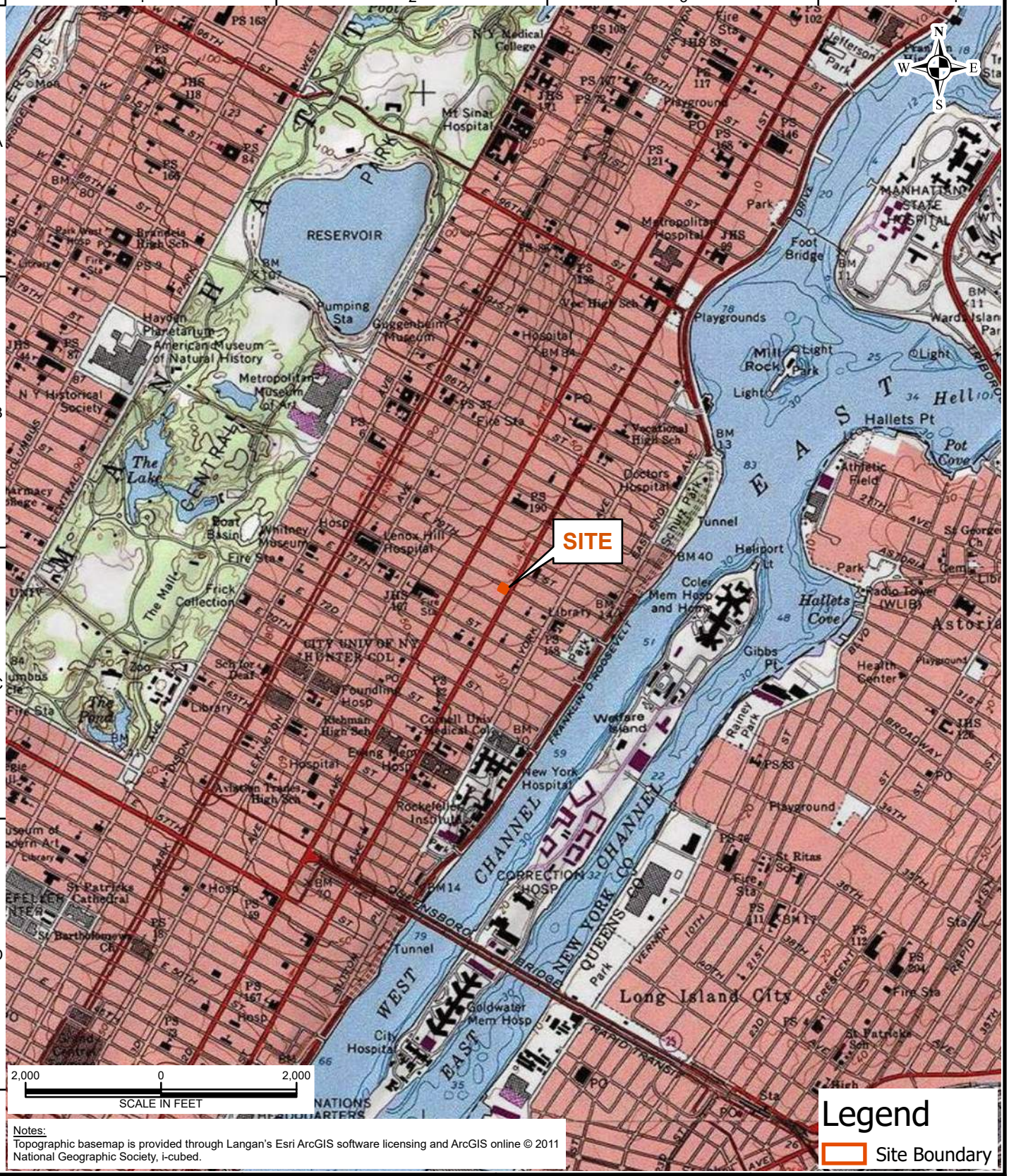
Qualifiers:

D - The concentration reported is a result of a diluted sample.
E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.
J - The analyte was detected above the method detection limit (MDL), but below the RL; therefore, the result is
U - The analyte was analyzed for, but was not detected at a level greater than or equal to the RL; the value shown
B - The analyte was found in the associated analysis batch blank.

Exceedance Summary:

10 - Result exceeds NYSDOH Decision Matrices Minimum Concentrations

FIGURES



Notes:
Topographic basemap is provided through Langan's Esri ArcGIS software licensing and ArcGIS online © 2011 National Geographic Society, i-cubed.

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Langan International LLC
Collectively known as Langan

Project
1487 FIRST AVENUE REDEVELOPMENT SITE
BLOCK No. 1452, LOT No.27
MANHATTAN
NEW YORK NEW YORK

Drawing Title
SITE LOCATION MAP

Project No.	100963701
Date	2/25/2022
Scale	1"=2,000'
Drawn By	JF
Submission Date	
Figure	1

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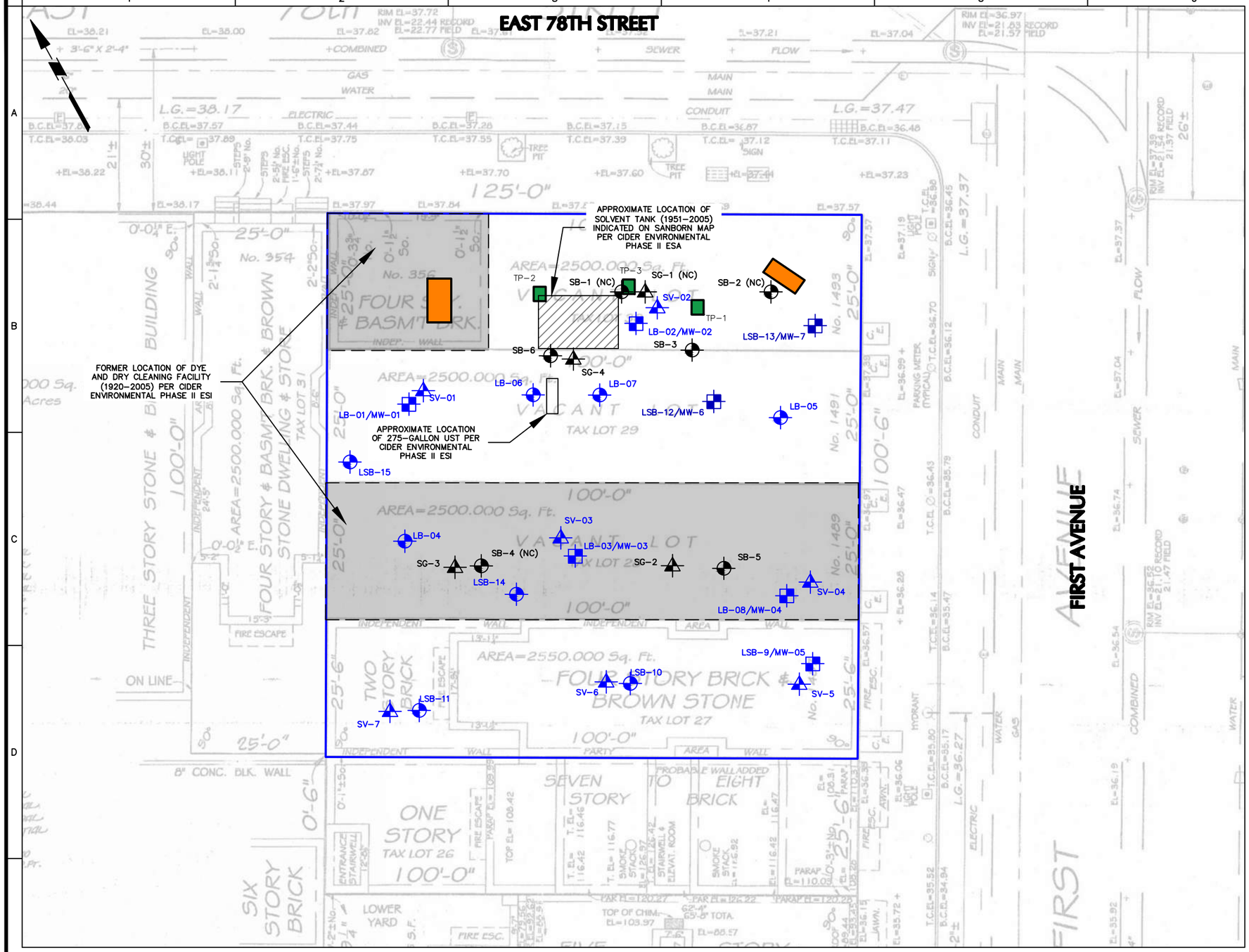

LEGEND

- APPROXIMATE SITE BOUNDARY
- No. 2 FUEL OIL AST LOCATION
- DYE AND DRY CLEANING HISTORICAL SITE USE
- SB-3 — PREVIOUS SOIL BORING LOCATION AND ID
- SG-2 — PREVIOUS SOIL GAS LOCATION AND ID
- LB-01/MW-01 — SOIL BORING AND MONITORING WELL LOCATION AND ID
- LB-04 — SOIL BORING LOCATION AND ID
- SV-01 — SOIL VAPOR LOCATION AND ID
- LB-01/MW-01 — SOIL BORING AND BEDROCK MONITORING WELL LOCATION AND ID
- ENVIRONMENTAL TEST PIT LOCATION

GENERAL NOTES:

1. BASE MAP SOURCE: PROPERTY SURVEY BY HAYNES LAND SURVEYORS OF SYOSSET, NY (DATED SEPTEMBER 14, 2015)
2. SAMPLING LOCATIONS ARE APPROXIMATE.
3. NC – NOT COMPLETED
4. VERTICAL ELEVATION DATUM: NATIONAL VERTICAL DATUM OF 1988 (NAVD88)
5. PREVIOUS SOIL BORING AND SOIL GAS LOCATIONS SAMPLED DURING THE CIDER PHASE II ESA.

20 0 5 10 20
SCALE IN FEET

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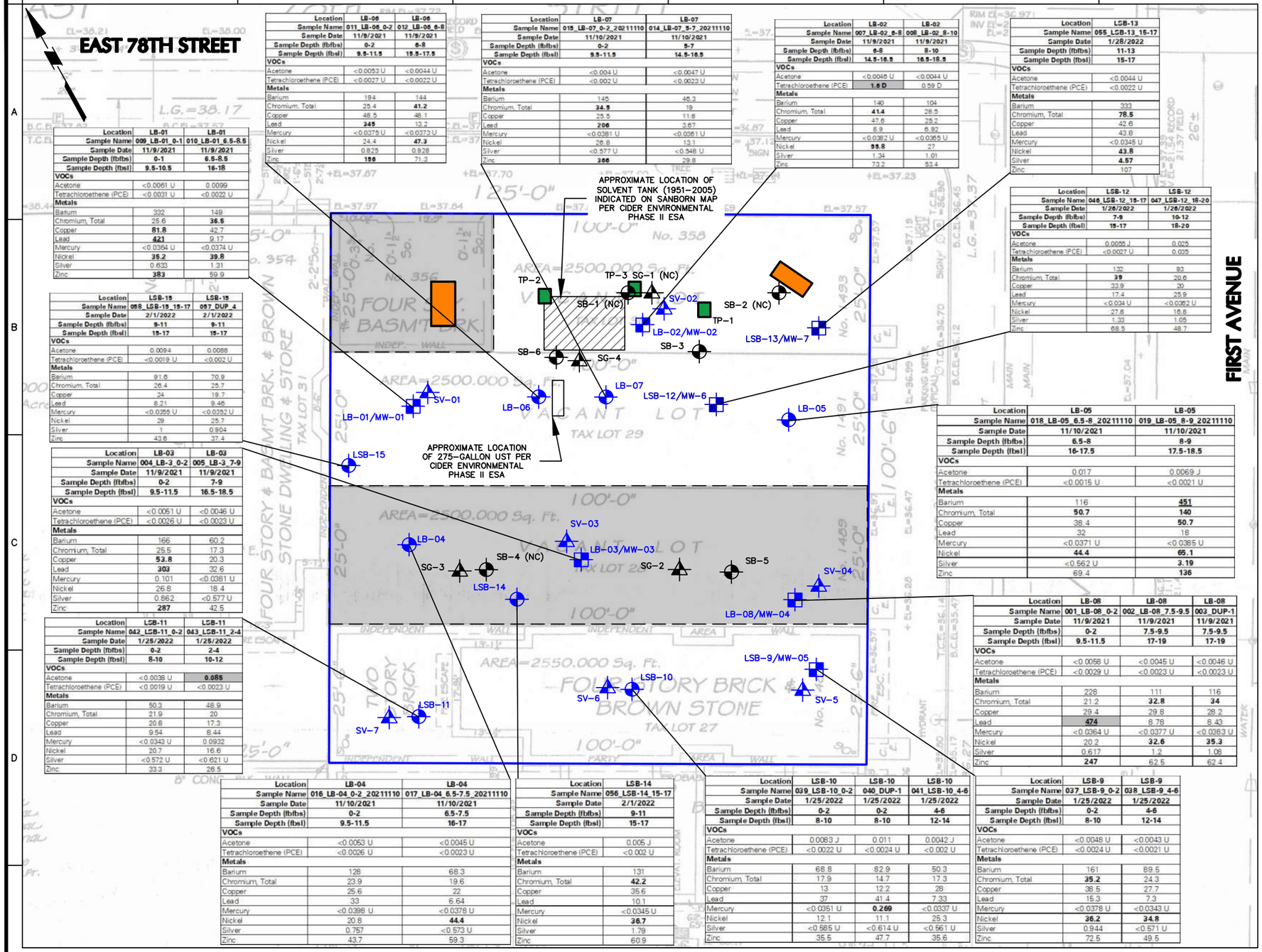
NEW YORK NEW YORK

Project	1487 FIRST AVENUE REDEVELOPMENT SITE BLOCK No. 1452, LOT No.27 MANHATTAN
Drawing Title	SITE PLAN
Project No.	100963701
Date	2/24/2022
Drawn By	GCW
Checked By	MSR
Drawing No.	2 1 1

Filename: \\langan.com\data\PAR\data7\100963701\Project Data\CAD\01\SheetFiles\Figures\2022-01\IRMWP\Figure 2 - Site Plan.dwg Date: 2/25/2022 Time: 11:52 User: ibaker Style Table: Langan.stb Layout: ANSIB-BL



Location	LB-01	LB-01
Sample Name	009_LB-01_0-1	010_LB-01_6.5-8.5
Sample Date	11/9/2021	11/9/2021
Sample Depth (fbfbs)	0-1	6.5-8.5
Sample Depth (fbsl)	9.5-10.5	16-18
VOCs		
Acetone	<0.0061 U	0.0099
Tetrachloroethene (PCE)	<0.0031 U	<0.0022 U
Metals		
Barium	332	149
Chromium, Total	25.6	**36.5**
Copper	**81.8**	42.7
Lead	**421**	9.17
Mercury	<0.0364 U	<0.0374 U
Nickel	**35.2**	**39.8**
Silver	0.633	1.31
Zinc	**383**	59.9

Location	LB-06	LB-06
Sample Name	011_LB-06_0-2	012_LB-06_6-8
Sample Date	11/9/2021	11/9/2021
Sample Depth (fbfbs)	0-2	6-8
Sample Depth (fbsl)	9.5-11.5	15.5-17.5
VOCs		
Acetone	<0.0053 U	<0.0044 U
Tetrachloroethene (PCE)	<0.0027 U	<0.0022 U
Metals		
Barium	194	144
Chromium, Total	25.4	**41.2**
Copper	48.5	48.1
Lead	**345**	13.2
Mercury	<0.0375 U	<0.0373 U
Nickel	24.4	**47.3**
Silver	0.825	0.928
Zinc	**156**	71.3

Location	LB-07	LB-07
Sample Name	015_LB-07_0-2_20211110	014_LB-07_5-7_20211110
Sample Date	11/10/2021	11/10/2021
Sample Depth (fbfbs)	0-2	5-7
Sample Depth (fbsl)	9.5-11.5	14.5-16.5
VOCs		
Acetone	<0.004 U	<0.0047 U
Tetrachloroethene (PCE)	<0.002 U	<0.0023 U
Metals		
Barium	145	46.3
Chromium, Total	**34.5**	19
Copper	25.5	11.8
Lead	**206**	3.67
Mercury	<0.0381 U	<0.0361 U
Nickel	26.8	13.1
Silver	<0.577 U	<0.548 U
Zinc	**366**	29.8

Location	LB-02	LB-02
Sample Name	007_LB-02_6-8	008_LB-02_8-10
Sample Date	11/9/2021	11/9/2021
Sample Depth (fbfbs)	6-8	8-10
Sample Depth (fbsl)	14.5-16.5	16.5-18.5
VOCs		
Acetone	<0.0046 U	<0.0044 U
Tetrachloroethene (PCE)	**1.6 D**	0.59 D
Metals		
Barium	140	104
Chromium, Total	**41.4**	28.5
Copper	47.6	25.2
Lead	8.9	6.92
Mercury	<0.0382 U	<0.0365 U
Nickel	**55.8**	27
Silver	1.34	1.01
Zinc	73.2	53.4

Location	LSB-13
Sample Name	055_LSB-13_15-17
Sample Date	1/28/2022
Sample Depth (fbfbs)	11-13
Sample Depth (fbsl)	15-17
VOCs	
Acetone	<0.0044 U
Tetrachloroethene (PCE)	<0.0022 U
Metals	
Barium	333
Chromium, Total	**78.5**
Copper	42.6
Lead	43.8
Mercury	<0.0345 U
Nickel	**43.8**
Silver	**4.57**
Zinc	107

Location	LSB-12	LSB-12
Sample Name	046_LSB-12_15-17	047_LSB-12_18-20
Sample Date	1/28/2022	1/28/2022
Sample Depth (fbfbs)	7-9	10-12
Sample Depth (fbsl)	15-17	18-20
VOCs		
Acetone	0.0065 J	0.025
Tetrachloroethene (PCE)	<0.0027 U	0.035
Metals		
Barium	132	93
Chromium, Total	**39**	20.6
Copper	33.9	20
Lead	17.4	25.9
Mercury	<0.034 U	<0.0362 U
Nickel	27.8	16.8
Silver	1.33	1.05
Zinc	68.5	48.7

Location	LSB-15	LSB-15
Sample Name	058_LSB-15_15-17	057_DUP_4
Sample Date	2/1/2022	2/1/2022
Sample Depth (fbfbs)	9-11	9-11
Sample Depth (fbsl)	15-17	15-17
VOCs		
Acetone	0.0094	0.0088
Tetrachloroethene (PCE)	<0.0019 U	<0.002 U
Metals		
Barium	91.6	70.9
Chromium, Total	26.4	25.7
Copper	24	19.7
Lead	8.21	9.46
Mercury	<0.0355 U	<0.0352 U
Nickel	29	25.7
Silver	1	0.904
Zinc	43.6	37.4

Location	LB-03	LB-03
Sample Name	004_LB-3_0-2	005_LB-3_7-9
Sample Date	11/9/2021	11/9/2021
Sample Depth (fbfbs)	0-2	7-9
Sample Depth (fbsl)	9.5-11.5	16.5-18.5
VOCs		
Acetone	<0.0051 U	<0.0046 U
Tetrachloroethene (PCE)	<0.0026 U	<0.0023 U
Metals		
Barium	166	60.2
Chromium, Total	25.5	17.3
Copper	**53.8**	20.3
Lead	**303**	32.6
Mercury	0.101	<0.0381 U
Nickel	26.8	18.4
Silver	0.862	<0.577 U
Zinc	**287**	42.5

Location	LSB-11	LSB-11
Sample Name	042_LSB-11_0-2	043_LSB-11_2-4
Sample Date	1/25/2022	1/25/2022
Sample Depth (fbfbs)	0-2	2-4
Sample Depth (fbsl)	8-10	10-12
VOCs		
Acetone	<0.0038 U	**0.085**
Tetrachloroethene (PCE)	<0.0019 U	<0.0023 U
Metals		
Barium	50.3	48.9
Chromium, Total	21.9	20
Copper	20.8	17.3
Lead	9.54	8.44
Mercury	<0.0343 U	0.0932
Nickel	20.7	16.6
Silver	<0.572 U	<0.621 U
Zinc	33.3	26.5

Location	LB-05	LB-05
Sample Name	018_LB-05_6.5-8_20211110	019_LB-05_8-9_20211110
Sample Date	11/10/2021	11/10/2021
Sample Depth (fbfbs)	6.5-8	8-9
Sample Depth (fbsl)	16-17.5	17.5-18.5
VOCs		
Acetone	0.017	0.0069 J
Tetrachloroethene (PCE)	<0.0015 U	<0.0021 U
Metals		
Barium	116	**451**
Chromium, Total	**50.7**	**140**
Copper	38.4	**50.7**
Lead	32	18
Mercury	<0.0371 U	<0.0385 U
Nickel	**44.4**	**65.1**
Silver	<0.562 U	**3.19**
Zinc	69.4	**136**

Location	LB-08	LB-08	LB-08
Sample Name	001_LB-08_0-2	002_LB-08_7.5-9.5	003_DUP-1
Sample Date	11/9/2021	11/9/2021	11/9/2021
Sample Depth (fbfbs)	0-2	7.5-9.5	7.5-9.5
Sample Depth (fbsl)	9.5-11.5	17-19	17-19
VOCs			
Acetone	<0.0058 U	<0.0045 U	<0.0046 U
Tetrachloroethene (PCE)	<0.0029 U	<0.0023 U	<0.0023 U
Metals			
Barium	228	111	116
Chromium, Total	21.2	**32.8**	**34**
Copper	29.4	29.8	28.2
Lead	**474**	8.78	8.43
Mercury	<0.0364 U	<0.0377 U	<0.0383 U
Nickel	20.2	**32.6**	**35.3**
Silver	0.617	1.2	1.08
Zinc	**247**	62.5	62.4

Location	LB-04	LB-04
Sample Name	016_LB-04_0-2_20211110	017_LB-04_6.5-7.5_20211110
Sample Date	11/10/2021	11/10/2021
Sample Depth (fbfbs)	0-2	6.5-7.5
Sample Depth (fbsl)	9.5-11.5	16-17
VOCs		
Acetone	<0.0053 U	<0.0045 U
Tetrachloroethene (PCE)	<0.0026 U	<0.0023 U
Metals		
Barium	128	68.3
Chromium, Total	23.9	19.6
Copper	25.6	22
Lead	33	6.64
Mercury	<0.0398 U	<0.0378 U
Nickel	20.8	**44.4**
Silver	0.757	<0.573 U
Zinc	43.7	59.3

Location	LSB-14
Sample Name	056_LSB-14_15-17
Sample Date	2/1/2022
Sample Depth (fbfbs)	9-11
Sample Depth (fbsl)	15-17
VOCs	
Acetone	0.005 J
Tetrachloroethene (PCE)	<0.002 U
Metals	
Barium	131
Chromium, Total	**42.2**
Copper	35.6
Lead	10.1
Mercury	<0.0345 U
Nickel	**36.7**
Silver	1.79
Zinc	60.9

Location	LSB-10	LSB-10	LSB-10
Sample Name	039_LSB-10_0-2	040_DUP-1	041_LSB-10_4-6
Sample Date	1/25/2022	1/25/2022	1/25/2022
Sample Depth (fbfbs)	0-2	0-2	4-6
Sample Depth (fbsl)	8-10	8-10	12-14
VOCs			
Acetone	0.0083 J	0.011	0.0042 J
Tetrachloroethene (PCE)	<0.0022 U	<0.0024 U	<0.002 U
Metals			
Barium	68.8	82.9	50.3
Chromium, Total	17.9	14.7	17.3
Copper	13	12.2	28
Lead	37	41.4	7.33
Mercury	<0.0351 U	**0.269**	<0.0337 U
Nickel	12.1	11.1	25.3
Silver	<0.585 U	<0.614 U	<0.561 U
Zinc	35.5	47.7	35.6

Location	LSB-9	LSB-9
Sample Name	037_LSB-9_0-2	038_LSB-9_4-6
Sample Date	1/25/2022	1/25/2022
Sample Depth (fbfbs)	0-2	4-6
Sample Depth (fbsl)	8-10	12-14
VOCs		
Acetone	<0.0048 U	<0.0043 U
Tetrachloroethene (PCE)	<0.0024 U	<0.0021 U
Metals		
Barium	161	89.5
Chromium, Total	**35.2**	24.3
Copper	38.5	27.7
Lead	15.3	7.3
Mercury	<0.0378 U	<0.0343 U
Nickel	**36.2**	**34.8**
Silver	0.944	<0.571 U
Zinc	72.5	49.5

LEGEND

- APPROXIMATE SITE BOUNDARY
- No. 2 FUEL OIL AST LOCATION
- DYE AND DRY CLEANING HISTORICAL SITE USE
- SB-3 — PREVIOUS SOIL BORING LOCATION AND ID
- SG-2 — PREVIOUS SOIL GAS LOCATION AND ID
- LB-01/MW-01 — SOIL BORING AND MONITORING WELL LOCATION AND ID
- LB-04 — SOIL BORING LOCATION AND ID
- SV-01 — SOIL VAPOR LOCATION AND ID
- LB-01/MW-01 — SOIL BORING AND BEDROCK MONITORING WELL LOCATION AND ID
- ENVIRONMENTAL TEST PIT LOCATION

Analyte	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Protection of Groundwater SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs
VOCs			
Acetone	0.05	0.05	100
Tetrachloroethene (PCE)	1.3	1.3	19
Metals			
Barium	350	820	400
Chromium, Total	30	NS	180
Copper	50	1720	270
Lead	63	450	400
Mercury	0.18	0.73	0.81
Nickel	30	130	310
Silver	2	8.3	180
Zinc	109	2480	10000

Exceedance Summary:

10 - Result exceeds Unrestricted Use SCOs
10 - Result exceeds Protection of Groundwater SCOs
10 - Result exceeds Restricted Use Restricted-Residential SCOs

Notes:

mg/kg - milligram per kilogram
NA - Not analyzed
RL - Reporting limit
<RL - Not detected
Sample Depth (fbfbs) - sample depth in feet below former basement slab
Sample Depth (fbsl) - sample depth in feet below sidewalk level
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 Unrestricted Use, Protection of Groundwater, and Restricted Use Restricted-Residential Soil Cleanup Objectives (SCO).

Qualifiers:

D - The concentration reported is a result of a diluted sample.
J - The analyte was detected above the method detection limit (MDL), but below the reporting limit (RL); therefore, the result is an estimated concentration.
U - The analyte was analyzed for, but was not detected at a level greater than or equal to the RL; the value shown in the table is the RL.

GENERAL NOTES:

1. BASE MAP SOURCE: PROPERTY SURVEY BY HAYNES LAND SURVEYORS OF SYOSSET, NY (DATED SEPTEMBER 14, 2015)
2. SAMPLING LOCATIONS ARE APPROXIMATE.
3. NC – NOT COMPLETED
4. VERTICAL ELEVATION DATUM: NATIONAL VERTICAL DATUM OF 1988 (NAVD88)
5. PREVIOUS SOIL BORING AND SOIL GAS LOCATIONS SAMPLED DURING THE CIDER PHASE II ESA.

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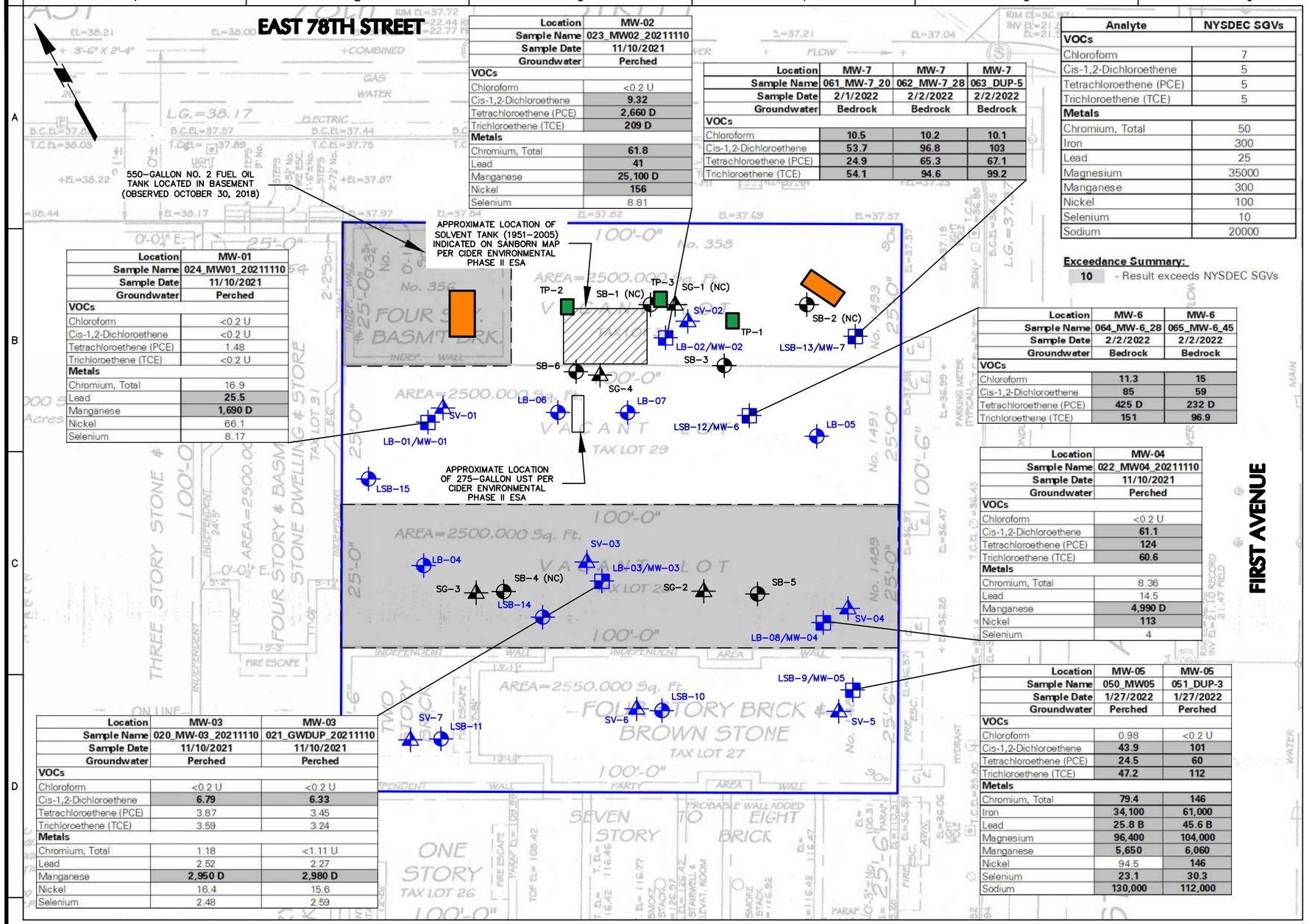
NJ Certificate of Authorization No.24GA27996400

Project
1487 FIRST AVENUE
BLOCK No. 1452, LOT No.27
MANHATTAN
NEW YORK NEW YORK

Drawing Title
HISTORICAL SOIL ANALYTICAL RESULTS

Project No.	Drawing No.
100963701	3
Date 2/24/2022	
Drawn By GCW	
Checked By MSR	

Filename: \\langan.com\data\PAR\data7\100963701\Project Data\CAD\01\SheetFiles\Figure 1 - Soil Analytical Results.dwg Date: 3/4/2022 Time: 12:51 User: ibaker Style Table: Langan.stb Layout: ANSIB-BL



Location	MW-01
Sample Name	024_MW01_20211110
Sample Date	11/10/2021
Groundwater	Perched
VOCs	
Chloroform	<0.2 U
Cis-1,2-Dichloroethene	<0.2 U
Tetrachloroethene (PCE)	1.48
Trichloroethene (TCE)	<0.2 U
Metals	
Chromium, Total	16.9
Lead	**25.5**
Manganese	**1,690 D**
Nickel	66.1
Selenium	8.17

Location	MW-02
Sample Name	023_MW02_20211110
Sample Date	11/10/2021
Groundwater	Perched
VOCs	
Chloroform	<0.2 U
Cis-1,2-Dichloroethene	**9.32**
Tetrachloroethene (PCE)	**2,660 D**
Trichloroethene (TCE)	**209 D**
Metals	
Chromium, Total	**61.8**
Lead	**41**
Manganese	**25,100 D**
Nickel	**156**
Selenium	8.81

Location	MW-03	MW-03
Sample Name	020_MW-03_20211110	021_GWDUP_20211110
Sample Date	11/10/2021	11/10/2021
Groundwater	Perched	Perched
VOCs		
Chloroform	<0.2 U	<0.2 U
Cis-1,2-Dichloroethene	**6.79**	**6.33**
Tetrachloroethene (PCE)	3.87	3.45
Trichloroethene (TCE)	3.59	3.24
Metals		
Chromium, Total	1.18	<1.11 U
Lead	2.52	2.27
Manganese	**2,950 D**	**2,980 D**
Nickel	16.4	15.6
Selenium	2.48	2.59

Location	MW-7	MW-7	MW-7
Sample Name	061_MW-7_20	062_MW-7_28	063_DUP-5
Sample Date	2/1/2022	2/2/2022	2/2/2022
Groundwater	Bedrock	Bedrock	Bedrock
VOCs			
Chloroform	**10.5**	**10.2**	**10.1**
Cis-1,2-Dichloroethene	**53.7**	**96.8**	**103**
Tetrachloroethene (PCE)	**24.9**	**65.3**	**67.1**
Trichloroethene (TCE)	**54.1**	**94.6**	**99.2**

Analyte	NYSDEC SGVs
VOCs	
Chloroform	7
Cis-1,2-Dichloroethene	5
Tetrachloroethene (PCE)	5
Trichloroethene (TCE)	5
Metals	
Chromium, Total	50
Iron	300
Lead	25
Magnesium	35000
Manganese	300
Nickel	100
Selenium	10
Sodium	20000

Exceedance Summary:

10 - Result exceeds NYSDEC SGVs

Location	MW-6	MW-6
Sample Name	064_MW-6_28	065_MW-6_45
Sample Date	2/2/2022	2/2/2022
Groundwater	Bedrock	Bedrock
VOCs		
Chloroform	**11.3**	**15**
Cis-1,2-Dichloroethene	**85**	**59**
Tetrachloroethene (PCE)	**425 D**	**232 D**
Trichloroethene (TCE)	**151**	**96.9**

Location	MW-04
Sample Name	022_MW04_20211110
Sample Date	11/10/2021
Groundwater	Perched
VOCs	
Chloroform	<0.2 U
Cis-1,2-Dichloroethene	**61.1**
Tetrachloroethene (PCE)	**124**
Trichloroethene (TCE)	**60.6**
Metals	
Chromium, Total	8.36
Lead	14.5
Manganese	**4,990 D**
Nickel	**113**
Selenium	4

Location	MW-05	MW-05
Sample Name	050_MW05	051_DUP-3
Sample Date	1/27/2022	1/27/2022
Groundwater	Perched	Perched
VOCs		
Chloroform	0.98	<0.2 U
Cis-1,2-Dichloroethene	**43.9**	**101**
Tetrachloroethene (PCE)	**24.5**	**60**
Trichloroethene (TCE)	**47.2**	**112**
Metals		
Chromium, Total	**79.4**	**146**
Iron	**34,100**	**61,000**
Lead	**25.8 B**	**45.6 B**
Magnesium	**96,400**	**104,000**
Manganese	**5,650**	**6,060**
Nickel	94.5	**146**
Selenium	**23.1**	**30.3**
Sodium	**130,000**	**112,000**

LEGEND

- APPROXIMATE SITE BOUNDARY
- No. 2 FUEL OIL AST LOCATION
- DYE AND DRY CLEANING HISTORICAL SITE USE
- SB-3 — PREVIOUS SOIL BORING LOCATION AND ID
- SG-2 — PREVIOUS SOIL GAS LOCATION AND ID
- LB-01/MW-01 — SOIL BORING AND MONITORING WELL LOCATION AND ID
- LB-04 — SOIL BORING LOCATION AND ID
- SV-01 — SOIL VAPOR LOCATION AND ID
- LB-01/MW-01 — SOIL BORING AND BEDROCK MONITORING WELL LOCATION AND ID
- ENVIRONMENTAL TEST PIT LOCATION

Notes:

ug/l - microgram per liter
NA - Not analyzed
RL - Reporting limit
<RL - Not detected
Groundwater 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 703.5 and the NYSDEC Technical and Operational Guidance Series (TOGS) 1.1.1 Ambient Water Quality Standards and Guidance Values for Class GA Water (herein collectively referenced as

Qualifiers:

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U - The analyte was analyzed for, but was not detected at a level greater than or equal to the RL; the value shown in the table is the RL.

GENERAL NOTES:

1. BASE MAP SOURCE: PROPERTY SURVEY BY HAYNES LAND SURVEYORS OF SYOSSET, NY (DATED SEPTEMBER 14, 2015)
2. SAMPLING LOCATIONS ARE APPROXIMATE.
3. NC – NOT COMPLETED
4. VERTICAL ELEVATION DATUM: NATIONAL VERTICAL DATUM OF 1988 (NAVD88)
5. PREVIOUS SOIL BORING AND SOIL GAS LOCATIONS SAMPLED DURING THE CIDER PHASE II ESA.

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NJ Certificate of Authorization No.24GA27996400

Project
1487 FIRST AVENUE REDEVELOPMENT SITE
BLOCK No. 1452, LOT No.27
MANHATTAN
NEW YORK NEW YORK

Drawing Title
HISTORICAL GROUNDWATER ANALYTICAL RESULTS

Project No.	Drawing No.
100963701	4
Date 2/24/2022	
Drawn By GCW	
Checked By MSR	

Filename: \\langan.com\data\PAR\data7\100963701\Project Data\CAD\01\SheetFiles\Figures\Figure 2 - Groundwater Analytical Results.dwg Date: 3/4/2022 Time: 12:53 User: ibaker Style Table: Langan.stb Layout: ANSIB-BL

EAST 78TH STREET

Location	SV-01	SV-01
Sample Name	027_SV-01_20211110	026_SVDUP_20211110
Sample Date	11/10/2021	11/10/2021
VOCs		
Cis-1,2-Dichloroethene	<0.349 U	<0.289 U
Tetrachloroethene (PCE)	4.78 D	4.65 D
Trichloroethene (TCE)	0.663 D	0.627 D

550-GALLON NO. 2 FUEL OIL TANK LOCATED IN BASEMENT (OBSERVED OCTOBER 30, 2018)

APPROXIMATE LOCATION OF SOLVENT TANK (1951–2005) INDICATED ON SANBORN MAP PER CIDER ENVIRONMENTAL PHASE II ESA

FORMER LOCATION OF DYE AND DRY CLEANING FACILITY (1920–2005) PER CIDER ENVIRONMENTAL PHASE II ESI

APPROXIMATE LOCATION OF 275-GALLON UST PER CIDER ENVIRONMENTAL PHASE II ESA

Location	SV-02
Sample Name	025_SV-02_20211110
Sample Date	11/10/2021
VOCs	
Cis-1,2-Dichloroethene	**6.44 D**
Tetrachloroethene (PCE)	**8,610 D**
Trichloroethene (TCE)	**489 D**

Location	SV-03
Sample Name	028_SV-03_20211110
Sample Date	11/10/2021
VOCs	
Cis-1,2-Dichloroethene	<0.382 U
Tetrachloroethene (PCE)	8.5 D
Trichloroethene (TCE)	0.518 D

Location	SV-04
Sample Name	029_SV-04_20211110
Sample Date	11/10/2021
VOCs	
Cis-1,2-Dichloroethene	<1.2 U
Tetrachloroethene (PCE)	13.2 D
Trichloroethene (TCE)	<0.815 U

Location	SV-5
Sample Name	033_SV-5
Sample Date	01/25/2022
VOCs	
Cis-1,2-Dichloroethene	<0.793 U
Tetrachloroethene (PCE)	3.68
Trichloroethene (TCE)	<1.07 U

Location	SV-7	SV-7
Sample Name	035_SV-7	036_DUP-2
Sample Date	01/25/2022	01/25/2022
VOCs		
Cis-1,2-Dichloroethene	<0.793 U	<0.793 U
Tetrachloroethene (PCE)	1.95	1.95
Trichloroethene (TCE)	<1.07 U	<1.07 U

Location	SV-6
Sample Name	034_SV-6
Sample Date	01/25/2022
VOCs	
Cis-1,2-Dichloroethene	<0.793 U
Tetrachloroethene (PCE)	2.62
Trichloroethene (TCE)	<1.07 U

FIRST AVENUE

LEGEND

- APPROXIMATE SITE BOUNDARY
- No. 2 FUEL OIL AST LOCATION
- DYE AND DRY CLEANING HISTORICAL SITE USE
- SB-3 — PREVIOUS SOIL BORING LOCATION AND ID
- SG-2 — PREVIOUS SOIL GAS LOCATION AND ID
- LB-01/MW-01 — SOIL BORING AND MONITORING WELL LOCATION AND ID
- LB-04 — SOIL BORING LOCATION AND ID
- SV-01 — SOIL VAPOR LOCATION AND ID
- LB-01/MW-01 — SOIL BORING AND BEDROCK MONITORING WELL LOCATION AND ID
- ENVIRONMENTAL TEST PIT LOCATION

Notes:
SV - Soil Vapor
ug/m3 - microgram per cubic meter
NA - Not analyzed
RL - Reporting limit
<RL - Not detected
Soil vapor sample analytical results are compared to the minimum soil vapor concentrations at which mitigation is recommended as set forth in the New York State Department of Health (NYSDOH) October 2006 Guidance for Evaluating Soil Vapor Intrusion in the State of New York Decision Matrices for Sub-Slab Vapor and Indoor Air and subsequent updates (2017).

Qualifiers:
D - The concentration reported is a result of a diluted sample.
J - The analyte was detected above the method detection limit (MDL), but below the reporting limit (RL); therefore, the result is an estimated concentration.
U - The analyte was analyzed for, but was not detected at a level greater than or equal to the RL; the value shown in the table is the RL.

Analyte	NYSDOH Decision Matrices Minimum Concentrations
VOCs	
Cis-1,2-Dichloroethene	6
Tetrachloroethene (PCE)	100
Trichloroethene (TCE)	6

Exceedance Summary:

10 - Result exceeds NYSDOH Decision Matrices Minimum Concentrations

GENERAL NOTES:

1. BASE MAP SOURCE: PROPERTY SURVEY BY HAYNES LAND SURVEYORS OF SYOSSET, NY (DATED SEPTEMBER 14, 2015)
2. SAMPLING LOCATIONS ARE APPROXIMATE.
3. NC – NOT COMPLETED
4. VERTICAL ELEVATION DATUM: NATIONAL VERTICAL DATUM OF 1988 (NAVD88)
5. PREVIOUS SOIL BORING AND SOIL GAS LOCATIONS SAMPLED DURING THE CIDER PHASE II ESA.

20 0 5 10 20
SCALE IN FEET

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Project
1487 FIRST AVENUE REDEVELOPMENT SITE
BLOCK No. 1452, LOT No.27
MANHATTAN
NEW YORK NEW YORK

Drawing Title
HISTORICAL SOIL VAPOR ANALYTICAL RESULTS

Project No.	100963701
Date	2/24/2022
Drawn By	GCW
Checked By	MSR

Drawing No. 5

Filename: \\langan.com\data\PAR\data7\100963701\Project Data\CAD\01\SheetFiles\Figures\Figure 3 - Soil Vapor Analytical Results.dwg Date: 3/4/2022 Time: 12:52 User: ibaker Style Table: Langan.stb Layout: ANSIB-BL

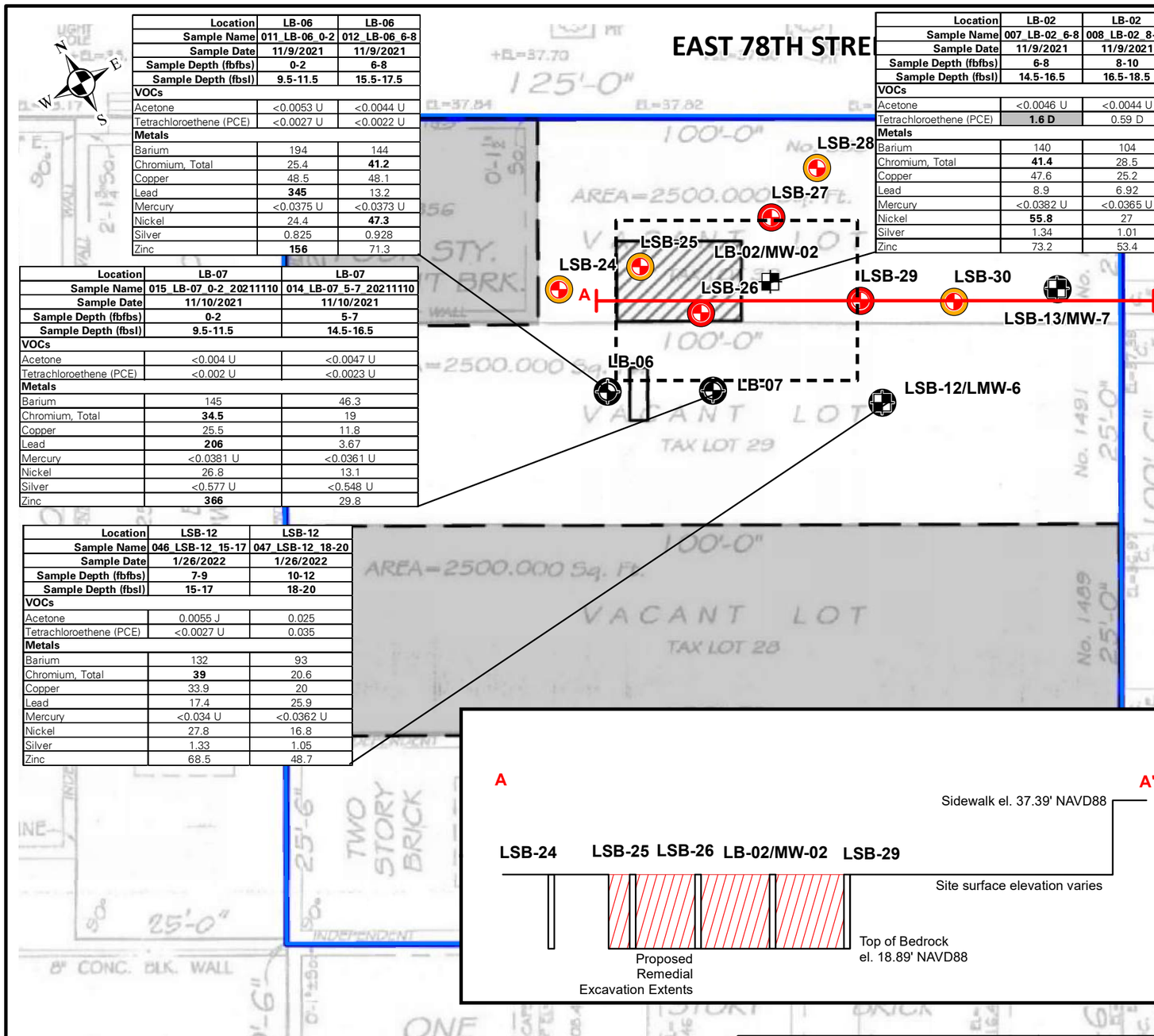
Location	LB-06	LB-06
Sample Name	011_LB-06_0-2	012_LB-06_6-8
Sample Date	11/9/2021	11/9/2021
Sample Depth (fbfbs)	0-2	6-8
Sample Depth (fbsl)	9.5-11.5	15.5-17.5
VOCs		
Acetone	<0.0053 U	<0.0044 U
Tetrachloroethene (PCE)	<0.0027 U	<0.0022 U
Metals		
Barium	194	144
Chromium, Total	25.4	**41.2**
Copper	48.5	48.1
Lead	**345**	13.2
Mercury	<0.0375 U	<0.0373 U
Nickel	24.4	**47.3**
Silver	0.825	0.928
Zinc	**156**	71.3

Location	LB-07	LB-07
Sample Name	015_LB-07_0-2_20211110	014_LB-07_5-7_20211110
Sample Date	11/10/2021	11/10/2021
Sample Depth (fbfbs)	0-2	5-7
Sample Depth (fbsl)	9.5-11.5	14.5-16.5
VOCs		
Acetone	<0.004 U	<0.0047 U
Tetrachloroethene (PCE)	<0.002 U	<0.0023 U
Metals		
Barium	145	46.3
Chromium, Total	**34.5**	19
Copper	25.5	11.8
Lead	**206**	3.67
Mercury	<0.0381 U	<0.0361 U
Nickel	26.8	13.1
Silver	<0.577 U	<0.548 U
Zinc	**366**	29.8

Location	LSB-12	LSB-12
Sample Name	046_LSB-12_15-17	047_LSB-12_18-20
Sample Date	1/26/2022	1/26/2022
Sample Depth (fbfbs)	7-9	10-12
Sample Depth (fbsl)	15-17	18-20
VOCs		
Acetone	0.0055 J	0.025
Tetrachloroethene (PCE)	<0.0027 U	0.035
Metals		
Barium	132	93
Chromium, Total	**39**	20.6
Copper	33.9	20
Lead	17.4	25.9
Mercury	<0.034 U	<0.0362 U
Nickel	27.8	16.8
Silver	1.33	1.05
Zinc	68.5	48.7

Location	LB-02	LB-02
Sample Name	007_LB-02_6-8	008_LB-02_8-10
Sample Date	11/9/2021	11/9/2021
Sample Depth (fbfbs)	6-8	8-10
Sample Depth (fbsl)	14.5-16.5	16.5-18.5
VOCs		
Acetone	<0.0046 U	<0.0044 U
Tetrachloroethene (PCE)	**1.6 D**	0.59 D
Metals		
Barium	140	104
Chromium, Total	**41.4**	28.5
Copper	47.6	25.2
Lead	8.9	6.92
Mercury	<0.0382 U	<0.0365 U
Nickel	**55.8**	27
Silver	1.34	1.01
Zinc	73.2	53.4

Location	MW-02
Sample Name	023_MW02_20211110
Sample Date	11/10/2021
Groundwater	Perched
VOCs	
Chloroform	<0.2 U
Cis-1,2-Dichloroethene	**9.32**
Tetrachloroethene (PCE)	**2,660 D**
Trichloroethene (TCE)	**209 D**
Metals	
Chromium, Total	**61.8**
Lead	**41**
Manganese	**25,100 D**
Nickel	**156**
Selenium	8.81



LEGEND

- SITE BOUNDARY
- MINIMUM REMEDIAL EXCAVATION EXTENTS *
- PROPOSED DELINEATION SOIL BORING LOCATION
- 2021/2022 PHASE II SOIL BORING LOCATION (LANGAN)
- 2021/2022 PHASE II SOIL BORING AND MONITORING WELL LOCATION (LANGAN)
- CONTINGENT DELINEATION SAMPLE
- DELINEATION SAMPLE
- DELINEATION

*IF REMEDIAL EXCAVATION EXTENTS ARE HINDERED BY DEMOLITION OPERATIONS, THE REMAINING REMEDIAL EXCAVATION WILL BE COMPLETED IN ACCORDANCE WITH THE FORTHCOMING RAWP.

Analyte	NYSDEC SGVs
VOCs	
Chloroform	7
Cis-1,2-Dichloroethene	5
Tetrachloroethene (PCE)	5
Trichloroethene (TCE)	5
Metals	
Chromium, Total	50
Iron	300
Lead	25
Magnesium	35000
Manganese	300
Nickel	100
Selenium	10
Sodium	20000

Exceedance Summary:

10 - Result exceeds NYSDEC SGVs

Analyte	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Protection of Groundwater SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs
VOCs			
Acetone	0.05	0.05	100
Tetrachloroethene (PCE)	1.3	1.3	19
Metals			
Barium	350	820	400
Chromium, Total	30	NS	180
Copper	50	1720	270
Lead	63	450	400
Mercury	0.18	0.73	0.81
Nickel	30	130	310
Silver	2	8.3	180
Zinc	109	2480	10000

Exceedance Summary:

10 - Result exceeds Unrestricted Use SCOs

10 - Result exceeds Protection of Groundwater SCOs

10 - Result exceeds Restricted Use Restricted-Residential SCOs

NOTES:
1. BASE MAP SOURCE: PROPERTY SURVEY BY HAYNES LAND SURVEYORS OF SYOSSET, NY (DATED SEPTEMBER 14, 2015)
2. SAMPLING LOCATIONS ARE APPROXIMATE.
3. VERTICAL ELEVATION DATUM: NATIONAL VERTICAL DATUM OF 1988 (NAVD88)
4. 2021/2022 SAMPLES LOCATIONS AS PRESENTED IN THE 2022 LANGAN PHASE II EI REPORT.

15 0 15
SCALE IN FEET

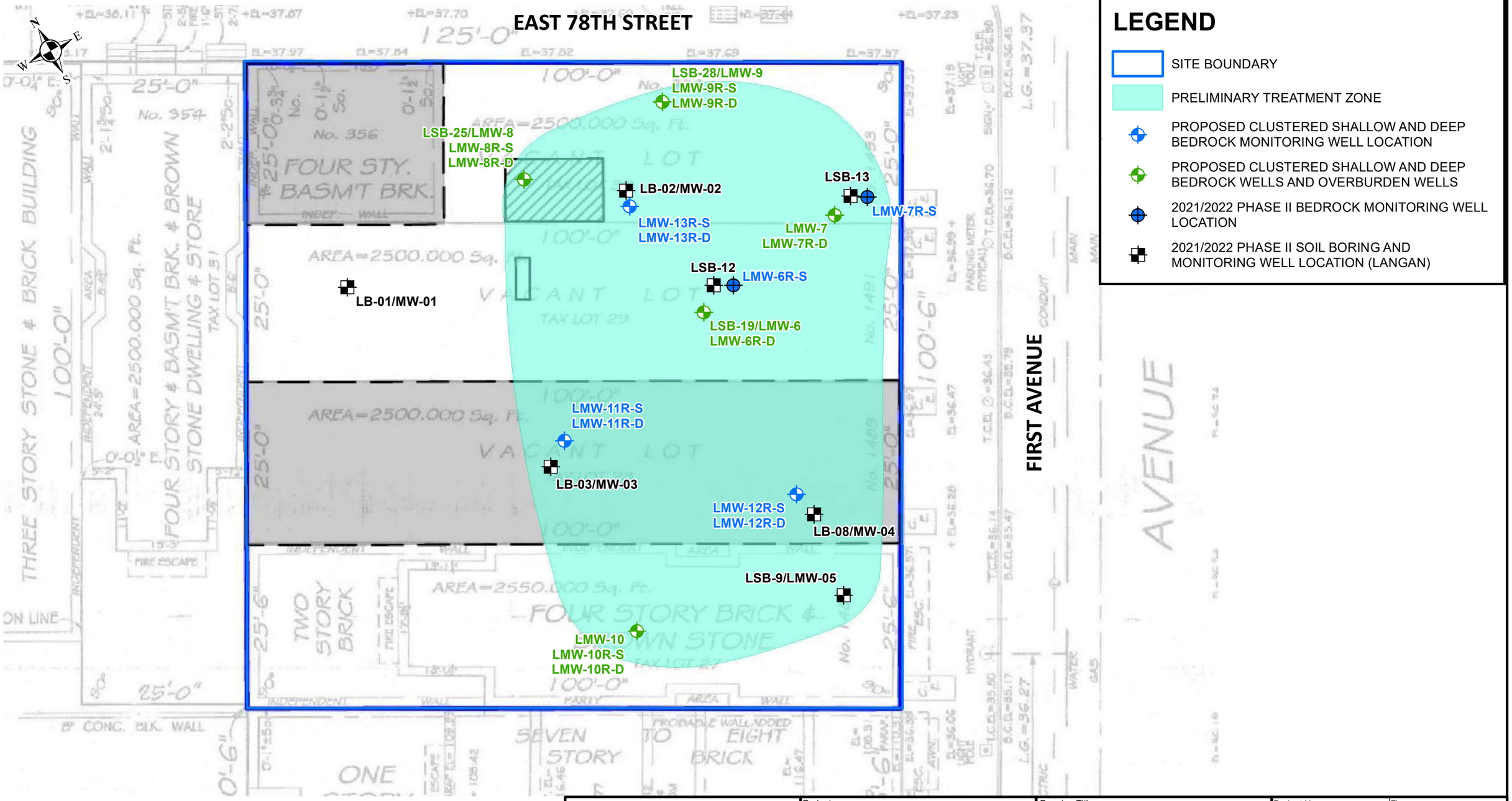
LANGAN
300 Kimball Drive
Parsippany, NJ 07054
T: 973.560.4900 F: 973.560.4901 www.langan.com
Langan Engineering & Environmental Services, Inc.
Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.
Langan International LLC
Collectively known as Langan
NJ CERTIFICATE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

Project
1487 FIRST AVENUE REDEVELOPMENT SITE
BLOCK No. 1452, LOT No. 27
MANHATTAN
NEW YORK NEW YORK

Drawing Title
PROPOSED REMEDIAL EXCAVATION EXTENTS

Project No.	Figure
100963701	6
Date: 10/20/2022	
Scale: 1 " = 15 '	
Drawn By: IHB	

Path: \\langan.com\data\PAR\data7\100963701\Project Data\ArcGIS\MXD\Environmental_Figures\2022-07 DEC Submission\Figure 6 - Proposed Remedial Excavation Extents.mxd Date: 10/20/2022 User: jrosol Time: 10:05:48 AM



NOTES:
1. BASE MAP SOURCE: PROPERTY SURVEY BY HAYNES LAND SURVEYORS OF SYOSSET, NY (DATED SEPTEMBER 14, 2015)
2. SAMPLING LOCATIONS ARE APPROXIMATE.
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4. 2021/2022 SAMPLES LOCATIONS AS PRESENTED IN THE 2022 LANGAN PHASE II EI REPORT.

15 0 15
SCALE IN FEET

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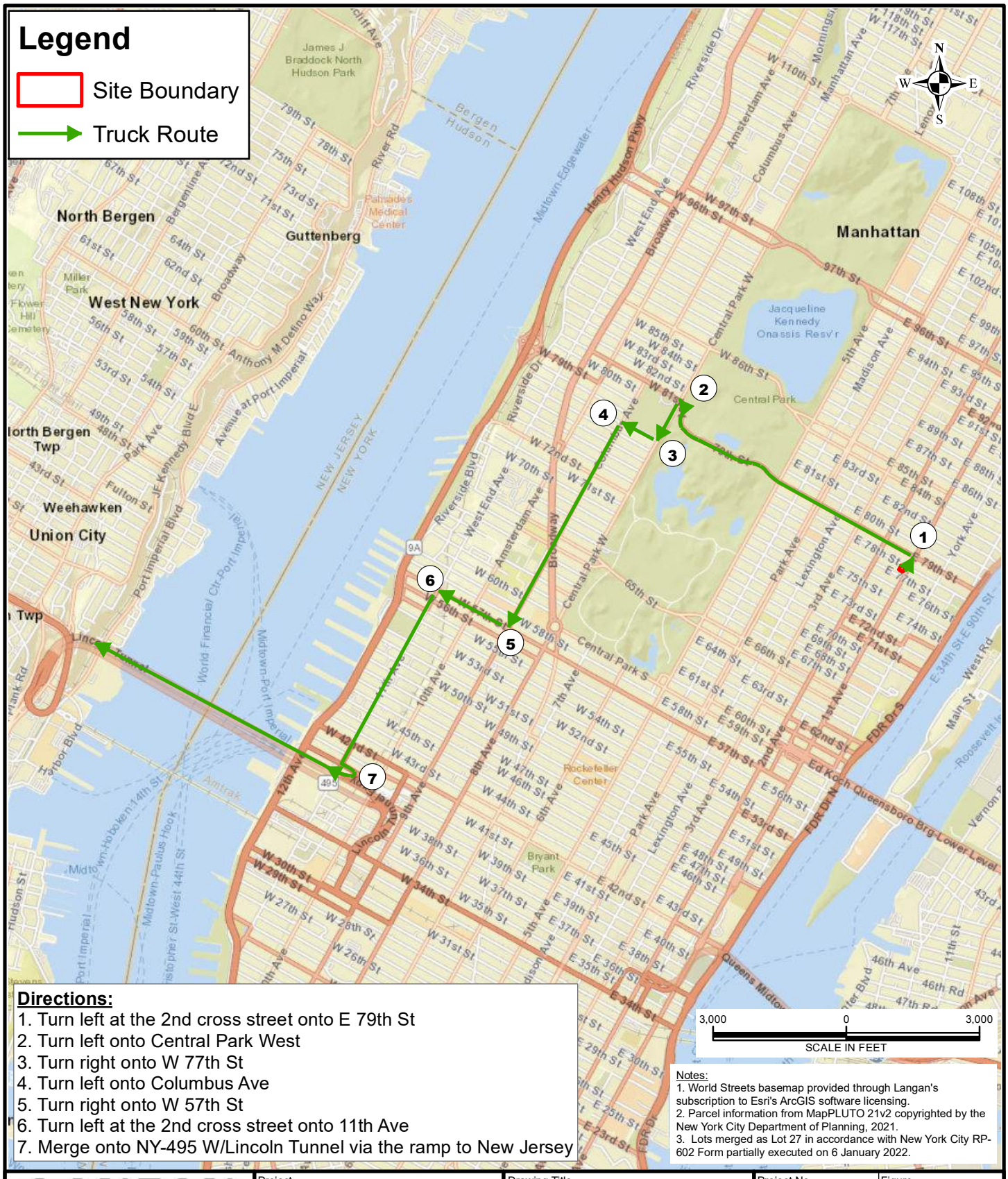
Project
1487 FIRST AVENUE REDEVELOPMENT SITE
BLOCK No. 1452, LOT No. 27
MANHATTAN
NEW YORK NEW YORK

Drawing Title
PRELIMINARY TREATMENT ZONE

Project No. 100963701	Figure 7
Date 3/16/2022	
Scale 1 " = 15 '	
Drawn By IHB	

Path: \\langan.com\data\PAR\data7\100963701\Project Data\ArcGIS\MXD\Environmental_Figures\2022-01\10.5\Figure 6 - Preliminary Treatment Zone.mxd Date: 3/16/2022 User: ibaker Time: 2:11:32 PM



Directions:

1. Turn left at the 2nd cross street onto E 79th St
2. Turn left onto Central Park West
3. Turn right onto W 77th St
4. Turn left onto Columbus Ave
5. Turn right onto W 57th St
6. Turn left at the 2nd cross street onto 11th Ave
7. Merge onto NY-495 W/Lincoln Tunnel via the ramp to New Jersey

Notes:
1. World Streets basemap provided through Langan's subscription to Esri's ArcGIS software licensing.
2. Parcel information from MapPLUTO 21v2 copyrighted by the New York City Department of Planning, 2021.
3. Lots merged as Lot 27 in accordance with New York City RP-602 Form partially executed on 6 January 2022.

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Project
1487 FIRST AVENUE REDEVELOPMENT SITE
BLOCK No. 1452, LOT No. 27
MANHATTAN NEW YORK

Drawing Title
TRUCK ROUTE MAP

Project No.	100805201
Date	3/16/2022
Scale	1 " = 3,000 '
Drawn By	IHB
Figure	8

Path: \\langan.com\data\PAR\data7\100963701\Project Data\ArcGIS\MXD\Environmental_Figures\2021-12\10.5\Figure 6 - Truck Route Map.mxd Date: 3/16/2022 User: ibaker Time: 2:25:18 PM

APPENDIX A

CONSTRUCTION HEALTH AND SAFETY PLAN

LANGAN

CONSTRUCTION HEALTH AND SAFETY PLAN

for

1487 First Avenue
New York, New York

Prepared For:

CP VII 78th Street Owner, LLC
805 Third Avenue, 20th Floor
New York, New York 10022

Prepared By:

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

March 2022
Revised October 2022
100963701

ENVIRONMENTAL HEALTH AND SAFETY PLAN

Client:	**CP VII 78th Street Owner, LLC**
Project:	**Remedial Investigation**
Location:	**1487 First Avenue, New York, NY**
Chemical Hazards:	**Chlorinated volatile organic compounds (VOCs), Semi-volatile organic compounds (SVOCs), Metals**
Prepared By:	**LANGAN ENGINEERING, ENVIRONMENTAL, SURVEYING, LANDSCAPE ARCHITECTURE AND GEOLOGY, D.P.C.**
Version:	**1**
Date:	**September 2022**

Client Contact:	**Kyle Becker**	**(212) 202-5794**
Langan Project Manager (PM):	**Amanda Forsburg**	**(973) 560-4900**
Langan Health & Safety Manager (HSM):	**Tony Moffa, CHMM**	**(215) 491-6545**
Langan Health and Safety Officer (HSO):	**Field Personnel**	
WorkCare:	**1-888-449-7787**	
Langan Incident/Injury Hotline:	**(973) 560-4699**	

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

APPROVALS

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

Amanda M. Forsburg	9/9/22
LANGAN Project Manager - PM (Amanda Forsburg)	Date
LANGAN Health and Safety Manager (Tony Moffa, CHMM)	Date
LANGAN Health and Safety Officer – HSO	Date

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LANGAN

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(Continued)

TABLE OF CONTENTS
(Continued)

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1.0 INTRODUCTION

1.1 Purpose and Policy

This Construction Health and Safety Plan (CHASP) has been developed to comply with the regulations under Occupational Safety and Health Administration (OSHA) 29 CFR 1910.120(b)(4), Hazardous Waste Operations and Emergency Response. It addresses foreseeable activities associated with the site work activities to be conducted at 1487 First Avenue (see Figure 1). This CHASP establishes personnel protection standards and mandatory safety practices and procedures. Additionally, it assigns responsibilities, establishes standard operating procedures, and provides for contingencies that may arise while operations are being conducted at known or suspected hazardous waste sites.

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

This CHASP covers construction-related field activities which have the potential to disturb and/or displace contaminated soil, soil vapor, and groundwater. These activities include, but are not limited to: excavation of contaminated soil and groundwater treatment injections.

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

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

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

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

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

Unsafe Conditions and Practices Form provided in Attachment C, a copy of which will be provided to the Langan Health and Safety Officer.

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

1.2 Site Description

The Site is located in the Upper East Side neighborhood of Manhattan, New York and is identified as Lots 27, 28, 29, and 30 (to be merged as Tentative Lot 27 in accordance with the New York City RP-602 Form partially executed on 6 January 2022). A Site Location Plan is provided as Figure 1. The Site is an approximately 10,050-square foot parcel bordered by the four-story 354 East 78th Street building to the west, East 78th Street to the north, 1st Avenue to the east, and the nine-story 1485 1st Avenue building to the south. The Site is currently occupied by two four-story vacant buildings in the southern and northwestern portions of the site. The remaining portions of the site consist of vacant land with the former building basements that have been partially backfilled with demolition debris.

1.3 Scope of Work

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

- Task 1: In-Situ Groundwater Treatment;
- Task 2: Hot Spot Excavation;
- Task 3: Confirmation post excavation soil sampling;
- Task 4: Oversight and air monitoring during excavation activities;

Details of the scopes of work to be completed for this project are provided within the March 2022 Interim Remedial Measures Work Plan (IRMWP).

2.0 PROJECT TEAM ORGANIZATION AND RESPONSIBILITIES

This section specifies the Langan Project Organization.

2.1 Langan Project Manager

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

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

2.2 Health and Safety Manager (HSM)

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

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

2.3 Langan Health and Safety Officer (HSO)

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

- Participating in the development and implementation of this CHASP;
- Conducting Jobsite Safety Inspections (Attachment G) and correcting any shortcomings in a timely manner;
- Helping to select proper Personal Protective Equipment (PPE) and periodically inspecting it;
- Ensuring that PPE is properly stored and maintained;
- Controlling entry into and exit from the contaminated areas or zones of the site;
- Confirming each team member's suitability for work based on a current physician's recommendation;
- Monitoring the work parties for signs of stress, such as heat stress, fatigue, and cold exposure;
- Monitoring site hazards and conditions;
- Knowing (and ensuring that all site personnel also know) emergency procedures, evacuation routes, and the telephone numbers of the ambulance, local hospital, poison control center, fire department, and police department;
- Resolves conflicting situations which may arise concerning safety requirements and working conditions.
- Conducting daily tailgate meetings to review applicable Hazard Analyses (Table 3) as well as check-in with site personnel.

3.0 HAZARDS ANALYSIS

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

3.1 General Hazard Assessment

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

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

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

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

3.2 Chemical Exposure Hazards

The following chemical hazard evaluation for the proposed investigation activities is based on the previous environmental investigation of the site and typical compounds commonly associated with contaminated fill and historical dry cleaning operations. The evaluation has been conducted to identify chemicals/materials that potentially may be present at the site, and to ensure that

work activities, personnel protection, and emergency response are consistent with the specific contaminants that potentially could be encountered.

3.2.1 Specific Chemical Hazards Previously Detected at the Site

The March 2022 Phase II Environmental Site Investigation Report identified the presence contaminated fill material in addition to chlorinated VOCs in soil, groundwater (perched and bedrock), and soil vapor. Metals were also identified in soil and groundwater. Polycyclic aromatic hydrocarbons are commonly associated with the presence of historic urban fill and may also be present in soil and/or groundwater. Table 1 lists Contaminants of Concern and potentially affected media. Exposure limits for potential contaminants that might be encountered in the field are listed in Table 2.

3.2.2 Injection Reagent Hazards

Injection reagents that may be used at the site include SRS®-SD small droplet emulsified vegetable oil, zero valent iron (ZVI), SDC-9TM (bioaugmentation culture), and NutriPlusTM (nutrients). Safety data sheets (SDSs) for each reagent are provided in Attachment H.

3.2.3 Chemical Hazard Exposure Routes

Potential hazards and their exposure routes include:

- Inhalation of organic vapors due to the presence of volatile organic compounds in soil, groundwater, and soil vapor and from diesel-powered equipment and minimal volatilization potential related to the presence of SVOCs in soil.
- Inhalation of dust impacted with SVOCs or metals associated with soil borings and/or soil sampling activity.
- Inadvertent ingestion of potentially toxic substances via hand to mouth contact or deliberate ingestion of materials inadvertently contaminated with potentially toxic materials or injection reagents.
- Dermal exposure and possible percutaneous (skin) absorption of certain lipophilic (readily absorbed through the skin) SVOCs.
- Skin and eye contact with contaminants or injection reagents at the site and decontamination activities.

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

3.2.4 Control of Exposure to Chemical Hazards

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

3.3 Physical Hazards

3.3.1 Temperature Extremes

Hot Temperatures

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

Cold Temperatures

Workers may be exposed to the hazard of working in a cold environment. Potential hazards in cold environments include frostbite, trench foot or immersion foot, hypothermia, as well as slippery surfaces, brittle equipment, poor judgment, and unauthorized procedural changes. In order to prevent frostbite, hypothermia, trench foot and immersion foot, the workers are responsible for dressing warmly in layers with thick socks, gloves, and appropriate head and face gear. Upon the onset of discomfort due to the cold, onsite workers should take regular five to ten minute breaks to warm up inside nearby buildings and to drink warm fluids. Please note that the NYCDEP statute prohibits idling an engine for more than three minutes (one-minute if adjacent to a school). This statue includes the use of a vehicle for the purpose of warming up employees. As such, all contractors and employees shall identify a place to warm up in advance. If discomfort continues and the onsite workers start to exhibit the signs of

frostbite, hypothermia, trench foot or immersion foot, they should seek immediate medical attention.

3.3.2 Noise Resources

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

3.3.3 Hand and Power Tools

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

3.3.4 Slips, Trips, and Falls

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

3.3.5 Fire and Explosion

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

3.3.6 Material Handling

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

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

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

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

3.3.7 Confined Space/Excavation Hazards

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

3.3.8 Working Near Equipment

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

Equipment will be equipped with back up alarms.

3.3.9 Drill Rig Operations

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

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

The driller must never leave the controls while the tools are rotating unless all personnel are kept clear of rotating equipment. A remote sampling device must be used to sample drill cuttings if the tools are rotating or if the tools are readily capable of rotating. Samplers must not reach into or

near the rotating equipment. Drillers, helpers, and other field personnel must secure all loose clothing when in the vicinity of drilling operations. No person shall climb the drill mast while tools are rotating or without the use of ANSI-approved fall protection (approved belts, lanyards and a fall protection slide rail) or portable ladder that meets the requirement of the OSHA standard.

3.3.10 Electrical Safety

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

3.3.11 Utilities

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

3.3.12 Vehicular Traffic

Portions of site activities (load in and load out) will be conducted in the street. As such, vehicular and pedestrian traffic will be present. Appropriate precautions to protect the on-site workers and civilians should be used including the use of cones and traffic vests as appropriate.

3.4 Biological Hazards

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

3.4.1 Animals

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

3.4.2 Insects

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

3.4.3 Wound Care

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

3.5 Coronavirus

General Preventative Measures

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

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

Construction Trailers

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

Communication

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

Sick/Ill Workers

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

3.6 Task Hazard Analysis

The tasks to be completed during the proposed site work activities, as summarized in Section 1.3, are listed in Table 3 with a Hazard Analysis for each task. Chemical exposures may occur, as described in Table 1. For all tasks, if evidence of historical contamination is encountered other than what is anticipated as part of the intended investigation, work will be stopped and emergency contacts listed in Attachment D of this HASP will be immediately notified. Activities will be conducted in Level D, but personnel should be prepared to upgrade to Level C, as appropriate, based on field screening criteria.

3.6.1 Hot Spot Excavation

A minimum approximately 20-foot by 20-foot area will be excavated from the current ground surface (approximately 9-feet bsl) to the top of bedrock (approximately 18.5 feet bsl) for the removal of chlorinated VOCs in soil and perched groundwater in this contamination source area. A larger excavation may be completed based on the results of the delineation sampling. All soil removed from 14 feet bsl to the top of bedrock will be disposed of off-Site as hot spot chlorinated VOC source material.

3.6.2 In-Situ Chlorinated Volatile Organic Compound Treatment

Groundwater treatment with zero-valent iron (ZVI) and carbon substrate or other reagents via injection points will be completed.

3.6.3 Confirmation Post-Excavation Soil Sampling

Post-excavation soil samples will be collected from immediately above the bedrock interface to document the quality of the soil removed as part of the remedial excavation.

4.0 PERSONAL PROTECTIVE EQUIPMENT (PPE)

4.1 Levels of Protection

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

- **Level D Protection**

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

- **Level D Protection (Modified)**

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

- **Level C Protection**

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

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

4.2 Respirator Fit-Test

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

4.3 Respirator Cartridge Change-Out Schedule

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

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

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

5.0 AIR QUALITY MONITORING AND ACTIONS LEVELS

5.1 Monitoring During Site Operations

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

During site work involving disturbance of impacted soils, real time air monitoring will be conducted to assess the potential for exposure to airborne contaminants of concern including VOCs, chlorinated VOCs, SVOCs, and metals. A photoionization detector (PID) and/or flame ionization detector (FID) will be used to monitor concentrations of VOCs at personnel breathing-zone height to assess the potential exposure to petroleum related VOCs related to use of machinery including backhoes, drill rigs, compressors etc. Dust monitoring will be completed with an aerosol monitor. Air monitoring will be the responsibility of the Langan Health and Safety Officer or designee. Air monitoring will be conducted during intrusive activities. 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.

5.1.1 Volatile Organic Compounds

Monitoring with a PID, such as a MiniRAE 2000 (11.7v) or equivalent will occur during all intrusive activities. 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 at least every 30 minutes, or whenever there is any indication that concentrations may have changed (odors, visible gases, appearance of drill cuttings, etc.) since the last measurement. 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 workzone every 30 minutes in additional to the employee breathing zone. Instrument action levels for monitored gases are provided in Table 4.

5.1.2 Dust

The soil at the site is impacted with VOCs and metals and may contain SVOCs. The remnant demolition debris may also be impacted with these or other compounds. During invasive procedures that have the potential for creating airborne dust, real time air monitoring with an aerosol monitor, such as a Thermo MEI person DataRAM-1000 (pDR-1000) will occur. 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/m3 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. If dust is generated during disturbance activities, dust suppression methods will be employed to minimize potential for exposure. Action levels for dust monitoring are provided in Table 4.

5.1.3 Determination of Background Levels

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

5.2 Monitoring Equipment Calibration and Maintenance

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

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

5.3 Noise Monitoring

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

6.0 COMMUNITY HEALTH AND SAFETY CONSIDERATIONS

Community air monitoring will be conducted in compliance with the NYSDOH Generic CAMP provided as Appendix C of the IRMWP.

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

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

7.0 WORK ZONES AND DECONTAMINATION

7.1 Site Control

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

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

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

each soil boring, soil vapor sampling location, and groundwater monitoring well location but may be expanded based on the results of air monitoring or any other field conditions identified by the HSO. All personnel working in the EZ must have 40 hours HAZWOPER training and be enrolled in a medical monitoring program prior to conducting any site activities.

7.2 Contamination Control

7.2.1 Personnel Decontamination Station

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

7.2.2 Minimization of Contact with Contaminants

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

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

7.2.3 Personnel Decontamination Sequence

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

7.2.4 Emergency Decontamination

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

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

7.2.5 Hand-Held Equipment Decontamination

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

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

7.2.6 Heavy Equipment Decontamination

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

7.3 Communications

The following communications equipment will be utilized as appropriate.

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

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

8.0 MEDICAL SURVEILLANCE

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

9.0 EMERGENCY RESPONSE PLAN

This section establishes procedures and provides information for use during a project emergency. Emergencies happen unexpectedly and quickly, and require an immediate response; therefore, contingency planning and advanced training of staff is essential. Specific elements of emergency support procedures that are addressed in the following subsections include communications, local emergency support units, preparation for medical emergencies, first aid for injuries incurred on site, record keeping, and emergency site evacuation procedures. In case of emergency, in addition to 911 the Langan Incident/Injury Hotline (973-560-4699) should be called as soon as possible.

9.1 Responsibilities

9.1.1 Langan Health and Safety Officer (HSO)

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

9.1.2 Emergency Coordinator

For this project the Emergency Coordinator is the HSO.

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

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

9.1.3 Site Personnel

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

9.2 Communications

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

9.3 Local Emergency Support Units

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

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

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

A Hospital route map is provided as Figure 2.

9.4 Pre-Emergency Planning

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

9.5 Emergency Medical Treatment

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

First Aid Kit:	Vehicles
Emergency Eye Wash:	Vehicles

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

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

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

Nearest hospital: **New York Presbyterian Hospital**
520 East 70th Street
New York, NY 10021
(212) 746-5454
(directions from site to hospital found on Figure 2)

9.6 Non-Emergency Medical Treatment

In case of injury to personnel, which is not a medical emergency the employee will contact WorkCare at (1-888-449-7787). WorkCare provides access 24 hours / 7 days a week to experienced occupational health nurses and physicians who confer with employees at the onset of a work-related injury or illness. WorkCare will provide over the phone injury treatment or direct employees to medical treatment by third party provider, if appropriate.

9.7 Emergency Site Evacuation Routes and Procedures

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

9.8 Fire Prevention and Protection

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

9.8.1 Fire Prevention

Fires will be prevented by adhering to the following precautions:

- Good housekeeping and storage of materials.
- Storage of flammable liquids and gases away from oxidizers.
- Shutting off engines to refuel.
- Grounding and bonding metal containers during transfer of flammable liquids.

- Use of UL approved flammable storage cans.
- Fire extinguishers rated at least 10 pounds ABC located on all heavy equipment, in all trailers and near all hot work activities.

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

9.9 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.

9.10 Overt Chemical Exposure

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

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

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

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

9.11 Decontamination During Medical Emergencies

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

9.12 Incident Reporting

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

- WorkCare (1-888-449-7787)
- Langan Incident/Injury Report Hotline (973-560-4699)
- Langan Project Manager, Amanda Forsburg (973-560-4574)
- Langan Health and Safety Manager, Tony Moffa (215-491-6500)
- The employer of any injured worker who is not a Langan employee

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

9.13 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.

9.14 Spill Control and Response

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

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

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

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

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

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

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

9.15 Emergency Equipment

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

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

9.16 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.

10.0 TRAINING

10.1 General Health and Safety Training

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

10.2 Site Specific Training

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

10.3 Onsite Safety Briefings

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

10.4 Hazard Communication

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

11.0 RECORDKEEPING

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

11.1 Field Change Authorization Request

A Field Procedures Change Authorization Request Form is to be completed for requesting a change to this CHASP (Attachment B). 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.

11.2 Medical and Training Records

Copies or verification of training (40-hour, 8-hour, supervisor, site-specific training, documentation of three-day OJT, and respirator fit-test records) and medical clearance for Site work and respirator use will be maintained in the office and

available upon request. Records for all subcontractor employees must also be available upon request. All employee medical records will be maintained by Langan's H&S Department.

11.3 Onsite Log

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

11.4 Daily Safety Meetings ("Tailgate Talks")

Completed Safety Briefing forms will be maintained by the HSO.

11.5 Exposure Records

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

11.6 Hazard Communication Program/SDS

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

11.7 Documentation

Employees are required to contact WorkCare at 1-888-449-7787 to document incidents/injuries which are not medical emergencies. 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 973-560-4699 and the client representative to report the incident or near miss. A written report must be completed and submitted to the client representative within 24 hours of the incident. For emergencies involving personnel injury and/or exposure, employee will complete and submit the Langan Incident/Injury Report to the Langan Corporate Health and Safety Manager as soon as possible following the incident. Accidents will be investigated in-depth to identify all causes and to recommend hazard control measures.

12.0 FIELD PERSONNEL REVIEW

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

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

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

TABLES

TABLE 1
CONTAMINANTS OF CONCERN
1487 FIRST AVENUE
NEW YORK, NEW YORK

Contaminant of Concern	Affected Media
VOLATILES	
Acetone	Soil
Chloroform	Groundwater
Cis-1,2-Dichloroethene	Groundwater / Soil Vapor
Tetrachlorethylene	Soil / Groundwater / Soil Vapor
Trichloroethylene	Groundwater / Soil Vapor
Chlorinated VOCs	Soil / Groundwater / Soil Vapor
Total Volatiles	Soil / Groundwater / Soil Vapor
SEMI-VOLATILES	
Common Historic Fill Contaminants:	
Benzo(a)anthracene	Soil / Groundwater
Benzo(b)flouranthene	Soil / Groundwater
Benzo(k)flouranthene	Soil / Groundwater
Benzo(a)pyrene	Soil / Groundwater
Chrysene	Soil / Groundwater
Dibenzo(a,h)anthracene	Soil / Groundwater
Indeno (1,2,3-cd) pyrene	Soil / Groundwater
Flouranthene	Soil / Groundwater
Pyrene	Soil / Groundwater
Diesel Fuel / Fuel Oils	Soil / Groundwater
Hydraulic Oil	Soil / Groundwater
METALS	
Barium	Soil
Lead	Soil / Groundwater
Chromium	Soil / Groundwater
Iron	Groundwater
Mercury	Soil
Magnesium	Groundwater
Manganese	Groundwater
Copper	Soil
Nickel	Soil / Groundwater
Silver	Soil
Selenium	Groundwater
Sodium	Groundwater
Zinc	Soil

TABLE 2
SELECTED POTENTIAL CHEMICAL EXPOSURE LIMITS AND HEALTH EFFECTS
1487 FIRST AVENUE
NEW YORK, NEW YORK

Chemical	Permissible Exposure Limit	IDLH Limit	Exposure Routes	Exposure Symptoms
Acetone	1,000 ppm	2,500 ppm	Inhalation, Ingestion, Skin and/or Eye Contact	Irritation eyes, nose throat; headache, dizziness, central nervous system depression; dermatitits
Chloroform	50 ppm	500 ppm	Inhalation, Skin Absorption, Ingestion, Skin and/or Eye Contact	Irritation eyes, skin; dizziness, mental dullness, nausea, confusion; headache, lassitude (weakness, exhaustion); anesthesia; enlarged liver; [potential occupational carcinogen]
Cis-1,2-Dichloroethene	200 ppm	1,000 ppm	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, respiratory system; central nervous system depression
Tetrachloroethene	15 ppm	150 ppm	Inhalation, Skin Absorption, Ingestion, skin and/or eye contact	Nausea, vomiting, abdominal pain, tremor fingers, jaundice, hepatitis, liver tenderness, dermatitis, monocytosis, kidney damage [potential occupational carcinogen]
Trichloroethene	100 ppm	1,000 ppm	Inhalation, Skin Absorption, Ingestion, skin and/or eye contact	Irritation eyes, skin; headache, visual disturbance, lassitude (weakness, exhaustion), dizziness, tremor, drowsiness, nausea, vomiting; dermatitis; cardiac arrhythmias, paresthesia; liver injury; [potential occupational carcinogen]
Total Volatile Organics	15 ppm	150 ppm	Inhalation, Skin Absorption, Ingestion	Irritation eyes, skin, nose, throat, respiratory system; nausea; flush face, neck; dizziness, incoordination; headache, drowsiness; skin erythema (skin redness); liver damage; [potential occupational carcinogen]
Benzo(a)anthracene	0.2 mg/m^3	80 mg/m^3	Inhalation, Skin Absorption, Ingestion	Irritate eyes, skin, upper respiratory system, cough
Benzo(b)fluoranthene	0.2 mg/m^3	80 mg/m^3	Inhalation, Skin Absorption, Ingestion	Irritate eyes, skin, upper respiratory system, cough

TABLE 2
SELECTED POTENTIAL CHEMICAL EXPOSURE LIMITS AND HEALTH EFFECTS
1487 FIRST AVENUE
NEW YORK, NEW YORK

Chemical	Permissible Exposure Limit	IDLH Limit	Exposure Routes	Exposure Symptoms
Benzo(k)fluoranthene	0.2 mg/m^3	80 mg/m^3	Inhalation, Skin Absorption, Ingestion	Irritate eyes, skin, upper respiratory system, cough
Benzo(a)pyrene	0.2 mg/m^3	80 mg/m^3	Inhalation, Skin Absorption, Ingestion	Irritate eyes, skin, upper respiratory system, cough
Chrysene	0.2 mg/m^3	80 mg/m^3	Inhalation, Skin Absorption, Ingestion	Irritate eyes, skin, upper respiratory system, cough
Dibenzo(a,h)anthracene	0.2 mg/m^3	80 mg/m^3	Inhalation, Skin Absorption, Ingestion	Irritate eyes, skin, upper respiratory system, cough
Flouranthene	0.2 mg/m^3	80 mg/m^3	Inhalation, Skin Absorption, Ingestion	Irritate eyes, skin, upper respiratory system, cough
Indeno (1,2,3-cd) pyrene	0.2 mg/m^3	80 mg/m^3	Inhalation, Skin Absorption, Ingestion	Irritate eyes, skin, upper respiratory system, cough
Pyrene	0.2 mg/m^3	80 mg/m^3	Inhalation, Skin Absorption, Ingestion	Irritate eyes, skin, upper respiratory system, cough
Lead	0.05 mg/m^3	100 mg/m^3	Inhalation, Ingestion, Skin and/or Eye Contact	Lassitude (weakness, exhaustion), insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; paralysis wrist, ankles; encephalopathy; kidney disease; irritation eyes; hypertension
Arsenic	0.010 mg/m^3	5 mg/m^3	Inhalation, Ingestion, Skin Absorption, Skin and/or Eye Contact	Ulceration of nasal septum, dermatitis, gastrointestinal disturbances, peripheral neuropathy, resp irritation, hyperpigmentation of skin, [potential occupational carcinogen]
Barium	0.5 mg/m^3	50 mg/m^3	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, upper respiratory system; skin burns; gastroenteritis; muscle spasm; slow pulse, extrasystoles; hypokalemia
Iron	--	--	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, mucous membrane; abdominal pain, diarrhea, vomiting; possible liver damage

TABLE 2
SELECTED POTENTIAL CHEMICAL EXPOSURE LIMITS AND HEALTH EFFECTS
1487 FIRST AVENUE
NEW YORK, NEW YORK

Chemical	Permissible Exposure Limit	IDLH Limit	Exposure Routes	Exposure Symptoms
Magnesium	15 mg/m^3	750 mg/m^3	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, nose, throat, lungs; metallic taste, headache, fever, chills, chest tightness, cough
Manganese	5 mg/m^3	500 mg/m^3	Inhalation, ingestion	Manganism; asthenia, insomnia, mental confusion; metal fume fever: dry throat, cough, chest tightness, dyspnea (breathing difficulty), rales, flu-like fever; low-back pain; vomiting; malaise (vague feeling of discomfort); lassitude (weakness, exhaustion); kidney damage
Total Chromium	5 mg/m^3	250 mg/m^3	Inhalation, Ingestion, Skin and/or Eye Contact	Irritation eyes, skin; lung fibrosis (histologic)
Mercury	0.1 mg/m3	10 mg/m3	Inhalation, Ingestion, Skin Absorption, Skin and/or Eye Contact	Irritation eyes, skin; cough, chest pain, dyspnea (breathing difficulty), bronchitis, pneumonitis; tremor, insomnia, irritability, indecision, headache, lassitude (weakness, exhaustion); stomatitis, salivation; gastrointestinal disturbance, anorexia, weight loss; proteinuria
Copper	1 mg/m3	100 mg/m3	Inhalation, Ingestion, skin and/or eye contact	Irritation eyes, respiratory system; cough, dyspnea (breathing difficulty), wheezing; [potential occupational carcinogen]
Nickel	1 mg/m3	10 mg/m3	Inhalation, Skin Absorption, Ingestion, skin and/or eye contact	Irritation eyes, skin; cough, chest pain, dyspnea (breathing difficulty), bronchitis, pneumonitis; tremor, insomnia, irritability, indecision, headache, lassitude (weakness, exhaustion); stomatitis, salivation; gastrointestinal disturbance, anorexia, weight loss; proteinuria

TABLE 2
SELECTED POTENTIAL CHEMICAL EXPOSURE LIMITS AND HEALTH EFFECTS
1487 FIRST AVENUE
NEW YORK, NEW YORK

Chemical	Permissible Exposure Limit	IDLH Limit	Exposure Routes	Exposure Symptoms
Silver	0.01 mg/m3	10 mg/m3	Inhalation, ingestion, skin and/or eye contact	Blue-gray eyes, nasal septum, throat, skin; irritation, ulceration skin; gastrointestinal disturbance
Selenium	0.02 mg/m3	1 mg/m3	Inhalation, ingestion, skin and/or eye contact	Irritation 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
Sodium	---	---	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, and throat; cough, shortness of breath, headache, nausea, vomiting, diarrhea, and abdominal pain
Zinc	---	---	Inhalation, ingestions, skin and/or eye contact	Irritation eyes, skin; cough, wheezing, metallic taste, headache, fever and chills, chest tightness and cough

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

TABLE 3
HAZARD ANALYSIS
1487 FIRST AVENUE
NEW YORK, NEW YORK

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

TABLE 4
INSTRUMENTATION ACTION LEVELS
1487 FIRST AVENUE
NEW YORK, NEW YORK

Instrument	Action Level	Level of Protection / Action Required
PID	Background to 5 ppm	Level D/No respirator; no further action required
	> 5 ppm for > 5 minutes	1. Temporarily discontinue all activities and evaluate potential causes of the excessive readings. If these levels persist and cannot be mitigated (i.e., by slowing drilling or excavation activities), contact HSO to review conditions and determine source and appropriate response action. 2. If PID readings remain above 5 ppm, temporarily discontinue work and upgrade to Level C protection. 3. If sustained PID readings fall below 1 ppm, downgrading to Level D protection may be permitted
	> 5 ppm but < 150 ppm for > 5 minutes	Level C/ 1. Discontinue all work; all workers shall move to an area upwind of the jobsite. 2. Evaluate potential causes of the excessive readings and allow work area to vent until VOC concentrations fall below 5 ppm. 3. Level C protection will continue to be used until PID readings fall below 1 ppm.
	> 30 ppm (steady state condition) within AOC zone	Stop Work / Suppress Emissions / Evacuate and re-evaluate.
	> 150 ppm	Evacuate the work area
Total Dust Aerosol Monitor	> 0.100 mg/m^3 above BKD (steady state condition) at perimeter of AOC zone for 15-minutes or visible dust.	Stop Work / Implement dust control / Continue dust monitoring if dust levels are less than 150 mg/m3
	> 0.150 mg/m3 above BKD (following dust suppression measures)	Stop Work / implement dust control, continue work once levels are <150 mg/m3
	>5 mg/m^3	Level C

Notes:

1. 1 ppm level based on OSHA Permissible Exposure Limit (PEL) for benzene.
2. 5 ppm level based on OSHA Short Term Exposure Limit (STEL) maximum exposure for vinyl chloride for any 15 minute period.
3. 150 ppm level based on NIOSH Immediately Dangerous to Life and Health (IDLH) for tetrachloroethylene

TABLE 5
PERSONAL PROTECTIVE EQUIPMENT
1487 FIRST AVENUE
New York, New York

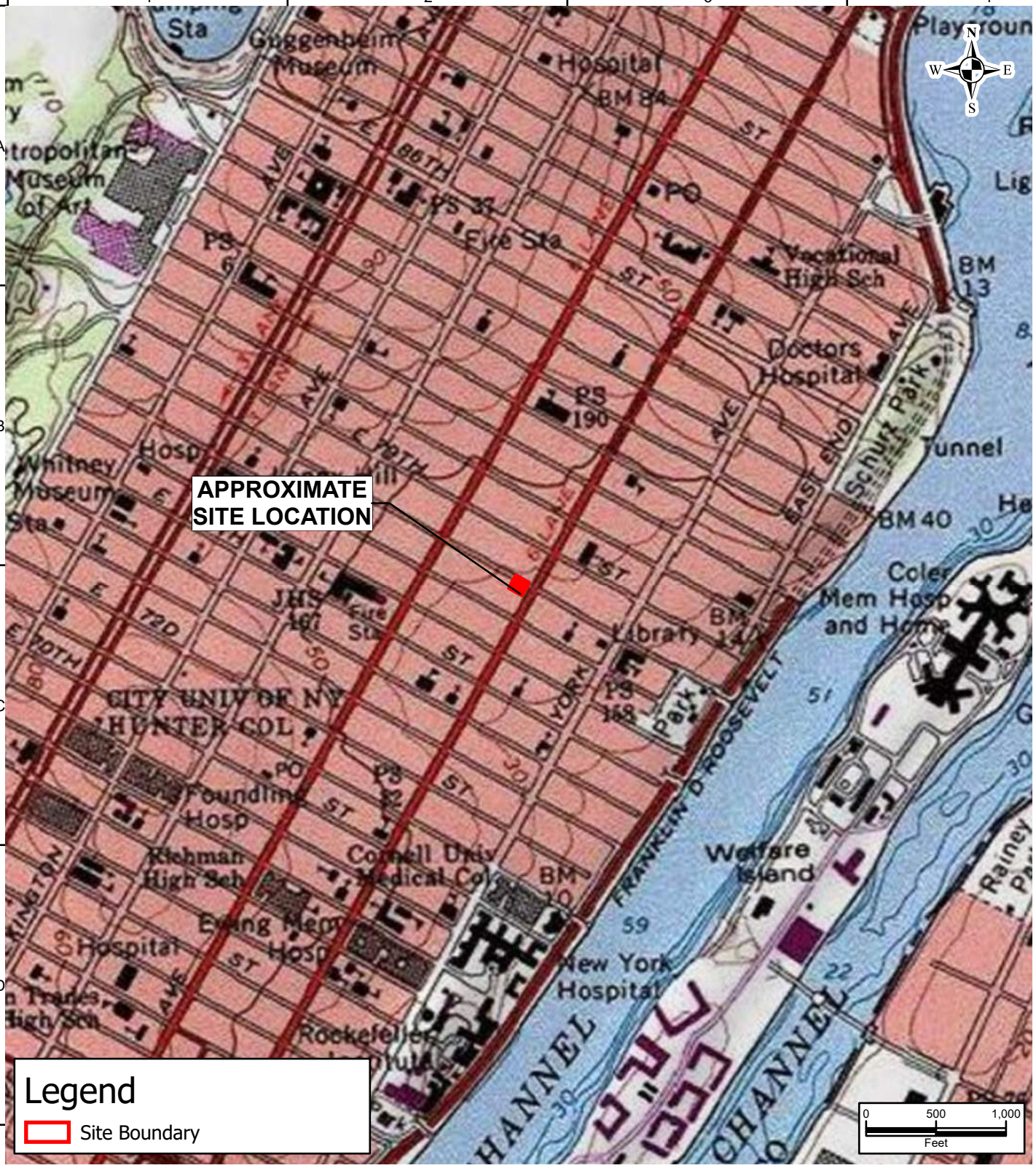
Respiratory Protection*:*

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

Personal Protective Clothing*:*

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

FIGURES



LANGAN
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Parsippany, NJ 07054
T: 973.560.4900 F: 973.560.4901 www.langan.com
Langan Engineering & Environmental Services, Inc.
Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.
Langan International
Collectively known as Langan

Project
1487 First Avenue

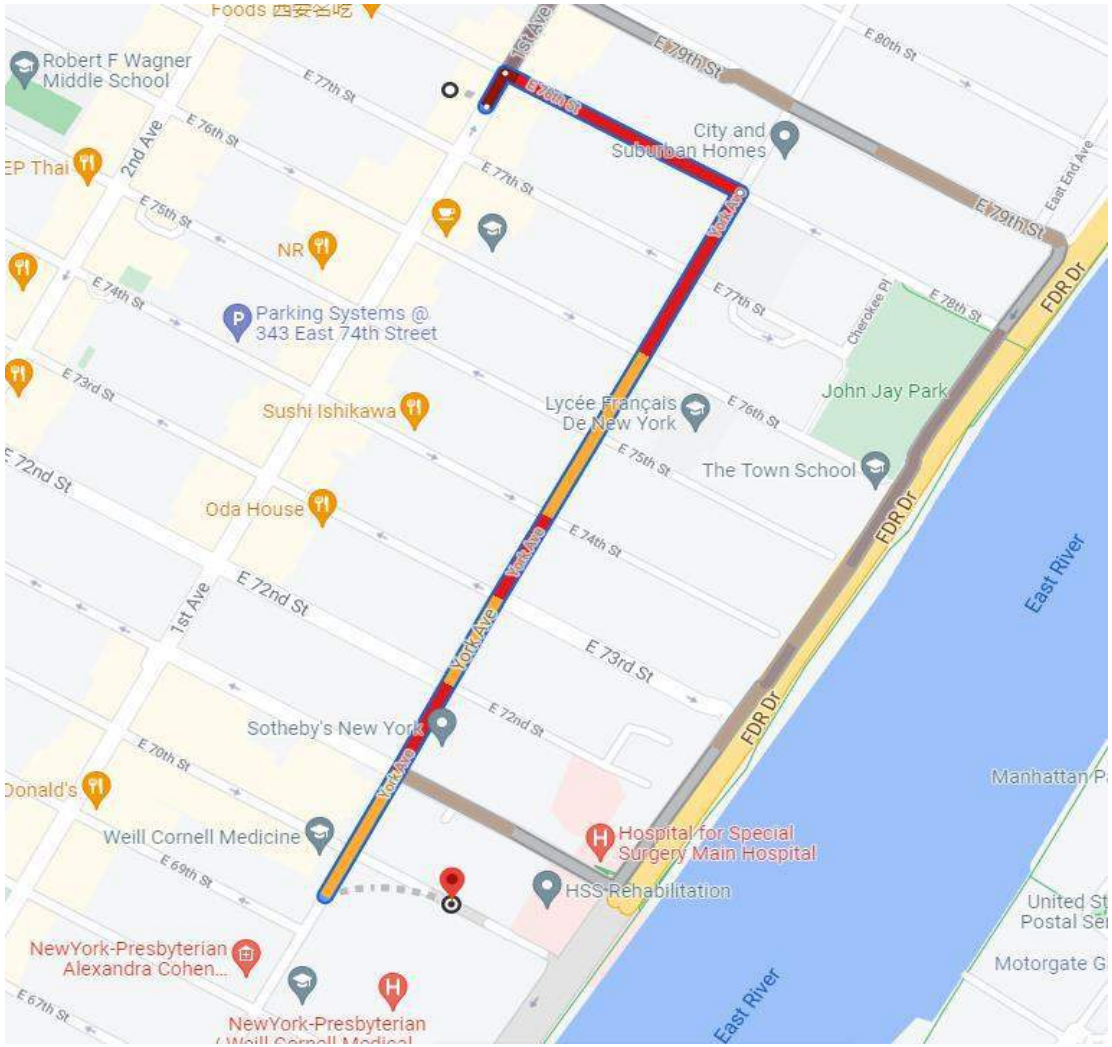
NEW YORK
COUNTY
NEW YORK NEW YORK

Drawing Title
SITE LOCATION

Project No.	
Date	11/5/2021
Scale	1:1,000
Drawn By	Site Analyzer
Submission Date	11/05/2021

Figure
1

Sheet 1 of 1



Emergency Route to New York Presbyterian Hospital (Phone # (212) 746-5454) :

1 Head northeast on 1st Ave toward E 78th Street
2 Turn right onto E 78th Street
3 Turn right onto York Avenue
4 Destination will be on the left in .4 miles
5 Arrive at New York Presbyterian Hospital on the left (520 E 70th Street, NY, NY)

MAP REFERENCE: Google Maps

LANGAN

Project

1487 First Avenue
EMERGENGY HOSPITAL ROUTE MAP

Manhattan **New York**

Project	DATE	SCALE	FIGURE NO.
100963701	**11/5/2021**	**NTS**	**2**

ATTACHMENT A

Health and Safety Briefing Statement

LANGAN

ATTACHMENT A

HEALTH AND SAFETY BRIEFING STATEMENT

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

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

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

_____
Name of Field Team Leader or Site Safety Officer

_____
Signature Date

ATTACHMENT B

Field Procedures Change Authorization Form

ATTACHMENT B

FIELD PROCEDURES CHANGE AUTHORIZATION FORM

Section to be changed:_____

Duration of Authorization Requested Date:_____

_____ Today only

_____ Duration of Task

_____ Other_____

_____

_____

Description of Procedures Modification:

_____

_____

_____

Justification:

_____ _____

Person Requesting Change Verbal Authorization Received From:

_____ _____

Name Name Time

_____ _____

Title Title

_____

Signature

Approvals:

_____

_____

_____

ATTACHMENT C

Unsafe Conditions and Practices Form

LANGAN

ATTACHMENT C

UNSAFE CONDITIONS AND PRACTICES FORM

DESCRIPTION OF CIRCUMSTANCES REGARDING UNSAFE CONDITION OR PRACTICE:

_____

_____

_____

_____

_____

_____

_____

IS THIS CONDITION EXISTING OR POTENTIAL?_____

REPORTED TO: _____

REPORTED BY:_____

DATE REPORTED:_____

COMMENTS:_____

_____

_____

ATTACHMENT D

Calibration Log

ATTACHMENT D

PROJECT:_____

DATE:_____

CALIBRATION LOG

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

ATTACHMENT E

Emergency Notification Numbers

ATTACHMENT E

EMERGENCY NOTIFICATION NUMBERS

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

ORGANIZATION	CONTACT		TELEPHONE
New York City Police			911
New York City Fire			911
New York Presbyterian			(212) 746-5454
Langan Incident/Injury Hotline			1-800-952-6426 or (973)560-4699
Langan Project Manager	Amanda Forsburg		973-560-4574
National Response Center			800-424-8802
Center for Disease Control			404-488-4100
CHEMTREC			800-424-9300
TSCA HOTLINE			202-554-1404
RCRA HOTLINE			800-424-9346
CDC		(DAY) (NIGHT)	404-452-4100 404-329-2888
BUREAU OF ALCOHOL, TOBACCO & FIREARMS			800-424-9555 202-566-7777
NATIONAL RESPONSE CENTER			800-424-8802
PESTICIDE INFORMATION SERVICE			800-424-9346
BUREAU OF EXPLOSIVES, A.A. RAILWAYS			202-835-9500
FEDERAL EXPRESS - HAZARDOUS MATERIAL INFO			901-922-1666

ATTACHMENT F

Accident / Incident Report Form

LANGAN

ATTACHMENT F

INCIDENT REPORT

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

Date: _____

Employee's Name:_____ Employee No:_____

Sex: M _____ F _____ Age: _____

Region: _____ Location:_____

Project: _____ Project No: _____

Incident:_____

Type: Possible Exposure _____ Exposure _____ Physical Injury _____

Location: _____

Date of Incident: _____ Time of Incident: _____

Date of Report Incident: _____

Person(s) to Whom Incident was Reported: _____

Weather Conditions During Incident: Temperature _____ Humidity _____

Wind Speed and Direction: _____ Cloud Cover: _____

Clear: _____ Precipitation: _____

Materials Potentially Encountered: _____

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

_____

_____

Radiological:_____

Other: _____

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

_____

_____

_____

_____

_____

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

Where? On-Site _____ Off-Site _____

By Whom: Name of Paramedic: _____

Name of Physician: _____

Other: _____

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

_____

Length of stay at the facility?_____

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

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

If so, who was the contact?_____

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

If so, explain:_____

_____

_____

_____

Has the employee returned to work? Yes _____ No _____

List the names of other persons affected during this incident:

_____

_____

_____

_____

_____

_____

_____

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

_____

_____

_____

_____

Possible cause of the exposure/injury incident: _____

_____

_____

_____

_____

_____

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

_____

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

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

_____

_____

_____

_____

_____

_____

Describe protective equipment and clothing used by the employee:

_____

_____

_____

_____

_____

_____

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

_____

_____

_____

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

_____

_____

_____

_____

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

_____

_____

_____

_____

_____

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

_____

_____

_____

_____

_____

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

_____

_____

_____

_____ _____

Employee Signature Date

_____ _____

Site Safety Officer Signature or Field Team Leader Signature Date

ATTACHMENT G

Jobsite Safety Inspection Checklist

LANGAN

LANGAN

JOBSITE SAFETY INSPECTION CHECKLIST

Client: _____ Inspection Date: _____

Site: _____ Inspector: _____

Employees: _____

Notes:_____
_____
_____

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

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

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

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

Unsafe acts observed? _____

Additional remarks _____

Notes:_____

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

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ATTACHMENT H

Safety Data Sheets
(SDS)

LANGAN

ATTACHMENT H

MATERIAL SAFETY DATA SHEETS

SAFETY DATA SHEETS

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

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

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

ATTACHMENT I

Langan Guidelines

LANGAN

ATTACHMENT I

LANGAN GUIDELINES

GENERAL

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

TOOLS AND HEAVY EQUIPMENT

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

APPENDIX B

QUALITY ASSURANCE PROJECT PLAN

LANGAN

QUALITY ASSURANCE PROJECT PLAN

for

1487 First Avenue
New York, New York
NYSDEC BCP No. TBD

Prepared For:

CP VII 78th Street Owner, LLC
805 Third Avenue, 20th Floor
New York, New York 10022

Prepared By:

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

March 2022
100963701

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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 VII 78th Street Owner, LLC (the Requestor) for the property at 1487 First Avenue identified as Lots 27, 28, 29, and 30 (to be merged as Tentative Lot 27 in accordance with the New York City RP-602 Form partially executed on 6 January 2022) in the Upper East Side neighborhood of Manhattan, New York (the Site). A Site Location Map is included as Figure 1.

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

1.2 Project Objectives

The Interim Remedial Measures Work Plan (IRMWP) covers hotspot excavation and groundwater treatment injections to be completed at the Site. A Construction Health and Safety Plan (CHASP) 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 remediation and construction activities.

This QAPP addresses sampling and analytical methods that will be necessary in support of the IRM. 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

Collection and analysis of post-excavation endpoint samples from immediately above the bedrock interface will be completed to document the quality of the soil removed during and remaining after hotspot excavation.

2.0 DATA QUALITY OBJECTIVES AND PROCESS

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

- To evaluate the quality of soil through the collection of soil samples.

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 RIWP will be overseen by Langan for CP VII 78th Street Owner, LLC. The environmental consultant will also arrange data analysis and reporting tasks. The analytical services will be performed by an Environmental Laboratory Approval Program (ELAP)-certified laboratory. Data validation services will be performed by approved data validation contractor(s).

For the required sampling as stated in the RIWP, 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 Joe Conboy; résumé attached (Attachment A).

Key contacts for this project are as follows:

CP VII 78th Street Owner, LLC	Kyle Becker Telephone: (212) 202-5794
Langan Project Manager:	Amanda Forsburg Telephone: (973) 560-4900
Langan Quality Assurance Officer (QAO):	Marlena Jewett Telephone: (212) 479-5735
Langan Remedial Engineer:	Stewart Abrams Telephone: (973) 560-4900
Data Validator / Program Quality Assurance Monitor:	Joe Conboy Telephone: (215) 845-8985
Laboratory Representative:	York Analytical Laboratories, Inc. Lidya Gulizia Telephone: (203) 325-1371 x833

4.0 QUALITY ASSURANCE OBJECTIVES FOR COLLECTION OF DATA

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

Precision

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

Accuracy

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

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

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

Completeness

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

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

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

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

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

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

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

Field records will also be collected on field data sheets including 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 250-milliliter (mL) high-density polyethylene (HDPE) containers provided by the laboratory and analyzed by using USEPA Method 537.1. The reporting limit for PFAS in soil is 0.5 microgram per kilogram (ug/kg). The laboratory standard operating procedures (SOP) for the analysis of PFAS is included in Attachment E. Soil samples analyzed for 1,4-dioxane will be collected in an 8 ounce jar provided by the laboratory and analyzed using USEPA Method 8270. The reporting limit for 1,4-dioxane in soil is 0.1 milligram per kilogram (mg/kg).

5.3.1.1 Sample Field Blanks and Duplicates

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

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

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

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

5.3.2 PFAS Sampling Procedures

Soil sampling for PFAS analysis will be completed during the remedial action. One confirmation soil sample collected during the proposed sampling event will be analyzed for PFAS. Field personnel conducting PFAS sampling will wear clothing and use equipment which does not contain PFAS materials including: powderless nitrile gloves, natural rubber overboots, and synthetic and natural fiber clothing. Clothing advertised as waterproof, water-repellant, and/or dirt and/or stain resistant will not be

worn. Personal hygiene products with conditioning agents will be avoided prior to the sampling event. Insect repellent and sunscreen will be avoided. Consumption of food and/or beverages will be strictly prohibited during sampling activities, excluding bottled water for hydration. Ballpoint pens will be used as the sole writing instrument to complete labels and record field notes. Waterproof field books, including "Rite-in-Rain"™ will be avoided.

Only sampling equipment known to be devoid of PFAS containing materials will be used. 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, perfluorohexanesulfonic acid, perfluoroheptanesulfonic acid, perfluorooctanessulfonic acid, perfluorodecanesulfonic acid, perfluorobutanoic acid, perfluoropentanoic acid, perfluorohexanoic acid, perfluoroheptanoic acid, perfluorooctanoic acid, perfluorononanoic acid, perfluorodecanoic acid, perfluoroundecanoic acid, perfluorododecanoic acid, perfluorotridecanoic acid, perfluorotetradecanoic acid, 6:2 fluorotelomer sulfonate, 8:2 fluorotelomer sulfonate, perfluroroctanesulfonamide, n-methyl perfluorooctanesulfonamidoacetic acid, and n-ethyl perfluorooctanesulfonamidoacetic acid.

5.4 Sample Containers and Handling

Certified, commercially clean sample containers will be obtained from the analytical laboratory. The laboratory will also prepare and supply the required field blank sample containers and reagent preservatives. 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 RI. 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

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

- Holding times;
- Sample preservation;

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

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

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

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

7.0 QUALITY ASSURANCE PERFORMANCE AUDITS AND SYSTEM AUDITS

7.1 Introduction

Quality assurance audits may be performed by the project quality assurance group under the direction and approval of the QAO. These audits will be implemented to evaluate the capability and performance of project and subcontractor personnel, items, activities, and documentation of the measurement system(s). Functioning as an independent body and reporting directly to corporate quality assurance

management, the QAO may plan, schedule, and approve system and performance audits based upon procedures customized to the project requirements. At times, the QAO may request additional personnel with specific expertise from company and/or project groups to assist in conducting performance audits. However, these personnel will not have responsibility for the project work associated with the performance audit.

7.2 System Audits

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

7.3 Performance Audits

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

7.4 Formal Audits

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

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

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

8.0 CORRECTIVE ACTION

8.1 Introduction

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

8.2 Procedure Description

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

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

- When predetermined acceptance standards are not attained;
- When procedure or data compiled are determined to be deficient;
- When equipment or instrumentation is found to be faulty;
- When samples and analytical test results are not clearly traceable;
- When quality assurance requirements have been violated;
- When designated approvals have been circumvented;

- As a result of system and performance audits;
- As a result of a management assessment;
- As a result of laboratory/field comparison studies; and,
- As required by USEPA SW-846, and subsequent updates, or by the NYSDEC ASP.

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

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

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

FIGURE 8.1

CORRECTIVE ACTION REQUEST

Number: _____ Date: _____

TO: _____

You are hereby requested to take corrective actions indicated below and as otherwise determined by you to (a) resolve the noted condition and (b) to prevent it from recurring. Your written response is to be returned to the project quality assurance manager by _____

CONDITION:

REFERENCE DOCUMENTS:

RECOMMENDED CORRECTIVE ACTIONS:

_____ _____ _____ _____ _____ _____

Originator Date Approval Date Approval Date

RESPONSE

CAUSE OF CONDITION

CORRECTIVE ACTION

(A) RESOLUTION

(B) PREVENTION

(C) AFFECTED DOCUMENTS

C.A. FOLLOWUP:

CORRECTIVE ACTION VERIFIED BY: _____ DATE:_____

9.0 REFERENCES

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

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

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

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

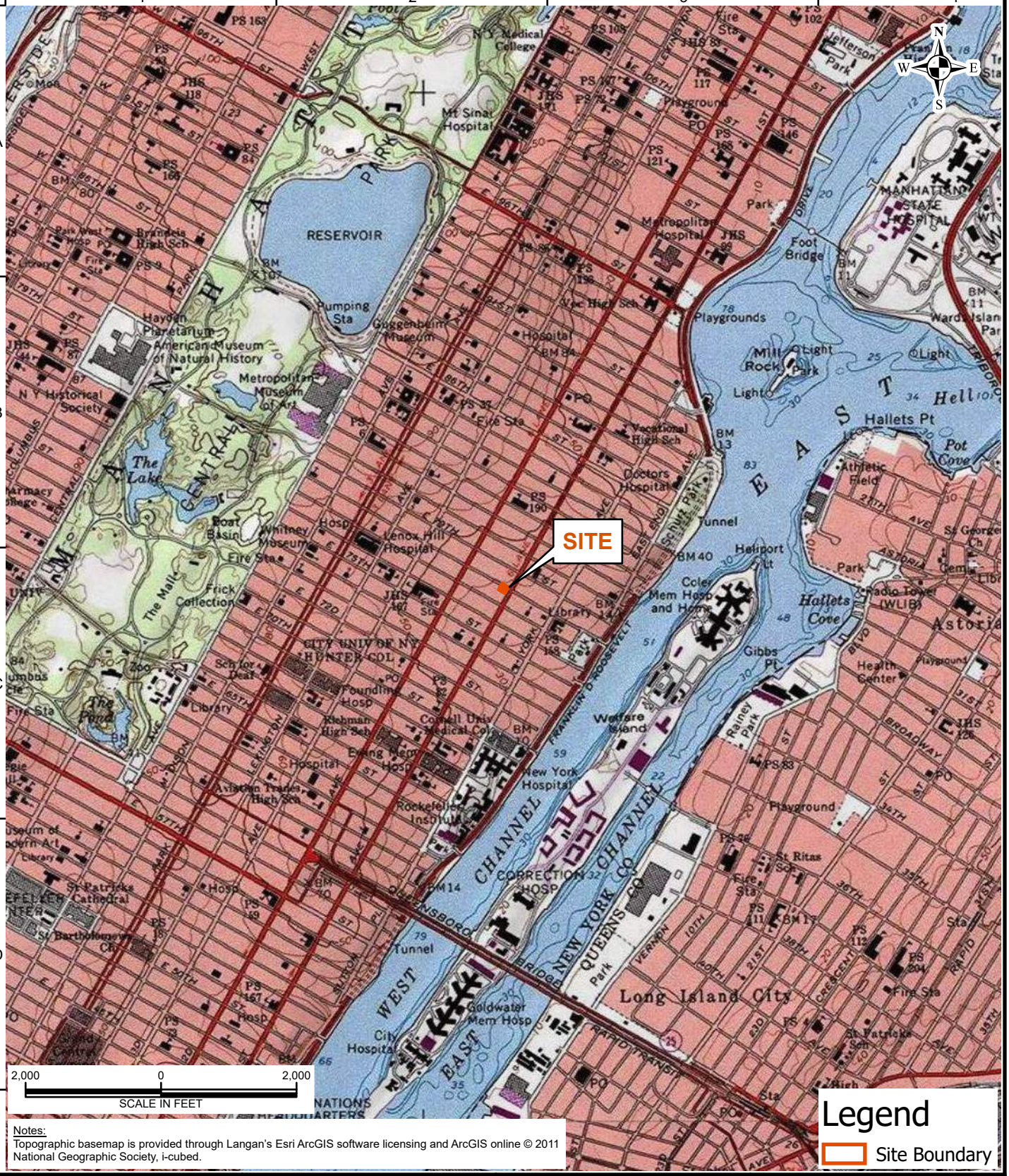
USEPA, 1987. Data Quality Objectives for Remedial Response Actions Activities: Development Process, EPA/540/G-87/003, OSWER Directive 9355.0-7 - U.S. Environmental Protection Agency, Washington, D.C.

USEPA, 1992a. CLP Organics Data Review and Preliminary Review. SOP No. HW-6, Revision #8, dated January 1992. USEPA Region II.

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

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

FIGURES



Notes:
Topographic basemap is provided through Langan's Esri ArcGIS software licensing and ArcGIS online © 2011 National Geographic Society, i-cubed.

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

Project
1487 FIRST AVENUE REDEVELOPMENT SITE
BLOCK No. 1452, LOT No.27
MANHATTAN
NEW YORK NEW YORK

Drawing Title
SITE LOCATION MAP

Project No.	100963701
Date	2/25/2022
Scale	1"=2,000'
Drawn By	JF
Submission Date	
Figure	1

Path: \\langan.com\data\PAR\data7\100963701\Project Data\ArcGIS\APRX\100963701\100963701.aprx Date: 2/25/2022 User: ibaker Time: 11:33 AM

ATTACHMENT A

Resumes

JOSEPH CONBOY

STAFF CHEMIST

ENVIRONMNETAL

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

EDUCATION

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

CERTIFICATIONS & TRAINING

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

NJ Analytical Guidance and Data Usability Training

USEPA Data Validation Training

Earthsoft EQuIS Environmental Database Training

SELECTED PROJECTS

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

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

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

**Project completed prior to employment at LANGAN.*

MARLENA JEWETT

DATA ANALYST

CAD/GIS

1 year in the industry

Proposed Title: Field Technician

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

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

Education

B.A., Environmental Economics
Colgate University

Work History

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

Langan
Data Analyst
5/10/2021 – Present

SELECTED PROJECTS

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

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

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

Lidya Gulizia
Director, Client Services

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

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

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

Education

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

Amanda Forsburg, CHMM

Project Scientist

Environmental Oversight, Remedial Investigation, Remedial Action

9 years in the industry ~ 9 years with Langan

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

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

Selected Projects

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

Education

B.A., Environmental Studies
Bucknell University

B.A., Environmental Geology
Bucknell University

Professional Registration

Certified Hazardous Materials Manager (CHMM)

OSHA 29 CFR 1910.120 Certification (HAZWOPER)

Professional Affiliations

New Jersey Society of Women Environmental Professionals (NJSWEP)

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

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

Alliance of Hazardous Materials Professionals New Jersey Chapter (AHMPNJ)

LANGAN

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

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

ASSOCIATE/CORPORATE HEALTH AND SAFETY MANAGER

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

EDUCATION

B.S., Physics
West Chester University

PROFESSIONAL REGISTRATION

Associate Safety Professional (ASP)

Certified Hazardous Material Manager (CHMM)

Certified Occupational Safety Specialist (COSS)

Certified Safety Professional (CSP)

AFFILIATIONS

Pennsylvania Chamber of Business & Industry

Chemical Council of New Jersey

New Jersey Business & Industry Association

Geoprofessional Business Association

American Society of Safety Professionals

STEWART H. ABRAMS, PE

PRINCIPAL/VICE PRESIDENT

CORPORATE DIRECTOR OF REMEDIATION TECHNOLOGY

Mr. Abrams has over 35 years of experience in soil and groundwater remediation, water treatment, Brownfields redevelopment, and engineering design. He is an expert in remedial technology, with particular emphasis on bioremediation, chemical oxidation/reduction technologies, soil vapor extraction, and air sparging. He also has extensive experience in water process engineering, notably water and wastewater treatment and industrial waste treatment for organics and metals. He is also involved in the fields of emerging contaminants and sustainable remediation. Before joining Langan, Mr. Abrams held positions of National Practice Leader for Remediation at a national consulting and engineering company and as vice president of operations at an environmental R&D firm. He is the founder of Langan's treatability facility, a joint venture with the New Jersey Institute of Technology (NJIT), whereby Langan personnel perform a wide variety of treatability and research studies for soil, groundwater and sediments.

EDUCATION

M.S., Environmental Sciences Rutgers University

B.S., Civil Engineering Rutgers University

B.A., Political Science Rutgers University

PROFESSIONAL REGISTRATION

Professional Engineer (PE) in NJ, NY, PA, NC

AFFILIATIONS

Battelle Conference on Bioremediation and Sustainable Remediation Technologies 2019 – Steering Committee Member

New Jersey Institute of Technology (NJIT) – Albert Dorman Honors College – Board of Visitors (2018-present)

PFAS Experts Symposium 2019, 2021. Chair – Available In-Situ Technologies Committee

Remediation Journal – Editorial Board (2019 – present)

SELECTED PROJECTS

Emerging Contaminants – Technical Director for a complex treatment upgrade project. Onsite pump and treat systems that do not currently address 1,4-dioxane, are being upgraded via the addition of an advanced oxidation process (AOP). Offsite, a public water supply, which had included air stripping for trichloroethylene removal, requires upgrade to address 1,4-dioxane and PFAS. AOP coupled with granular activated carbon is the selected approach. Treatability studies for various AOP processes; as well GAC were performed prior to final to final process selection. Mr. Abrams consults to a Superfund site where he formulates natural attenuation and other strategies for 1,4-dioxane. For the Interstate Technology Regulatory Council (ITRC), Mr. Abrams is one of a handful of experts on PFAS treatment providing seminars nationwide.

Peer Review Activities – Mr. Abrams serves routinely as an independent third party reviewer of remediation plans for Fortune 500 clients. This work is often performed in a collaborative panel format with other reviewers.

Technology Development Consulting - Mr. Abrams has an ongoing consulting relationship with a venture-capital technology start-up in the PFAS treatment field. He advises the firm on the engineering aspects of various developmental technologies.

Expert Testimony. Mr. Abrams has served as a testifying expert witness in both State and Federal Court. He has also been deposed and has prepared expert reports for submission as evidence.

Experimental Work – At Langan's Treatability Facility at the NJIT, recently directed a bench scale research test of an emerging technology for PFOS treatment, i.e., electrocoagulation. Findings showed the electrochemical adsorption may be a feasible as a more cost-effective alternative to conventional GAC.

Thermal Remediation – Directed the installation and operation of an in-situ Thermal Conductive Heating project to remediate PCE and naphthalene in both groundwater and soil. System successfully remediated soils to stringent NJDEP standards. Subsequently, directed the use of bioremediation "polishing" to remove

Injectable Activated Carbon – Providing technical direction for several projects utilizing this technology for the remediation of VOCs in sources areas.

MTBE/Propane Bioaugmentation – First use of propane infusion at a gasoline station to bioremediate MTBE. Combined use of low-level propane with oxygen infusion has been shown to promote the direct remediation of ethers, notably MTBE, with concentrations driven to non-detect in less than four months. Used bioaugmentation.

Zero Valent Iron – Directed the use of injected zero-valent iron for remediating chlorinated solvents at a Brownfield site. Pneumatic fracturing was used to inject 500,000 pounds of micro-scale iron into the shallow bedrock source zone. This process resulted in remediation of the 20,000-square-foot source zone and conditions favorable to the long-term natural attenuation of the plume.

Sulfate Reduction – Directing the use of sulfate addition (Epsom salts) in the remediation of benzene-contaminated soils and groundwater. Microcosm and column treatability studies completed. Directed use of gypsum for full scale sulfate reduction at Brownfield site.

Emulsified Zero Valent Iron (EZVI) – Directed combined use of emulsified vegetable oil and zero valent iron (NASA Patented technology) at a two separate sites: A Brownfield site in Brooklyn, NY and a dry cleaner in New Jersey. NJ site combined EZVI with pneumatic fracturing injection under the floor of the operating dry cleaner.

Ex-situ chemical oxidation mixing –Technical Director of large iron-activated persulfate soil mixing project. Contaminants in soil and groundwater include primarily chlorinated benzenes. Mixing accomplished via "Lang Tool". On-site laboratory utilized for oxidation optimization in real-time.

In-situ chromium remediation – Directed the in-situ remediation of hexavalent chromium through the use of calcium polysulfide (CaSx) addition injection. Injections performed both inside the building as well as outside. Pneumatic fracturing used for injection in shallow bedrock. Monitoring showed that concentrations in the source area groundwater declined to non-detect from 15,000 ug/l in less than a week.

Pump & Treat – Directed the design, installation and operation of a pump and treat system located in southeastern Pennsylvania. Unit processes include filtration, air stripping and granular activated carbon. Constructed in 2013, the system mitigates migration of a plume into a potable water supply.

New Jersey Turnpike, Cranbury, NJ – Managed design (pilot testing, conceptual, and plans and specifications) of a remediation system consisting of 77 air-sparging (AS) wells and 37 soil vapor extraction (SVE) wells for the New Jersey Turnpike at the Molly Pitcher Service Area. Oversaw installation and system startup. Innovative one-day AS/SVE pilot test. Volatilization and destruction of 10,000 gallons of subsurface free product. First use of catalytic oxidation at a Turnpike facility for air-pollution control.

Sustainable Remediation Forum (SURF) (2009 – present)

ITRC Perfluorinated Contaminants Committee (2017 – present) – Subcommittee on Remediation & Treatment

ITRC Integrated Chlorinated Site Remedy Committee (2007 – 2009)

NJDEP Advisory Council on Environmental Justice (2002 - 2004, 2006 - 2013)

Governor-elect Corzine Environmental Policy Transition Committee (2005 – 2006)

NJDEP Remediation Stakeholders Committee (2007 - 2009)

Woodlands Superfund Site, Woodland Twp., NJ – As a subcontractor to *de maximis, inc.,* directed the subsurface design, installation and testing of a major air sparging/SVE system (+200 vertical wells) for a Superfund site in southern New Jersey. Work involved pilot testing of air sparging, SVE pneumatic modeling, early use of CPT/MIPS, and an extensive well-installation using sonic drilling.

GE – Schenectady, NY – Served as technical director for the design of a comprehensive remediation program for a New York state site involving the bioremediation of three VOC plumes and the collection and treatment of leachate seeps. Supported GE Researchers in performing flow-through laboratory column tests using innovative sulfate reduction techniques to remediate a BTEX plume. Led the scale-up of this column study into a design.

BROS Superfund Site, Bridgeport, NJ – Directed extensive laboratory treatability studies and design scale-up of aerobic and anaerobic bioremediation, in-situ Fenton's reagent for chlorinated solvents, and BTEX and cometabolic testing of BCEE degradation. Bench testing was correlated to a site conceptual model, with particular tests tailored to conditions in specific segments and zones of the aquifer. This included detailed work plans for submission to USEPA Laboratories in Cincinnati and Oklahoma.

TCE & Chromium combined – Site with both Cr+6 and TCE contamination being contained by a pump-and-treat system. Pursued pump-and-treat shutdown strategy through laboratory testing and a comprehensive feasibility study. Zero-valent iron, bioremediation, calcium polysulfide, and ferrous sulfate were all lab-tested. Directed the field pilot testing of bioaugmentation and nano-scale zero-valent iron at the sites. Bioaugmentation selected for full scale, since it was highly effective for both Cr^{+6} and TCE.

TCE Cometabolic Bioaugmentation – Innovative first use of aerobic bioaugmentation for the shutdown of a 20-year-old pump-and-treat system in 1995. TCE and daughter products were the contaminants of concern. Shutdown occurred over six months through the repeated injection of bioaugmentation culture.

Zero Valent Iron for P&T Shutdown – Directed the use of injected zero-valent iron at a northern New Jersey site for the remediation of chlorinated solvents. Pneumatic fracturing used to inject micro-scale iron into the recovery zone. Temporary shutdown permission obtained from NJDEP. Injection was a significant success, resulting in permanent cessation of pump-and-treat activities at the site.

TCE Bioaugmentation – Directed the injection of emulsified vegetable oil, followed by bioaugmentation culture, in an aquifer contaminated with PCE. Aquifer preconditioned with baker's yeast and sugar, prior to injection of EVO. Bioaugmentation activities completed in April 2012. Second source area was remediated via in-situ thermal remediation in 2014.

Horizontal Injection Wells for Permanganate Injection – Directed the injection of over 400,000 pounds of potassium permanganate for chlorinated solvent destruction at a large Brownfields site in Maryland. Extensive use of horizontal wells. Work performed under a fixed-price contract with blended finite insurance. This project awarded the prestigious Phoenix Award for EPA Region 3 by the National Brownfields Association.

Selected Publications, Reports, and Presentations

PFAS Experts Symposium: White Paper. Position paper prepared by a group of 40 experts convened under the auspices of Remediation Journal. September 2019.

Treatment Technology for Perfluorinated Compounds. Presented at ITRC PFAS Annual Meeting. Boston, MA. March 2019.

Treatment Technology for Perfluorinated Compounds. Presented at ITRC PFAS Training Program. Montclair State University, New Jersey. October 2018.

Use of In-Situ Remediation Technology at Brownfield Sites – Case Studies. Presented at Battelle Symposium on Remediation of Chlorinated and Recalcitrant Compounds, Palm Springs, CA. (April 2018).

Air Sparging Technology Status Review: Advanced Design and Implementation Tools. Joint with Omer Uppal. Presented at Battelle Symposium on Bioremediation of Chlorinated and Recalcitrant Compounds, Palm Springs, CA. (May 2016).

Evaluation of Remedial Alternatives via Three Bench-Scale Treatability Studies for a Mixed Dense Non-Aqueous Phase Plume. Presented at Battelle International Symposium on Bioremediation and Sustainable Environmental Technologies, Jacksonville, FL. (June 2013).

Geng, X., Boufadel, M.C., Lee, K., Abrams, S., Suidan, M. (2014). Biodegradation of subsurface oil in a tidally influenced sand beach: Impact of hydraulics and interaction with pore water chemistry. *AGU Water Resources Research, 51,* 3193 – 3218.

From Flask to Field – The Role of Treatability and Pilot Tests in Remediation. Presented to Association of Environmental & Engineering Geologists (AEG) New York/Philadelphia Section, Somerset, NJ. (December 2014).

Evaluation of Remedial Alternatives via Three Bench-Scale Treatability Studies for a Mixed Dense Non-Aqueous Phase Plume. Presented at Battelle International Symposium on Bioremediation and Sustainable Environmental Technologies, Jacksonville, FL. (June 2013).

Sustainable Remediation and SURF. Presented at RE3 Conference, Atlantic City, NJ. (November 2012).

Application of Pneumatic Fracturing and Zero-valent Iron for a Maryland Brownfield Site. Presented at Battelle International Symposium on In-Situ and Sustainable Technologies, Monterey, CA. (May 2012).

Integrating Remediation and Redevelopment. Presented at Honeywell "All-Hands" RES Meeting, Morristown, NJ. (December 2011).

Assessing Innovative Remedial Technologies. Presented to Environmental Bankers Association, Charlotte, NC. (January 2009).
Time, Cost & Effectiveness: Assessing Innovative Remedial Technologies. Presented at ITRC/Langan Conference, East Brunswick, NJ. (June 2008).

Remediation Technology Pitfalls. Presented at Prudential Realty Investors Conference, New Orleans, LA. (December 2008).

Selecting Innovative Remedial Technologies. Presented at NJ Innovative Environmental Technology Conference, Newark, NJ. (October 2007).

Bioaugmentation for Site Remediation. Presented at AWMA Central New York Conference, Syracuse, NY. (March 2007).

Selecting Innovative Remedial Technologies. Presented at NJ Innovative Environmental Technology Conference, Newark, NJ. (October 2007).

Use of Persulfate for MTBE Remediation. Presented by Abrams, S.H. & E. Mott-Smith at AEHS West Conference, San Diego, CA. (March 2006).

Innovative Approaches to Chlorinated Solvent Remediation. Presented to Conference of Envirogen clients. Oak Brook, IL. (May 2002).

Bioremediation. Guest Lecturer at Rutgers Graduate School, New Brunswick, NJ. (October 2001).

Biosparging and Bioventing for In-situ Cleanup. Guest Lecturer at Rutgers Graduate School, New Brunswick, NJ. (April 1995).

NPDES Permitting in the Pulp & Paper Industry. Presented at Delaware Valley Section Meeting, Yardley, PA. (November 1991).

Strategies to Minimize Liabilities Under the New Jersey Clean Water Enforcement Act. Presented to New Jersey Business & Industry Association, West Windsor, NJ. (October 1990).

Meeting EPA's Organic Chemicals Plastics and Synthetic Fibers Pretreatment Regulations. Presented at Mid-Atlantic Industrial Waste Conference, Harrisburg, PA. (June 1989).

Design of Packed Columns for Water Treatment. Guest Lecturer at Rutgers Graduate School, New Brunswick, NJ. (March 1987).

Workshop on Response to Volatile Organics in Public Water Supplies. Presented to water suppliers at Technology transfer session. Edison, NJ (March 1987).

ATTACHMENT B

Laboratory Reporting Limits and Method Detection Limits

LANGAN

ATTACHMENT B

Laboratory Reporting Limits and Method Detection Limits

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

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Laboratory Reporting Limits and Method Detection Limits

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

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Laboratory Reporting Limits and Method Detection Limits

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

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Laboratory Reporting Limits and Method Detection Limits

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

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

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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

ATTACHMENT B

Laboratory Reporting Limits and Method Detection Limits

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

ATTACHMENT B

Laboratory Reporting Limits and Method Detection Limits

Method	Matrix	Analyte	MDL	RL	Units
		PFAS			
Modified EPA 537	Soil	Perfluorobutanesulfonic acid (PFBS)	0.2	0.25	ug/kg
Modified EPA 537	Soil	Perfluorohexanoic acid (PFHxA)	0.0659	0.25	ug/kg
Modified EPA 537	Soil	Perfluoroheptanoic acid (PFHpA)	0.0455	0.25	ug/kg
Modified EPA 537	Soil	Perfluorohexanesulfonic acid (PFHxS)	0.031	0.25	ug/kg
Modified EPA 537	Soil	Perfluorooctanoic acid (PFOA)	0.0772	0.25	ug/kg
Modified EPA 537	Soil	Perfluorooctanesulfonic acid (PFOS)	0.0438	0.25	ug/kg
Modified EPA 537	Soil	Perfluorononanoic acid (PFNA)	0.0598	0.25	ug/kg
Modified EPA 537	Soil	Perfluorodecanoic acid (PFDA)	0.0512	0.25	ug/kg
Modified EPA 537	Soil	Perfluoroundecanoic acid (PFUnA)	0.116	0.25	ug/kg
Modified EPA 537	Soil	Perfluorododecanoic acid (PFDoA)	0.075	0.25	ug/kg
Modified EPA 537	Soil	Perfluorotridecanoic acid (PFTrDA)	0.0435	0.25	ug/kg
Modified EPA 537	Soil	Perfluorotetradecanoic acid (PFTA)	0.0747	0.25	ug/kg
Modified EPA 537	Soil	N-MeFOSAA	0.104	0.25	ug/kg
Modified EPA 537	Soil	N-EtFOSAA	0.104	0.25	ug/kg
Modified EPA 537	Soil	Perfluoropentanoic acid (PFPeA)	0.0919	0.25	ug/kg
Modified EPA 537	Soil	Perfluoro-1-octanesulfonamide (FOSA)	0.0467	0.25	ug/kg
Modified EPA 537	Soil	Perfluoro-1-heptanesulfonic acid (PFHpS)	0.0493	0.25	ug/kg
Modified EPA 537	Soil	Perfluoro-1-decanesulfonic acid (PFDS)	0.0512	0.25	ug/kg
Modified EPA 537	Soil	1H,1H,2H,2H-Perfluorooctanesulfonic acid (6:2 FTS)	0.066	0.25	ug/kg
Modified EPA 537	Soil	1H,1H,2H,2H-Perfluorodecanesulfonic acid (8:2 FTS)	0.0256	0.25	ug/kg
Modified EPA 537	Soil	Perfluoro-n-butanoic acid (PFBA)	0.183	0.25	ug/kg

Analytical Method Information

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

Preservation: Cool 4°C

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

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

ATTACHMENT C

Analytical Methods / Quality Assurance Summary Table

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ATTACHMENT C
ANALYTICAL METHODS/QUALITY ASSURANCE SUMMARY TABLE

Matrix Type	Field Parameters	Laboratory Parameters	Analytical Methods	Sample Preservation	Sample Container Volume and Type	Sample Hold Time	Number of Samples to be Collected	Field Duplicate Samples	Equipment Blank Samples	Trip Blank Samples	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	5	1 per 20 samples (minimum 1)	1 per 20 samples, if needed (minimum 1, if needed)	1 per shipment of VOC samples	1 per 20 samples (minimum 1)
		Part 375 + TCL SVOCs / CP-51 SVOCs	EPA 8270D	Cool to 4°C	4 oz. jar*	14 days extract, 40 days after extraction to analysis					
		1,4-Dioxane	EPA 8270D	Cool to 4°C	8 oz. jar	14 days extract, 40 days after extraction to analysis					
		Part 375 + TAL Metals	EPA 6010C, EPA 7470, EPA 7196A, EPA 9014/9010C	Cool to 4°C	2 oz. jar*	6 months, except Mercury 28 days					
		Hexavalent Chromium	EPA 7196A	Cool to 4°C	2 oz. jar*	28 days					
		Perfluoroalkyl Substances (PFAs)	EPA 537.1	Cool to 4°C	1/2 filled 250mL HDPE container	14 days extract, 40 days after extraction to analysis					
		Part 375 + TCL Herbicides	EPA 8151A	Cool to 4°C	4 oz. jar*	14 days extract, 40 days after extraction to analysis					
		Part 375 + TCL Pesticides	EPA 8081B	Cool to 4°C	4 oz. jar*	14 days extract, 40 days after extraction to analysis					
		Part 375 + TCL PCBs	EPA 8082A	Cool to 4°C	4 oz. jar*	14 days extract, 40 days after extraction to analysis					
		PFAS	EPA 537m	Cool to 4°C	250ml Plastic	14 days					

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

The PFAS compounds to be analyzed includes: perfluorobutanesulfonic acid, perfluorohexanesulfonic acid, perfluoroheptanesulfonic acid, perfluorooctanessulfonic acid, perfluorodecanesulfonic acid, perfluorobutanoic acid, perfluoropentanoic acid, perfluorohexanoic acid, perfluoroheptanoic acid, perfluorooctanoic acid, perfluorononanoic acid, perfluorodecanoic acid, perfluoroundecanoic acid, perfluorododecanoic acid, perfluorotridecanoic acid, perfluorotetradecanoic acid, 6:2 fluorotelomer sulfonate, 8:2 fluorotelomer sulfonate, perfluroroctanesulfonamide, n-methyl perfluorooctanesulfonamidoacetic acid, and n-ethyl perfluorooctanesulfonamidoacetic acid.
The number of groundwater samples collected will depend on the results of the geophysical evaluation and hydraulic conductivity testing.

ATTACHMENT D

Sample Nomenclature

SOP #01 – Sample Nomenclature

INTRODUCTION

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

SCOPE AND APPLICATION

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

GENERAL SAMPLE IDENTIFICATION CONSIDERATIONS

Sample Labels

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

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

Quick Breakdown of Sample Format

The general format for sample nomenclature is:

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

LLNN_ID

Where

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

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

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

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

LL – Sample Investigation Code

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

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

NN – Numeric Identifier

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

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

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

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

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

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

SB01_6-8

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

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

MW01_070115

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

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

EPSW01_N_5

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

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

SVE01_MID_070115

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

SB01_2-4_MS

and for the matrix spike duplicate sample:

SB01_2-4_MSD

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

MW01a_070115

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

MW01b_070115

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

ATTACHMENT E

Laboratory Standard Operating Procedures for PFAS Analysis

LANGAN

Standard Operating Procedure

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

Approvals

Laboratory Director 12058

Jon Walsh

Corporate Technical Director

Robert Bradley

Corporate QA/QC Officer

Sarah Widomski

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Controlled Copy No. PFAS_LCMSMS112518, Rev 1.3-____

Issued to: NA

Target PFAS in Potable Water Matrices

1. SCOPE AND APPLICATION

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

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

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

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

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

2. SUMMARY

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

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

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

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

3. DEFINITIONS

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

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

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

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

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

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

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

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

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

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

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

3.12 LABORATORY FORTIFIED SAMPLE MATRIX DUPLICATE (LFSMD) – A

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

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

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

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

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

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

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

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

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

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

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

4. INTERFERENCES

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

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

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

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

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

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

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

snap caps.

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

4.5 Matrix interferences may be caused by contaminants that are co-extracted from the sample. The extent of matrix interferences will vary considerably from source to source, depending upon the nature of the water.

4.6 Solid phase extraction cartridges may be a source of interferences. The analysis of field and laboratory reagent blanks can provide important information regarding the presence or absence of such interferences. The Biotage Isolute 101 500 mg/6mL cartidges (SDVB) brand or Phenomenex SDVB have shown no interfering peaks/ions at the retention times of interest. Each new lot of SPE cartidges must be tested to ensure that contamination does not preclude analyte identification and quantitation.

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

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

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

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

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

5. SAMPLE HANDLING

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

5.2 FIELD REAGENT BLANKS (FRB)
A FRB must be handled along with each sample set. The sample set is composed of samples collected from the same sample site and at the same time. At the laboratory, fill the field blank sample bottle with reagent water and preservatives, seal, and ship to the sampling site along with the sample bottles. For each FRB shipped, an empty sample bottle (no preservatives) must also be shipped. At the sampling site, the sampler must open the shipped FRB and pour the preserved reagent water into the empty shipped sample bottle, seal and label this bottle as the FRB. The FRB is shipped back to the laboratory along with the samples and analyzed to ensure that PFAAs were not introduced into the sample during sample collection/handling.

5.3 SAMPLE SHIPMENT AND STORAGE – Samples must be chilled during shipment and must not exceed 10 °C during the first 48 hours after collection. Sample temperature must be confirmed to be at or below 10 °C when the samples are received at the laboratory. Samples stored in the lab must be held at or below 6 °C until extraction, but should not be frozen.

NOTE: Samples that are significantly above 10° C, at the time of collection, may need to be iced or refrigerated for a period of time, in order to chill them prior to shipping. This will allow them to be shipped with sufficient ice to meet the above requirements.

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

6. APPARATUS AND MATERIALS

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

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

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

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

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

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

6.6 3.1 Micron in-line filters, Promochrom only

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

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

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

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

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

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

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

6.13.1 HPLC System-Agilent 1260 Infinity II

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

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

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

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

6.13.2 Agilent LC/MS-MS- Agilent 6470AAR

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

6.14 Vortex Mixer- Benchmark Industries or equivalent

6.15 SenSafe Free Chlorine test strips- VWR Scientific or equivalent

7. REAGENTS AND STANDARDS

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

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

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

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

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

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

7.5 Stock Standards

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

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

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

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

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

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

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

7.6 Preparation of Standards

7.6.1 Preparation of Working Standards and Intermediates from STOCK Materials

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

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

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

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

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

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

7.6.2 Storage of Standards

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

7.6.3 Detailed Preparation Procedure-EPA 537.1 R1

7.6.4 Internal Standards

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

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

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

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

For 1.0 mL final volume:

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

7.6.5 Surrogates

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

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

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

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

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

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

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

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

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

7.6.6 Target Analytes- EPA 537.1 R1

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

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

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

7.6.7 Calibration

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

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

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

Based upon a final volume of 500 uL

Calibration Curve Preparation

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

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

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

7.6.8 Checking the Efficacy of the Surrogate/Spike Mixes

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

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

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

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

Initial Calibration Verification Preparation

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

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

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

8. PROCEDURE

8.1 Preventative and Routine Maintenance

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

8.2 Sample Preparation (Extraction and Concentration)

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

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

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

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

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

8.2.6 Using the Promochrom automated system, run a cleaning run.

Be sure the reservoirs of LC/MS grade methanol and HPLC plus grade water are full. Prime all lines and align all components.

8.2.7. Load in the EPA537 method.

8.2.8 The SPE method parameters are listed in Figure 1.

Figure 1.0- Promochrom 537.1 SPE Parameters

Step	Action	Inlet	Flow (mL/Min)	Volume (mL)	Time (Mins)
1	Elute W2	CH3OH	5	5	
2	Wait (Soak)				1
3	Elute W2	CH3OH	3	5	
4	Wait (Soak)				1
5	Elute W2	CH3OH	3	5	
6	Wait (Soak)				2
7	Elute W1	H2O	5	18	
8	Wait (Soak)				1
9	Elute W1	H2O	5	5	
10	Wait				2
11	Add Sample W1	Sample	10	285*	
12	Rinse W1 (bottle rinse)	H2O	10	7.5	
13	Rinse W1 (bottle rinse)	H2O	10	7.5	
14	Add Sample W1 (line rinse)	Sample	10	4.5	
15	Elute W1 (prime)	CH3OH	10	0.2	
16	Air-Purge1 (dry tube)	Air	10	5	
17	Blow N_2 (dry tube)				5 @ (2.0 L/min)
18	Rinse 1 (Elute PFAS)	CH3OH	5	6	
19	Wait (Soak)				2
20	Rinse 1 (Elute)	CH3OH	5	6	
21	Wait (soak)				2
22	Collect 1 (final Elute step)	Sample	5	6	
23	Air-Purge1 (purge into collect)	Air	5	10	

*Maximum volume is based upon highest volume of sample in extraction batch

8.2.9 Place labeled 15 mL collection vessels in the sample collection tray and use Element labels to identify the vials at this point. Print 2 sets of labels for each since they will be used after the concentration step as well. These are graduated.

8.2.10 For Potable waters, check for free chlorine levels upon receipt using SenSafe free chlorine strips and show to be <0.1 ppm free chlorine before extraction. All samples above this limit should be rejected.

8.2.12 Add 100uL of Surrogate to each sample and QC sample and mix. Add 5 uL, 50 uL and 100 uL of the LFB (BS) depending upon the rotation of low, mid to high LFB. For LFM (MS) add 100 uL as the LFM for the batch.

8.2.13 Connect the bottles to the automated system..

8.2.14 Initiate the EPA537.1 Extraction Program as defined in Figure 1.0. Each run is approximately 1 hour 15 minutes. Draw a mark on each bottle and later measure the volume with a graduated cylinder. The actual sample volume extracted then entered into the Element Bench Sheet.

8.2.14 The resulting 10-14 mL extracts are transferred to the N-EVAP concentrator system operated at 50-55 degrees C (never more than 65C) in their original collection vials. The nitrogen flow is initiated and adjusted on each individual sample to provide a gentle stream causing a slight disturbance at the surface of the methanol extracts.

8.2.15 As this evaporation proceeds the walls of each vessel are rinsed with methanol when the volume is approximately 5 mls and then again when the volume is reduced to just below 1.0 mL. After these rinses, the evaporation is allowed to proceed until near dryness. At that point the walls of each sample vial are rinsed again with LC/MS grade Methanol and concentration allowed to proceed to dryness.

8.2.16 To each vial, add 1000 uL of 96%/4%Methanol/Water mix by swirling and using a disposable polypropylene pipet, vortex to mix, allow to settle then carefully transfer to a 2 mL PP snap cap.

8.2.17 Withdraw an aliquot of 300 uL into a 500 uL autos ampler vial (PP) and add 3.0 uL of ISTD mix. .

8.2.18 Cap with polyolefin flexible caps and vortex to mix.

8.2.19 Store Extracts at room temperature until analysis. If analysis is to proceed the next day or later, refrigerate at <10C.

8.3 Running Samples/QC - Acquisition Method

The acquisition method is detailed in Attachment 1 (HPLC) and Attachment 2 (MS/MS) of this SOP. The method is a HPLC with dynamic MRM method with precursor and

product ions with specific acquisition parameters to maximize sensitivity and specificity. This list may be modified to add other PFAS target analytes as necessary.
The Solid Phase Extraction Method (SPE) is detailed as Attachment 3.

8.3.1 The triple Quadrupole (QQQ) system must be optimized for each target analyte (including surrogates and internal standards) using the Mass Hunter Optimizer program. This program determines the most abundant precursor and product ions for each compound and their abundances. These data are then used to build an MRM (multiple reaction monitor) method for acquisition. This is done initially or after any major maintenance procedures are performed to the triple quadrupole system. A high level standard is used for this in the $[M-H]^-$ mode.

8.3.2 The QQQ is checked for tuning on a weekly basis before analysis using the Tune context by selecting the CHECKTUNE radio button. This is done only in negative ion mode since that what we are operating under. If the Checktune fails, run the Autotune program-note: this takes approx. 45 mins. in negative mode. This will require a calibration of the instrument.

8.3.3 Before any QC or samples can be run, the HPLC must be allowed to purge for at least thirty minutes. This purge must be done using the initial mobile phase conditions used in the method must be allowed to run for 15 minutes or until pressure has stabilized (ripple must be < 1%)

8.3.4 An instrument sequence (Worklist) is then made. It should begin with two primers (5 ng/mL) followed by a blank.

8.5.5 Those will be followed by the opening Low level CCC then mid level CCV. Then, the worklist can start running. Every 10 field samples (excluding QC and FRBs) a subsequent CCC must be run, alternating between medium and high CCVs (medium = 5 ng/mL, High = 20 ng/mL; Low CCV = 0.25 ng/mL). The sequence must end with a CCC in the rotation.

8.5.6 Following the run, a store column run must be entered, to ensure the column is stored in a high ratio of solvent.

8.5.7 The run can end with a script to put the instrument into standby mode.

8.4 Daily Sample Preparation/Analysis Sequence

- Prepare extracts for analysis by placing a 500 ul aliquot of sample extract containing internal standards into a PP auto-sampler vial. Apply snap cap.
- Confirm that the samples loaded on the auto-sampler were entered correctly in the injection log. Make any necessary corrections.

- Run instrument CCV checks at the RL (0.25 ng/mL), then at a mid level and high level rotating every ten samples (5, 20 ng/mL) and ending with a mid level CCV.
- Prepare samples by placing 100 ul of extract (diluted if necessary) into an auto-sampler vial. Add 2.0 ul 25 ppm Internal Standard to each.
- Enter the Worklist (injection sequence)into the instrument software and load samples onto the auto-sampler in the following order,

    - 2 Primers and a blank with ISTD
    - CCV conditioner @ 5 ng/mL
    - Low Level CCV (0.25 ng/mL)
    - Batch Method Blank
    - LFB
    - Sample Dup/LFM/LFMD
    - Samples to fill the 12-hour clock or 10 sample injections whichever is more frequent
    - CCV (ending or continuing) at 5.0 ng/mL
    - 10 injections
    - Ending CCV -High level, etc.

8.5 Data Review

The Agilent Mass Hunter Quantitation program is used to review all data. All identifications are based upon acceptable ion ratios for the abundance of both precursor and product ions along with retention time information.

8.5.1 Since certain PFAS species are manufactured by different processes the presence of branched as well as linear isomers may be found. In order to properly quantitate these species, the analyst must sum the related branched and linear isomers. This affects the following species: PFOS, PFHxS, N-EtFOSAA and N-MeFOSAA. These should be annotated as total in the quantitation report and subsequent Element outputs. This is accomplished by adding a Qualifier to these specific analytes. The specific qualifier is PFAS-T which says: "For this PFAS compound, the reported result is the Total of the linear and branched isomers".

EPA guidance on this is as follows:

1. Calibrate instrumentation using a certified quantitative standard containing only the linear isomer.

2. Identify the branched isomers by analyzing a “qualitative/semi-quantitative” PFOA mixed standard that includes both linear and branched isomers (Wellington Laboratories, cat#: T-PFOA or equivalent) and compare retention times and tandem mass spectrometry transitions.

3. Quantitate PFOA and the others by integrating the total response (i.e., accounting for peaks that are identified as linear and branched isomers) and relying on the initial calibration with the linear-isomer quantitative standard.

8.5.2 Any detection greater than the upper limit of the calibration curve requires dilution into the upper half of the curve, where possible.

9. CALIBRATION

9.1 Initial Calibration

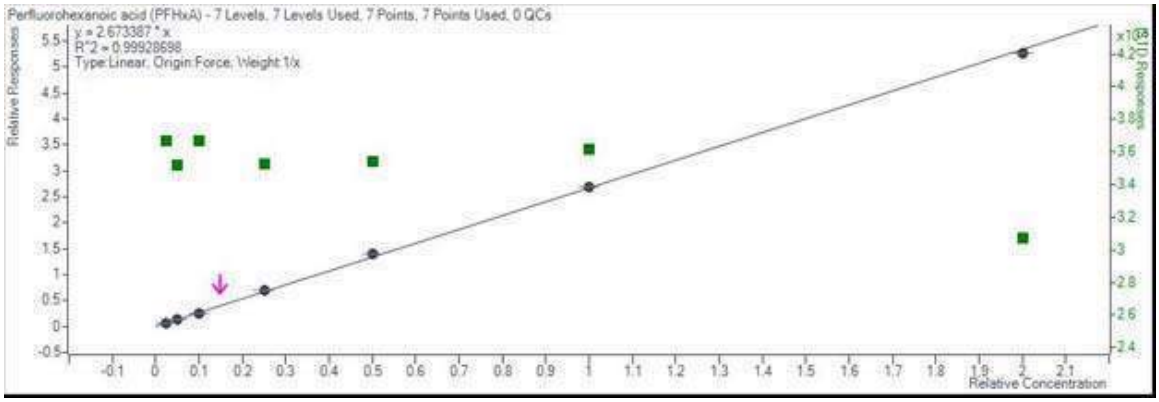
The initial calibration covers the range 0.25 ng/mL to 20 ng/mL or higher depending upon the linearity of the PFAS species. After acquisition, the data are quantitated in Mass Hunter and the default calibration model is generated using Quadratic regression , FORCED through the origin. Depending upon the response and accuracy at each level as shown in the Mass Hunter program, use Linear, Forced, weighted (1/x) or quadratic, Forced, with or without weighting to achieve the best fit which is based upon the best accuracy on a compound by compound basis. In any case, the correlation coefficient must be greater than 0.990.

9.1.1 The calibration levels as shown in Section 7.6.3 use 7 levels. All points are included in the calibration.

9.1.2 A typical calibration for a single compound showing responses and accuracy when quantitated against the curve is shown in Figure 2.0 below.

Figure 2.0 - Typical Calibration Accuracy Report and Curve

Initial Calibration	Perfluorohexanoic acid (PFHxA) Results			MPFOA (ISTD)
Name	RT, mins	Final Conc.	Accuracy	Area
SEQ-CAL1 0.25 ng/mL	10.3302	0.23	90.4	366519
SEQ-CAL2 0.50 ng/mL	10.2801	0.48	95.7	351967
SEQ-CAL3 1.00 ng/mL	10.3886	0.95	95.1	366588
SEQ-CAL4 2.50 ng/mL	10.3886	2.57	102.7	352457
SEQ-CAL5 5.00 ng/mL	10.3886	5.26	105.1	353774
SEQ-CAL6 10.0 ng/mL	10.3886	10.01	100.1	361544
SEQ-CAL7 20.0 ng/mL	10.3552	19.76	98.8	307426
BLANK	ND	ND < 0.25)	NA	365583
SEQ-SCV1 5.0 ng/mL	10.2801	5.12	102.5	360505



9.2 ICV/QCS

A second-source Initial Calibration Verification must be run immediately following initial calibration. The concentration of this standard should be in the middle of the calibration range (e.g. 5.0 ng/mL). Unless project-specific data quality objectives are required, the values from the second-source check should be within 30% of the expected concentration.

> **Corrective Action**: Quantitative sample analyses should not proceed for a failing ICV. Recalibrate and re-run the ICV if necessary.

9.3 Continuing Calibration Verification

The first CCV must be at a level of 0.25 ng/mL (the RL level), followed by rotating mid-level (2.5-5.0 ng/mL) and high-level (10-20 ng/mL) CCVs every 10 client samples including a closing CCV.

The low level (MRL) CCV must be ± 50% of the true value (0.125-0.375 ng/mL). The mid-Level CCV must be ± 30% of the true value.

> **Corrective Action**: If any of the required calibration check criteria fail, the system must be evaluated and any appropriate instrument repair or maintenance must be performed. Sample data are unacceptable and must be rerun. Reinjection the standard may be done. If the calibration check standard still fails, the system must be recalibrated.

10. Quality Control

10.1 Initial Demonstration of Capability (IDOC)

The initial demonstration requirement of EPA 537.1 must be acceptable before analysis of samples may begin. The IDOC includes the

following key elements that are detailed in Sections 9.2.1 et seq. for EPA 537.1:

10.1.1 Initial Demonstration of Branched vs. Linear Isomer profile for PFOA

10.1.2 Initial Demonstration of Low system background

10.1.3 Initial Demonstration of Precision

10.1.4 Initial Demonstration of Accuracy

10.1.5 Initial Demonstration of Asymmetry Factor

10.1.6 MRL Confirmation

10.1.7 MDL Determination (initial and on-going). This is detailed in Section 10.1.7.1 below.

10.1.7.1 MDL Determination-Spike at 4 ng/L

MDL Determination –In order to perform the MDL study, 7 total extractions are performed on 3 different days (Extraction day 1= 3 LRBs and 3 LFBs); Extraction day 2 is 2 of each, and Extraction day 3 is also 2 of each). Once extracted, the analyses are conducted on 3 separate days (we use only QQQ1 so all runs are on that system). The MDL is determined according to the EPA MDL protocol defined in Definition and Procedure of the Determination of the Method Detection Limit, Revision 2 Dec. 2016 as detailed below:

Make all computations as specified in the analytical method and express the final results in the method-specified reporting units.

Calculate the sample standard deviation (SD) of the replicate spiked sample measurements and the sample standard deviation of the replicate method blank measurements from all instruments to which the MDL will be applied.

Compute the MDLs (the MDL based on spiked samples) as follows:

MDL_s = 3.143 x SD (for seven replicates; SD = Standard Deviation)

Compute the MDLb (MDL based on method blanks-LRBs) as follows:

- If none of the blanks give numerical results then the MDLb does not apply
- If only some of the blanks (but not all) give a result, set the MDLb to the highest result found
- If ALL method blanks show a detections then use the following calculation to determine MDLb:

MDLb = Average of Blank Detections + (3.143 x Std. Dev.)

Calculate the final MDL by selecting the greater of MDLs or MDLb.

10.2 Batches are defined at the sample preparation step. Batches should be kept together through the whole analytical process as far as possible, but it is not mandatory to analyze prepared extracts on the same instrument or in the same sequence.

10.2.1 The quality control batch is a set of up to 20 samples of the same matrix processed using the same procedure and reagents within the same time period. The quality control batch must contain a matrix spike/matrix spike duplicate (MS/MSD), a laboratory control sample (LCS) and a method blank. Laboratory generated QC samples (Blank, LCS, MS/MSD) do not count toward the maximum 20 samples in a batch. Field QC samples are included in the batch count. In some cases, at client request, the MS/MSD may be replaced with a matrix spike and sample duplicate. If insufficient sample is available for an MS/MSD, an LCSD may be substituted if batch precision is required by the program or client. In the event that multiple MS/MSDs are run with a batch due to client requirements, the additional MS/MSDs do not count toward the maximum 20 samples in a batch.

10.3 METHOD BLANK- One method blank (MB, laboratory reagent blank) must be extracted with every process batch of similar matrix, not to exceed twenty (20) samples. For aqueous samples, the method blank is an aliquot of laboratory reagent water. For solid samples, the method blank is an aliquot of Ottawa sand. The method blank is processed in the same manner and at the

same time as the associated samples. Corrective actions must be documented on a Non-Conformance memo, and then implemented when target analytes are detected in the method blank above the reporting limit or when IDA recoveries are outside of the control limits. Re-extraction of the blank, other batch QC, and the affected samples are required when the method blank is deemed unacceptable.

10.3.1 If the MB produces a peak within the retention time window of any of the analytes, determine the source of the contamination and eliminate the interference before processing samples.

10.3.2 The method blank must not contain any analyte at or above 1/3 the reporting limit- for EPA 537.1 potable waters.

10.3.3 If there is no target analyte greater than the RL in the samples associated with an unacceptable method blank, the data may be reported with qualifiers. Such action should be taken in

consultation with the client.

10.3.4 Re-extraction and reanalysis of samples associated with an unacceptable method blank is required when reportable concentrations are determined in the samples.

10.3.5 Results are acceptable if the blank contamination is less than ½ of the reporting limit/LOQ for each analyte, or less than 1/10 of the regulatory limit, or less than 1/10 of the sample result for the same analyte, whichever is greater. If the method blank does not meet the acceptance criteria, the source of contamination must be investigated and measures taken to correct, minimize or eliminate the problem. Reprepare and reanalyze all field and QC samples associated with the contaminated method blank.

10.4 LABORATORY CONTROL SAMPLE (LCS) must be extracted with every process batch of similar matrix, not to exceed twenty (20) samples. The LCS is an aliquot of laboratory matrix (e.g. water for aqueous samples and Ottawa sand for solids) spiked with analytes of known identity and concentration. The LCS must be processed in the same manner and at the same time as the associated samples. Corrective actions must be documented on a Non-Conformance memo, then implemented when recoveries of any spiked analyte is outside of the control limits. Re-extraction of the blank, other batch QC, and all associated samples are required if the LCS is deemed unacceptable. The control limits for the LCS are stored in Element unless the method preempts this (537 limits).

10.5 A matrix spike/matrix spike duplicate (MS/MSD or MS/SD) pair must be extracted with every process batch of similar matrix, not to exceed twenty (20) samples. An MS/MSD pair is aliquots of a selected field sample spiked with analytes of known identity and concentration. The MS/MSD pair must be processed in the same manner and at the same time as the associated samples. Spiked analytes with recoveries or precision outside of the control limits must be within the control limits in the LCS. Corrective actions must be documented on a nonconformance memo, then implemented when recoveries of any spiked analyte are outside of the control limits provided by ELEMENT or by the client. Again if a specific method has required limits, this is preempted. Any outliers must be qualified accordingly.

10.6 A duplicate control sample (LCSD or DCS) may be added when insufficient sample volume is provided to process an MS/MSD pair, or is requested by the client. The LCSD is evaluated in the same manner as the LCS.

10.7 Initial calibration verification (ICV) –A second source standard is analyzed with the initial calibration curve. The concentration should be at the mid range of

the curve and must recover within 80-120 % of expected value.

Corrective actions for the ICV include:

- Rerun the ICV.
- Remake or acquire a new ICV.
- Evaluate the instrument conditions.
- Evaluate the initial calibration standards.
- Rerun the initial calibration.

10.8 Internal Standard- The Internal Standard (IS) is added to each field and QC sample prior to analysis. The IS response (peak area) must not deviate by more than 50% from the average response (peak area) of the initial calibration.

10.8.1 Sample IS response (peak area) must be within 70-140% of the response (peak area) in the most recent CCV.

10.9 Specific QC requirements for EPA Method 537.1 are detailed in Table 1.0 as follows.

Table 1.0 QC Criteria-EPA 537.1

Requirement	Specification and Frequency	Acceptance Criteria
Sample Holding Time	14 days with appropriate preservation and storage as described in Sections 8.1-8.5.	Sample results are valid only if samples are extracted within sample hold time.
Extract Holding Time	28 days when stored room temp. in polypropylene centrifuge tubes	Sample results are valid only if extracts are analyzed within extract hold time.
Laboratory Reagent Blank (LRB)	One MBLK with each extraction batch of up to 20 Field Samples.	Demonstrate that the method analyte concentration < 1/3 the MRL, and confirm that possible interferences do not prevent quantification. If the background concentration exceeds 1/3 the MRL, results for the extraction batch are invalid.
Laboratory Fortified Blank (LFB)	One LFB is required for each extraction batch of up to 20 Field Samples. Rotate between low, mid, high levels	Results of LFB analyses at medium and High fortification for the analyte and SUR. Results of a low-level LFB must be 50-150% of the true value.
Internal Standard (IS)	Compare IS area to the average IS area in the initial calibration and the most recent CCC.	Peak area counts for all injections must be within ± 50% of the average peak area calculated during the initial cal. and 70–140% from the most recent CCC. If the IS does not meet this criterion, target analyte results are invalid.
Surrogate(SUR) Standard	The SUR standard added to all calibration standards and samples, including QC samples. Calculate SUR recoveries.	SUR recovery must be 70-130% of the true value. If a SUR fails this criterion, report all results for sample as suspect/SUR recovery with appropriate qualifier.

Sample Matrix Spike (LFSM)	Analyze one MS per extraction batch (of up to 20 Field Samples) fortified target analytes. Calculate LFSM recoveries.	Recoveries at mid-high levels should be 70-130%. For low level LFSM 50-150% is acceptance range. Qualify any outliers using appropriate flags.
MSD (LFSMD) or Field Duplicates (FD)	Extract at least one FD or LFSMD with each extraction batch of 20 field samples or less. Calculate RPD.	RPD should be ≤30% at mid-high spike levels and at low levels ≤ 50% RPD. If not met, qualify data accordingly.
Field Reagent Blank (FRB)	Required when any target analyte is detected above the MRL. Processed as a sample.	IF any target analyte is detected at > 1/3 the MRL, all samples collected are invalid and must be recollected/reanalyzed.
Peak Asymmetry Factor	Calc. this factor each time a new ICAL is done by evaluating the 1st two chromatographic peaks in the mid point of the curve.	The Peak asymmetry factor must be 0.8-1.5-Agilent Mass Hunter calculates this as a Symmetry Factor
Quality Control Sample (QCS)-SCV	Analyzed Quarterly or when preparing new standards as well as during initial demonstration.	70-130% of true value
Initial Calibration	Use ISTD technique first order or second order FORCED through zero (origin). Use minimum of 5 points or 6 points for 2nd order	When each standard is calculated against the curve, the accuracy should be 70-130%, except for the lowest standard which should be 50-150% of the true value.
Continuing Calibration Check (CCC) (or CCV)	Verify by running low std 1st then after every 10 runs, rotating between mid and high levels	Surrogates and analyte recovery 70-130% except for low level. For low level: 50-150% recovery for analytes and 70-130% recovery for surrogates.

10.10 Initial Demonstration of Capability (IDC)

Initial Demonstration of Capability involves the following processes listed ion Table 2.0 as follows.

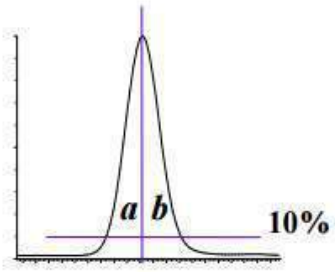
Table 2.0 - Initial Demonstration of Capability (IDC)

Requirement	**Specification**	**Acceptance Criteria**
Initial Demonstration of Low System Background *See EPA 537.1 Section 9.2.1*	Analyze LRB prior to any Other IDC steps	Demonstrate that all method analytes are < 1/3 MRL and possible interferences form extraction media do not prevent identification and quantification of method analytes.
Initial Demonstration of Precision (IDP) *See Section 9.2.2-*	Analyze 4-7 replicate LFBs at mid-cal level	%RSD must be < 20%
Initial Demonstration of Accuracy (IDA) *See Section 9.2.3-537.1*	Using the IDP runs above, Calc. average % Recovery	Mean Recovery ± 30% of true value

Initial Demonstration of Peak Asymmetry Factor	Calc. by evaluating the 1st two chromatographic peaks in the mid point of the curve. Equation in *Section 9.3.9 of EPA 537.1*	The Peak asymmetry factor must be 0.8-1.5 SEE FIGURE 3.0
Minimum Reporting Limit (MRL) Confirmation *See Section 9.2.5-537.1*	Fortify, extract and analyze seven replicates at the proposed MRL level. Calc. mean and the half range (HR). Confirm that the upper and lower limits for the prediction interval of result (Upper PIR and Lower PIR) meet recovery criteria.	Upper PIR $\leq$ 150% Lower PIR $\geq$ 50% SEE BELOW section 10.10.1 FOR CALCULATIONS

Figure 3.0 Peak Asymmetry Factor Determination

$$A_s = \frac{b}{a}$$



where:

A_s = peak asymmetry factor

B = width of the back half of the peak measured (at 10% peak height) from the trailing edge of the peak to a line dropped perpendicularly from the peak apex

a = the width of the front half of the peak measured (at 10% peak height) from the leading edge of the peak to a line dropped perpendicularly from the apex.

Agilent Mass Hunter performs this calculation automatically as shown below:

			Perfluorobutanesulfonic acid (PFBS) Results				MPFOS (ISTD)...		MPFHxA Results			
Acq. Date-Time	Dil.	Pos.	RT	Final Conc.	Accuracy	Symmetry	RT	Area	RT	Final Conc.	Accuracy	Symmetry
3/31/2021 7:06 PM	1.0	Vial 2	8.715	4.7078		1.17	13.954	96552	10.318	5.3196		1.40

10.10.1 MINIMUM REPORTING LEVEL (MRL) CONFIRMATION – Establish a target concentration for the MRL (0.25-0.5 ng/mL in extract- 1.0-2.0 ng/L in sample)for PFAS based on the intended use of the method. Fortify, extract, and analyze seven replicate LFBs at the proposed MRL concentration. Calculate the mean (*Mean*) and standard deviation for these replicates. Determine the Half Range for the prediction interval of results (*HRPIR*) using the equation below

$HR_{PIR} = 3.963S$

where *S* is the standard deviation, and 3.963 is the constant value for seven replicates.

NOTE: The mass spectrum (either SIM or full scan) for the method analyte in the LFBs must meet all the analyte identification criteria the MRL verification may not be performed on LFBs where only the base peak is observed. If during MRL confirmation all identification ions are not observed, the MRL selected is too low.

Confirm that the upper and lower limits for the Prediction Interval of Result (*PIR = Mean + HRPIR*) meet the upper and lower recovery limits as shown below.

The Upper PIR Limit must be ≤ 150% recovery.

$$\textit{Upper PIR Limit} = \frac{\textit{Mean} + \textit{HRPIR}}{\textit{Fortified Concentration}} \times 100\%$$

The Lower PIR Limit must be ≥ 50% recovery.

$$\textit{Lower PIR Limit} = \frac{\textit{Mean} - \textit{HRPIR}}{\textit{Fortified Concentration}} \times 100\%$$

The MRL is validated if both the Upper and Lower PIR Limits meet the criteria described above. If these criteria are not met, the MRL for PFAS has been set too low and must be re-evaluated at a higher concentration.

11.0 DATA REVIEW, CALCULATIONS AND REPORTING

Samples concentrations are determined using either or linear regression or quadratic regression FORCED through the origin. Weighted (1/x or $1/x^2$) may assist with low level accuracy and is recommended where necessary. All calibration curves have greater than 6 points and no points can be removed. Any target analyte exceeding the calibration range will require dilution.

11.1 Data interpretation

All sample data calculations are performed by the Agilent Mass Hunter software in ng/mL and then final data are calculated taking into account final extract volumes and the initial sample volumes extracted which are entered into the Element bench sheet.

11.2 Linear and Branched Isomers are addressed in Section 8.5 and are reported for the noted species as Total which is a sum of the linear and branched isomers for affected species.

12. HEALTH AND SAFETY

12.1 General safety considerations and requirements are detailed in the York Laboratory Safety and Health Standard Operating Procedure No. Safety011600.

Specific safety rules applying to the conduct of this analysis requiring the following:

- When handling standards and samples, latex gloves are required.
- Also, when handling neat materials, a fume hood and safety glasses are required.
- When handling samples, gloves and glasses are required.
- Highly odorous samples must be handled in a fume hood.
- Refer to SDSs for specific safety/health information.

12.2 The analysts must exercise normal care and be supervised and trained to work in an analytical chemistry laboratory. The analysts will be handling fragile glassware, needles, syringes, volatile and flammable chemicals, toxic chemicals and corrosive chemicals.

- No smoking or open flames are allowed.
- No food or food products may be brought into the laboratory.

Solvents should not be left uncovered on the laboratory benches.
All solvent transfers should be done in the hoods.

Hood doors must be kept in the position which yields approx. 100 fpm face velocity.
Solvent evaporation must be done in the hood with exhaust elevated and in the rear.

Waste containers that had solvents must be vented to a hood until all solvents have evaporated.

Safety glasses are provided and must be worn at all times in the laboratory.
Gloves are provided and must be worn when working with chemicals.
Laboratory coats are provided and should be worn to protect the analysts' clothes.
Syringes and needles must be kept in their original cases when not in use.
Care must be exercised in using and handling syringes to avoid injury.
Report any sticking with a needle immediately to your supervisor.

12.3 Specific Safety Concerns

12.3.1 Preliminary toxicity studies indicate that PFAS could have significant toxic effects. In the interest of keeping exposure levels as low as reasonably achievable, PFAS must be handled in the laboratory as hazardous and toxic chemicals.

12.3.2 Exercise caution when using syringes with attached filter disc assemblies. Application of excessive force has, upon occasion, caused a filter disc to burst during the process.

12.3.3 Laboratory procedures such as repetitive use of pipets, repetitive transferring of extracts and manipulation of filled separatory funnels and other glassware represent a significant potential for repetitive motion or other ergonomic injuries. Laboratory associates performing these procedures are in the best position to realize when they are at risk for these types of injuries.

12.3.4 Eye protection, laboratory coat, and nitrile gloves must be worn while handling samples, standards, solvents, and reagents. Disposable gloves that have been contaminated will be removed and discarded; other gloves will be cleaned immediately.

12.3.5 Perfluorocarboxylic acids are acids and are not compatible with strong bases.

12.3.6 Primary Materials Used- The following is a list of the materials used in this method, which have a serious or significant hazard rating. NOTE: This list does not include all materials used in the method. The table contains a summary of the primary hazards listed in the SDS for each of the materials listed in the table. A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the SDS for each material before using it for the first time or when there are major changes to the SDS.

Methanol (2-3-0)	Flammable Poison Irritant	200 ppm (TWA)	A slight irritant to the mucous membranes. Toxic effects exerted upon nervous system, particularly the optic nerve. Symptoms of overexposure may include headache, drowsiness and dizziness. Methyl alcohol is a defatting agent and may cause skin to become dry and cracked. Skin absorption can occur; symptoms may parallel inhalation exposure. Irritant to the eyes.

13. WASTE MANAGEMENT/POLLUTION PREVENTION

Neat Materials

Waste management procedures require the prudent use of neat materials. The ordering of neat standards and materials must be done to minimize unused material which would result in storage or handling of excess material. Quantities ordered should be sufficient to provide for necessary standards with consideration to shelf life. When ordering a unique material for a standard, be sure to order the smallest practical quantity.

Solvents

The solvents used at York for this procedure include isopropanol and Methanol. These solvents are used for sample extraction or LC cleanup, All amounts are either consumed during concentration or placed in one liter amber jars in the hood areas for evaporation. Any remaining solvent/water is transferred to a drum designated for solvent waste.

Samples

Unused or remaining soil and water samples are returned to the sample control room for continued storage for proper disposal by the sample control group.

14. REFERENCES

1. US EPA, "Method 537.1 - Determination of Selected Per- and Polyfluorinated alkyl Substances in Drinking Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometery (LC/MS/MS)", Version 1.0, November 2018, J.A. Shoemaker, P.E. Grimmett, B.K. Boutin, EPA Document #: EPA/600/R-18/352, and Version 2.0, March 2020 (the only updates were editorial and did not include any technical revisions).

2. Method ISO 25101:2009, "Determination of perfluorooctanesulfonate (PFOS) and perfluorooctanoate (PFOA) – Method for unfiltered samples using solid phase extraction and liquid chromatography/mass spectrometry", April 30, 2009.

3. EPA Technical Advisory-Laboratory Analysis of Drinking Water Samples for Perfluorooctanoic Acid (PFOA) using EPA Method 537 Rev. 1.1 EPA 815-B-16-021 September 2016

15. REVISION HISTORY

Revision 1.0	11/25/2018	First issue.
Revision 1.1	01/09/2019	Modified Cover page
Revision 1.2	03/30/2021	Modified Stds prep. Section 7 to reflect updated procedures
Revision 1.3	04/22/2021	Modified Reference 1 to reflect EPA 537.1

Attachment 1 -HPLC Method Parameters

Acquisition Method Report

	Channel	Name 1	Name 2	Selected	Used	Percent
1	A	Water 5mM ammonium acetate		Ch. 1	Yes	10.0 %
2	B	95% MeOH 5mM ammonium acetate		Ch. 1	Yes	90.0 %

Timetable

	Time	A	B	Flow
1	0.50 min	90.0 %	10.0 %	--- mL/min
2	2.00 min	70.0 %	30.0 %	--- mL/min
3	14.00 min	5.0 %	95.0 %	--- mL/min
4	14.50 min	0.0 %	100.0 %	--- mL/min

Name: Column Comp. **Module:** G7116A

Left Temperature Control	
Temperature Control Mode	Temperature Set
Temperature	50.0 °C
Enable Analysis Left Temperature	
Enable Analysis Left Temperature On	Yes
Enable Analysis Left Temperature Value	0.8 °C
Left Temp. Equilibration Time	1.0 min
Right Temperature Control	
Right temperature Control Mode	Temperature Set
Right temperature	50.0 °C
Enable Analysis Right Temperature	
Enable Analysis Right Temperature On	Yes
Enable Analysis Right Temperature Value	0.8 °C
Right Temp. Equilibration Time	1.0 min
Enforce column for run	
Enforce column for run enabled	No
Stop Time	
Stoptime Mode	As pump/injector
Post Time	
Posttime Mode	Off
Timetable	
Valve Position	Position 1 (Port 1 -> 1')
Position Switch After Run	Do not switch

Attachment 2 - Triple Quadrupole Acquisition Method

Acquisition Method Report

Acquisition Method Info

Method Name	EPA537.1_041720_ACQ.m
Method Path	D:\MassHunter\Methods\EPA537.1_041720_ACQ.m
Method Description	Target PFAS Acquisiton EPA537.1 PW

Device List

Multisampler
Binary Pump
Column Comp.
QQQ

MS QQQ Mass Spectrometer

Ion Source	AJS ESI	**Tune File**	D:\MassHunter\Tune\QQQ\G6470A \Autotune_20210106_152612\atunes_20 210106_154847.TUNE.XML
Stop Mode	No Limit/As Pump	**Stop Time (min)**	1
Time Filter	On	**Time Filter Width (min)**	0.07
LC->Waste Pre Row	N/A	**LC->Waste Post Row**	N/A

Time Segments

Index	Start Time (min)	Scan Type	Ion Mode	Div Valve	Delta EMV	Store	Cycle Time (ms)	Triggered?	MRM Repeats
1	0	DynamicMRM	ESI+Agilent Jet Stream	To MS	325	Yes	500	No	3

Time Segment 1

Scan Segments

Cpd Name	ISTD?	Prec Ion	MS1 Res	Prod Ion	MS2 Res	Frag (V)	CE (V)	Cell Acc (V)	Ret Time (min)	Ret Window	Polarity
11CL-PF3OUdS	No	630.89	Unit/Enh (6490)	450.7	Unit/Enh (6490)	170	33	4	15.711	3	Negative
9CL-PF3ONS	No	530.89	Unit/Enh (6490)	350.7	Unit/Enh (6490)	175	29	4	14.471	3	Negative
ADONA	No	376.97	Unit/Enh (6490)	250.8	Unit/Enh (6490)	103	9	4	12.108	3	Negative
ADONA	No	376.97	Unit/Enh (6490)	84.9	Unit/Enh (6490)	103	37	4	12.108	3	Negative
d3-N-MeFOSAA	Yes	572.99	Unit/Enh (6490)	418.7	Unit/Enh (6490)	146	21	4	15.092	3	Negative
d5-N-EtFOSAA	No	589.02	Unit/Enh (6490)	530.8	Unit/Enh (6490)	156	21	4	15.427	3	Negative
d5-N-EtFOSAA	No	588.99	Unit/Enh (6490)	418.8	Unit/Enh (6490)	156	21	4	15.427	3	Negative
HFPO-DA (GenX)	No	285	Unit/Enh (6490)	169	Unit/Enh (6490)	100	20	4	11.076	3	Negative
M2PFOA	Yes	414.99	Unit/Enh (6490)	369.8	Unit/Enh (6490)	84	9	4	13.067	3	Negative
M3HFPO-DA	No	287	Unit/Enh (6490)	169	Unit/Enh (6490)	100	20	4	11.075	3	Negative
MPFDA	No	514.99	Unit/Enh (6490)	469.8	Unit/Enh (6490)	78	9	4	14.774	3	Negative
MPFHxA	No	314.99	Unit/Enh (6490)	269.8	Unit/Enh (6490)	88	5	4	10.601	3	Negative
MPFOS	Yes	502.99	Unit/Enh (6490)	79.8	Unit/Enh (6490)	180	40	4	14.009	3	Negative
N-EtFOSAA	No	584	Unit/Enh (6490)	525.9	Unit/Enh (6490)	130	20	4	15.436	3	Negative
N-EtFOSAA	No	584	Unit/Enh (6490)	418.8	Unit/Enh (6490)	130	20	4	15.436	3	Negative
N-MeFOSAA	No	570	Unit/Enh (6490)	511.9	Unit/Enh (6490)	150	20	4	15.101	3	Negative
N-MeFOSAA	No	570	Unit/Enh (6490)	418.9	Unit/Enh (6490)	150	20	4	15.101	3	Negative
Perfluorobutanesulfonic acid (PFBS)	No	298.9	Unit/Enh (6490)	79.9	Unit/Enh (6490)	150	36	4	9.091	3	Negative
Perfluorodecanoic acid (PFDA)	No	513	Unit/Enh (6490)	468.8	Unit/Enh (6490)	90	8	4	14.775	3	Negative
Perfluorodecanoic acid (PFDA)	No	513	Unit/Enh (6490)	268.8	Unit/Enh (6490)	90	16	4	14.775	3	Negative

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Acquisition Method Report

Cpd Name	ISTD?	Prec Ion	MS1 Res	Prod Ion	MS2 Res	Frag (V)	CE (V)	Cell Acc (V)	Ret Time (min)	Ret Window	Polarity
Perfluorododecanoic acid (PFDoA)	No	613	Unit/Enh (6490)	568.8	Unit/Enh (6490)	90	12	4	15.964	3	Negative
Perfluorododecanoic acid (PFDoA)	No	613	Unit/Enh (6490)	168.7	Unit/Enh (6490)	90	28	4	15.964	3	Negative
Perfluoroheptanoic acid (PFHpA)	No	363	Unit/Enh (6490)	318.8	Unit/Enh (6490)	90	8	4	11.968	3	Negative
Perfluoroheptanoic acid (PFHpA)	No	363	Unit/Enh (6490)	168.9	Unit/Enh (6490)	90	16	4	11.968	3	Negative
Perfluorohexanesulfonic acid (PFHxS)	No	398.9	Unit/Enh (6490)	98.9	Unit/Enh (6490)	150	40	4	12.015	3	Negative
Perfluorohexanesulfonic acid (PFHxS)	No	398.9	Unit/Enh (6490)	79.9	Unit/Enh (6490)	150	44	4	12.015	3	Negative
Perfluorohexanoic acid (PFHxA)	No	313	Unit/Enh (6490)	268.9	Unit/Enh (6490)	70	4	4	10.595	3	Negative
Perfluorohexanoic acid (PFHxA)	No	313	Unit/Enh (6490)	119	Unit/Enh (6490)	70	20	4	10.595	3	Negative
Perfluorononanoic acid (PFNA)	No	463	Unit/Enh (6490)	418.8	Unit/Enh (6490)	90	8	4	14.002	3	Negative
Perfluorononanoic acid (PFNA)	No	463	Unit/Enh (6490)	218.8	Unit/Enh (6490)	90	16	4	14.002	3	Negative
Perfluorooctanesulfonic acid (PFOS)	No	498.9	Unit/Enh (6490)	98.9	Unit/Enh (6490)	150	44	4	14.01	3	Negative
Perfluorooctanesulfonic acid (PFOS)	No	498.9	Unit/Enh (6490)	79.9	Unit/Enh (6490)	150	84	4	14.01	3	Negative
Perfluorooctanoic acid (PFOA)	No	413	Unit/Enh (6490)	368.8	Unit/Enh (6490)	90	8	4	13.067	3	Negative
Perfluorooctanoic acid (PFOA)	No	413	Unit/Enh (6490)	168.9	Unit/Enh (6490)	90	16	4	13.067	3	Negative
Perfluorotetradecanoic acid (PFTA)	No	713	Unit/Enh (6490)	669	Unit/Enh (6490)	110	12	4	16.843	3	Negative
Perfluorotetradecanoic acid (PFTA)	No	713	Unit/Enh (6490)	168.8	Unit/Enh (6490)	110	28	4	16.843	3	Negative
Perfluorotridecanoic acid (PFTrDA)	No	663	Unit/Enh (6490)	618.8	Unit/Enh (6490)	90	12	4	16.433	3	Negative
Perfluoroundecanoic acid (PFUnA)	No	563	Unit/Enh (6490)	519	Unit/Enh (6490)	90	8	4	15.421	3	Negative
Perfluoroundecanoic acid (PFUnA)	No	563	Unit/Enh (6490)	169	Unit/Enh (6490)	90	24	4	15.421	3	Negative

Scan Parameters

Data Stg	Threshold
Centroid	0

Report generation date: 05-Apr-2021 07:54:20 AM

Acquisition Method Report

Source Parameters

Parameter	Value (+)	Value (-)
Gas Temp (°C)	230	230
Gas Flow (l/min)	5	5
Nebulizer (psi)	15	15
SheathGasHeater	350	350
SheathGasFlow	12	12
Capillary (V)	3500	2500
VCharging	500	0

Chromatograms

Chrom Type	Label	Offset	Y-Range
TIC	TIC	0	10000000

Instrument Curves

Actual

Name: Multisampler	Module: G7167A
Sampling Speed	
Draw Speed	100.0 µL/min
Eject Speed	400.0 µL/min
Wait Time After Drawing	1.2 s
Injection	
Needle Wash Mode	Standard Wash
Injection Volume	5.00 µL
Standard Needle Wash	
Needle Wash Mode	Flush Port
Duration	10 s
High Throughput	
Injection Valve to Bypass for Delay Volume Reduction	No
Sample Flush-Out Factor	5.0
Overlapped Injection	
Overlap Injection Enabled	No
Needle Height Position	
Draw Position Offset	1.5 mm
Use Vial/Well Bottom Sensing	Yes
Stop Time	
Stoptime Mode	No Limit
Post Time	
Posttime Mode	Off

Name: Binary Pump	Module: G7112B
Flow	0.400 mL/min
Use Solvent Types	No
Low Pressure Limit	0.00 bar
High Pressure Limit	600.00 bar
Maximum Flow Gradient	100.000 mL/min²
Stroke A	
Automatic Stroke Calculation A	Yes
Stroke B	
Automatic Stroke Calculation B	Yes
Compress A	
Compressibility Mode A	Compressibility Value Set
Compressibility A	70 10e-6/bar
Compress B	
Compressibility Mode B	Compressibility Value Set
Compressibility B	90 10e-6/bar
Stop Time	
Stoptime Mode	Time set

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ATTACHMENT F

ELAP Certification
(York Analytical Laboratories, Inc.)

LANGAN

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2022
Issued April 01, 2021

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MR. ROBERT Q. BRADLEY
YORK ANALYTICAL LABORATORIES INC
120 RESEARCH DRIVE
STRATFORD, CT 06615

NY Lab Id No: 10854

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2016) for the category ENVIRONMENTAL ANALYSES NON POTABLE WATER
All approved analytes are listed below:

Acrylates	
Acrolein (Propenal)	EPA 8260D
	EPA 8260C
	EPA 624.1
Acrylonitrile	EPA 8260D
	EPA 8260C
	EPA 624.1
Methyl methacrylate	EPA 8260D
	EPA 8260C
Amines	
1,2-Diphenylhydrazine	EPA 8270D
	EPA 8270E
2-Nitroaniline	EPA 8270D
	EPA 8270E
3-Nitroaniline	EPA 8270D
	EPA 8270E
4-Chloroaniline	EPA 8270D
	EPA 8270E
4-Nitroaniline	EPA 8270D
	EPA 8270E
Aniline	EPA 625.1
	EPA 8270D
	EPA 8270E
Carbazole	EPA 625.1
	EPA 8270D
	EPA 8270E
Amines	
Diphenylamine	EPA 8270D
	EPA 8270E
Pyridine	EPA 625.1
	EPA 8270D
	EPA 8270E
Benzidines	
3,3'-Dichlorobenzidine	EPA 625.1
	EPA 8270D
	EPA 8270E
Benzidine	EPA 625.1
	EPA 8270D
	EPA 8270E
Chlorinated Hydrocarbon Pesticides	
4,4'-DDD	EPA 8081B
	EPA 608.3
4,4'-DDE	EPA 8081B
	EPA 608.3
4,4'-DDT	EPA 8081B
	EPA 608.3
Aldrin	EPA 8081B
	EPA 608.3
alpha-BHC	EPA 8081B
	EPA 608.3
alpha-Chlordane	EPA 8081B
beta-BHC	EPA 8081B

Serial No.: 62804

Property of the New York State Department of Health. Certificates are valid only at the address shown, must be conspicuously posted, and are printed on secure paper. Continued accreditation depends on successful ongoing participation in the Program. Consumers are urged to call (518) 485-5570 to verify the laboratory's accreditation status.

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Chlorinated Hydrocarbon Pesticides	
beta-BHC	EPA 608.3
Chlordane Total	EPA 8081B
	EPA 608.3
delta-BHC	EPA 8081B
	EPA 608.3
Dieldrin	EPA 8081B
	EPA 608.3
Endosulfan I	EPA 8081B
	EPA 608.3
Endosulfan II	EPA 8081B
	EPA 608.3
Endosulfan sulfate	EPA 8081B
	EPA 608.3
Endrin	EPA 8081B
	EPA 608.3
Endrin aldehyde	EPA 8081B
	EPA 608.3
Endrin Ketone	EPA 8081B
gamma-Chlordane	EPA 8081B
Heptachlor	EPA 8081B
	EPA 608.3
Heptachlor epoxide	EPA 8081B
	EPA 608.3
Lindane	EPA 8081B
	EPA 608.3
Methoxychlor	EPA 8081B

Chlorinated Hydrocarbon Pesticides	
Methoxychlor	EPA 608.3
Mirex	EPA 8081B
Toxaphene	EPA 8081B
	EPA 608.3
Chlorinated Hydrocarbons	
1,2,3-Trichlorobenzene	EPA 8260D
	EPA 8260C
1,2,4,5-Tetrachlorobenzene	EPA 8270D
	EPA 8270E
1,2,4-Trichlorobenzene	EPA 625.1
	EPA 8270D
	EPA 8270E
2-Chloronaphthalene	EPA 625.1
	EPA 8270D
	EPA 8270E
Hexachlorobenzene	EPA 625.1
	EPA 8270D
	EPA 8270E
Hexachlorobutadiene	EPA 625.1
	EPA 8270D
	EPA 8270E
Hexachlorocyclopentadiene	EPA 625.1
	EPA 8270D
	EPA 8270E
Hexachloroethane	EPA 625.1

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Chlorinated Hydrocarbons	
Hexachloroethane	EPA 8270D
	EPA 8270E
Pentachlorobenzene	EPA 8270D
	EPA 8270E
Chlorophenoxy Acid Pesticides	
2,4,5-T	EPA 8151A
2,4,5-TP (Silvex)	EPA 8151A
	SM 6640B-2006
2,4-D	EPA 8151A
Dicamba	EPA 8151A
Demand	
Biochemical Oxygen Demand	SM 5210B-2011
Carbonaceous BOD	SM 5210B-2011
Chemical Oxygen Demand	SM 5220D-2011
Fuel Oxygenates	
Di-Isopropyl ether	EPA 8260D
	EPA 8260C
Ethanol	EPA 8260D
	EPA 8260C
Methyl tert-butyl ether	EPA 8260D
	EPA 8260C
tert-amyl alcohol	EPA 8260D
	EPA 8260C
tert-amyl methyl ether (TAME)	EPA 8260D
Fuel Oxygenates	
tert-amyl methyl ether (TAME)	EPA 8260C
tert-butyl alcohol	EPA 8260D
	EPA 8260C
tert-butyl ethyl ether (ETBE)	EPA 8260D
	EPA 8260C
Haloethers	
2,2'-Oxybis(1-chloropropane)	EPA 625.1
	EPA 8270D
	EPA 8270E
4-Bromophenylphenyl ether	EPA 625.1
	EPA 8270D
	EPA 8270E
4-Chlorophenylphenyl ether	EPA 625.1
	EPA 8270D
	EPA 8270E
Bis(2-chloroethoxy)methane	EPA 625.1
	EPA 8270D
	EPA 8270E
Bis(2-chloroethyl)ether	EPA 625.1
	EPA 8270D
	EPA 8270E
Low Level Halocarbons	
1,2,3-Trichloropropane, Low Level	EPA 8011
1,2-Dibromo-3-chloropropane, Low Level	EPA 8011
1,2-Dibromoethane, Low Level	EPA 8011

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Low Level Polynuclear Aromatics	
Acenaphthene Low Level	EPA 8270D
	EPA 8270E
	EPA 8270E SIM
Acenaphthylene Low Level	EPA 8270D
	EPA 8270E
	EPA 8270E SIM
Anthracene Low Level	EPA 8270D
	EPA 8270E
	EPA 8270E SIM
Benzo(a)anthracene Low Level	EPA 8270D
	EPA 8270E
	EPA 8270E SIM
Benzo(a)pyrene Low Level	EPA 8270D
	EPA 8270E
	EPA 8270E SIM
Benzo(b)fluoranthene Low Level	EPA 8270D
	EPA 8270E
	EPA 8270E SIM
Benzo(g,h,i)perylene Low Level	EPA 8270D
	EPA 8270E
	EPA 8270E SIM
Benzo(k)fluoranthene Low Level	EPA 8270D
	EPA 8270E
	EPA 8270E SIM
Chrysene Low Level	EPA 8270D
	EPA 8270E

Low Level Polynuclear Aromatics	
Chrysene Low Level	EPA 8270E SIM
Dibenzo(a,h)anthracene Low Level	EPA 8270D
	EPA 8270E
	EPA 8270E SIM
Fluoranthene Low Level	EPA 8270D
	EPA 8270E
	EPA 8270E SIM
Fluorene Low Level	EPA 8270D
	EPA 8270E
	EPA 8270E SIM
Indeno(1,2,3-cd)pyrene Low Level	EPA 8270D
	EPA 8270E
	EPA 8270E SIM
Naphthalene Low Level	EPA 8270D
	EPA 8270E
	EPA 8270E SIM
Phenanthrene Low Level	EPA 8270D
	EPA 8270E
	EPA 8270E SIM
Pyrene Low Level	EPA 8270D
	EPA 8270E
	EPA 8270E SIM
Metals I	
Barium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C

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All approved analytes are listed below:

Metals I	
Barium, Total	EPA 6010D
	EPA 6020A
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Cadmium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Calcium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
Chromium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Copper, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Iron, Total	EPA 200.7, Rev. 4.4 (1994)

Metals I	
Iron, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Lead, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Magnesium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
Manganese, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Nickel, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)

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All approved analytes are listed below:

Metals I	
Potassium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
Silver, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Sodium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
Metals II	
Aluminum, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Antimony, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Metals II	
Arsenic, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Beryllium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Chromium VI	EPA 7196A
	SM 3500-Cr B-2011
Mercury, Total	EPA 245.1, Rev. 3.0 (1994)
	EPA 245.2 (Issued 1974, Rev. 1
	EPA 7470A
	EPA 7473
Selenium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Vanadium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C

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CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MR. ROBERT Q. BRADLEY
YORK ANALYTICAL LABORATORIES INC
120 RESEARCH DRIVE
STRATFORD, CT 06615

NY Lab Id No: 10854

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2016) for the category ENVIRONMENTAL ANALYSES NON POTABLE WATER
All approved analytes are listed below:

Metals II	
Vanadium, Total	EPA 6010D
	EPA 6020A
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Zinc, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Metals III	
Cobalt, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Molybdenum, Total	EPA 6020A
	EPA 200.8, Rev. 5.4 (1994)
Thallium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Metals III	
Tin, Total	EPA 6020A
	EPA 200.8, Rev. 5.4 (1994)
Titanium, Total	EPA 6020A
	EPA 200.8, Rev. 5.4 (1994)
Mineral	
Alkalinity	SM 2320B-2011
Calcium Hardness	EPA 200.7, Rev. 4.4 (1994)
Chloride	EPA 300.0, Rev. 2.1 (1993)
Fluoride, Total	EPA 300.0, Rev. 2.1 (1993)
Hardness, Total	EPA 200.7, Rev. 4.4 (1994)
Sulfate (as SO4)	EPA 300.0, Rev. 2.1 (1993)
Miscellaneous	
Boron, Total	EPA 6020A
	EPA 200.8, Rev. 5.4 (1994)
Bromide	EPA 300.0, Rev. 2.1 (1993)
Color	SM 2120B-2011
Cyanide, Total	SM 4500-CN E-2011
Oil and Grease Total Recoverable (HEM)	EPA 1664A
Organic Carbon, Total	SM 5310C-2011
Phenols	EPA 420.1 (Rev. 1978)
Specific Conductance	EPA 120.1 (Rev. 1982)
Sulfide (as S)	SM 4500-S2- F-2011
Surfactant (MBAS)	SM 5540C-2011
Turbidity	EPA 180.1, Rev. 2.0 (1993)

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Nitroaromatics and Isophorone	
2,4-Dinitrotoluene	EPA 625.1
	EPA 8270D
	EPA 8270E
2,6-Dinitrotoluene	EPA 625.1
	EPA 8270D
	EPA 8270E
Isophorone	EPA 625.1
	EPA 8270D
	EPA 8270E
Nitrobenzene	EPA 625.1
	EPA 8270D
	EPA 8270E
Nitrosoamines	
N-Nitrosodimethylamine	EPA 625.1
	EPA 8270D
	EPA 8270E
N-Nitrosodi-n-propylamine	EPA 625.1
	EPA 8270D
	EPA 8270E
N-Nitrosodiphenylamine	EPA 625.1
	EPA 8270D
	EPA 8270E
Nutrient	
Ammonia (as N)	SM 4500-NH3 D-2011 or E-2011
Kjeldahl Nitrogen, Total	SM 4500-N Org D-2011
Nutrient	
Kjeldahl Nitrogen, Total	SM 4500-NH3 D-2011 or E-201
Nitrate (as N)	EPA 300.0, Rev. 2.1 (1993)
Nitrate-Nitrite (as N)	EPA 300.0, Rev. 2.1 (1993)
Nitrite (as N)	EPA 300.0, Rev. 2.1 (1993)
Orthophosphate (as P)	EPA 300.0, Rev. 2.1 (1993)
	SM 4500-P E-2011
Phosphorus, Total	SM 4500-P E-2011
Organophosphate Pesticides	
Atrazine	EPA 8270D
	EPA 8270E
Parathion ethyl	EPA 8270D
	EPA 8270E
Petroleum Hydrocarbons	
Diesel Range Organics	EPA 8015D
Gasoline Range Organics	EPA 8015D
Phthalate Esters	
Benzyl butyl phthalate	EPA 625.1
	EPA 8270D
	EPA 8270E
Bis(2-ethylhexyl) phthalate	EPA 625.1
	EPA 8270D
	EPA 8270E
Diethyl phthalate	EPA 625.1
	EPA 8270D

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Phthalate Esters	
Diethyl phthalate	EPA 8270E
Dimethyl phthalate	EPA 625.1
	EPA 8270D
	EPA 8270E
Di-n-butyl phthalate	EPA 625.1
	EPA 8270D
	EPA 8270E
Di-n-octyl phthalate	EPA 625.1
	EPA 8270D
	EPA 8270E
Polychlorinated Biphenyls	
Aroclor 1016 (PCB-1016)	EPA 8082A
	EPA 608.3
Aroclor 1221 (PCB-1221)	EPA 8082A
	EPA 608.3
Aroclor 1232 (PCB-1232)	EPA 8082A
	EPA 608.3
Aroclor 1242 (PCB-1242)	EPA 8082A
	EPA 608.3
Aroclor 1248 (PCB-1248)	EPA 8082A
	EPA 608.3
Aroclor 1254 (PCB-1254)	EPA 8082A
	EPA 608.3
Aroclor 1260 (PCB-1260)	EPA 8082A
	EPA 608.3
Polychlorinated Biphenyls	
Aroclor 1262 (PCB-1262)	EPA 8082A
Aroclor 1268 (PCB-1268)	EPA 8082A
Polynuclear Aromatics	
Acenaphthene	EPA 625.1
	EPA 8270D
	EPA 8270E
Acenaphthylene	EPA 625.1
	EPA 8270D
	EPA 8270E
Anthracene	EPA 625.1
	EPA 8270D
	EPA 8270E
Benzo(a)anthracene	EPA 625.1
	EPA 8270D
	EPA 8270E
Benzo(a)pyrene	EPA 625.1
	EPA 8270D
	EPA 8270E
Benzo(b)fluoranthene	EPA 625.1
	EPA 8270D
	EPA 8270E
Benzo(g,h,i)perylene	EPA 625.1
	EPA 8270D
	EPA 8270E
Benzo(k)fluoranthene	EPA 625.1

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Polynuclear Aromatics	
Benzo(k)fluoranthene	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
	EPA 8270E
Naphthalene	EPA 625.1
	EPA 8270D
	EPA 8270E
Phenanthrene	EPA 625.1
	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 625.1
	EPA 8270D
	EPA 8270E
2-Chlorophenol	EPA 625.1
	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

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Priority Pollutant Phenols	
2-Nitrophenol	EPA 625.1
	EPA 8270D
	EPA 8270E
4-Chloro-3-methylphenol	EPA 625.1
	EPA 8270D
	EPA 8270E
4-Methylphenol	EPA 625.1
	EPA 8270D
	EPA 8270E
4-Nitrophenol	EPA 625.1
	EPA 8270D
	EPA 8270E
Cresols, Total	EPA 8270D
	EPA 8270E
Pentachlorophenol	EPA 625.1
	EPA 8270D
	EPA 8270E
Phenol	EPA 625.1
	EPA 8270D
	EPA 8270E
Residue	
Settleable Solids	SM 2540 F-2011
Solids, Total	SM 2540 B-2011
Solids, Total Dissolved	SM 2540 C-2011
Solids, Total Suspended	SM 2540 D-2011

Semi-Volatile Organics	
1,1'-Biphenyl	EPA 8270D
	EPA 8270E
1,2-Dichlorobenzene, Semi-volatile	EPA 8270D
	EPA 8270E
1,3-Dichlorobenzene, Semi-volatile	EPA 8270D
	EPA 8270E
1,4-Dichlorobenzene, Semi-volatile	EPA 8270D
	EPA 8270E
2-Methylnaphthalene	EPA 8270D
	EPA 8270E
Acetophenone	EPA 8270D
	EPA 8270E
alpha-Terpineol	EPA 625.1
	EPA 8270E
Benzaldehyde	EPA 8270D
	EPA 8270E
Benzoic Acid	EPA 8270D
	EPA 8270E
Benzyl alcohol	EPA 8270D
	EPA 8270E
Caprolactam	EPA 8270D
	EPA 8270E
Dibenzofuran	EPA 8270D
	EPA 8270E

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Volatile Aromatics	
1,2,4-Trichlorobenzene, Volatile	EPA 8260D
	EPA 8260C
1,2,4-Trimethylbenzene	EPA 8260D
	EPA 8260C
1,2-Dichlorobenzene	EPA 8260D
	EPA 8260C
	EPA 624.1
1,3,5-Trimethylbenzene	EPA 8260D
	EPA 8260C
1,3-Dichlorobenzene	EPA 8260D
	EPA 8260C
	EPA 624.1
1,4-Dichlorobenzene	EPA 8260D
	EPA 8260C
	EPA 624.1
2-Chlorotoluene	EPA 8260D
	EPA 8260C
4-Chlorotoluene	EPA 8260D
	EPA 8260C
Benzene	EPA 8260D
	EPA 8260C
	EPA 624.1
Bromobenzene	EPA 8260D
	EPA 8260C
Chlorobenzene	EPA 8260D
	EPA 8260C

Volatile Aromatics	
Chlorobenzene	EPA 624.1
Ethyl benzene	EPA 8260D
	EPA 8260C
	EPA 624.1
Isopropylbenzene	EPA 8260D
	EPA 8260C
m/p-Xylenes	EPA 8260D
	EPA 8260C
	EPA 624.1
Naphthalene, Volatile	EPA 8260D
	EPA 8260C
n-Butylbenzene	EPA 8260D
	EPA 8260C
n-Propylbenzene	EPA 8260D
	EPA 8260C
o-Xylene	EPA 8260D
	EPA 8260C
	EPA 624.1
p-Isopropyltoluene (P-Cymene)	EPA 8260D
	EPA 8260C
sec-Butylbenzene	EPA 8260D
	EPA 8260C
Styrene	EPA 8260D
	EPA 8260C
	EPA 624.1
tert-Butylbenzene	EPA 8260D

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Volatile Aromatics	
tert-Butylbenzene	EPA 8260C
Toluene	EPA 8260D
	EPA 8260C
	EPA 624.1
Total Xylenes	EPA 8260D
	EPA 8260C
	EPA 624.1
Volatile Halocarbons	
1,1,1,2-Tetrachloroethane	EPA 8260D
	EPA 8260C
1,1,1-Trichloroethane	EPA 8260D
	EPA 8260C
	EPA 624.1
1,1,2,2-Tetrachloroethane	EPA 8260D
	EPA 8260C
	EPA 624.1
1,1,2-Trichloro-1,2,2-Trifluoroethane	EPA 8260D
	EPA 8260C
1,1,2-Trichloroethane	EPA 8260D
	EPA 8260C
	EPA 624.1
1,1-Dichloroethane	EPA 8260D
	EPA 8260C
	EPA 624.1
1,1-Dichloroethene	EPA 8260D

Volatile Halocarbons	
1,1-Dichloroethene	EPA 8260C
	EPA 624.1
1,1-Dichloropropene	EPA 8260D
	EPA 8260C
1,2,3-Trichloropropane	EPA 8260D
	EPA 8260C
1,2-Dibromo-3-chloropropane	EPA 8260D
	EPA 8260C
1,2-Dibromoethane	EPA 8260D
	EPA 8260C
1,2-Dichloroethane	EPA 8260D
	EPA 8260C
	EPA 624.1
1,2-Dichloropropane	EPA 8260D
	EPA 8260C
	EPA 624.1
1,3-Dichloropropane	EPA 8260D
	EPA 8260C
2,2-Dichloropropane	EPA 8260D
	EPA 8260C
2-Chloroethylvinyl ether	EPA 8260D
	EPA 8260C
	EPA 624.1
Bromochloromethane	EPA 8260D
	EPA 8260C
Bromodichloromethane	EPA 8260D

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Volatile Halocarbons	
Bromodichloromethane	EPA 8260C
	EPA 624.1
Bromoform	EPA 8260D
	EPA 8260C
	EPA 624.1
Bromomethane	EPA 8260D
	EPA 8260C
	EPA 624.1
Carbon tetrachloride	EPA 8260D
	EPA 8260C
	EPA 624.1
Chloroethane	EPA 8260D
	EPA 8260C
	EPA 624.1
Chloroform	EPA 8260D
	EPA 8260C
	EPA 624.1
Chloromethane	EPA 8260D
	EPA 8260C
	EPA 624.1
cis-1,2-Dichloroethene	EPA 8260D
	EPA 8260C
	EPA 624.1
cis-1,3-Dichloropropene	EPA 8260D
	EPA 8260C
	EPA 624.1

Volatile Halocarbons	
Dibromochloromethane	EPA 8260D
	EPA 8260C
	EPA 624.1
Dibromomethane	EPA 8260D
	EPA 8260C
Dichlorodifluoromethane	EPA 8260D
	EPA 8260C
	EPA 624.1
Hexachlorobutadiene, Volatile	EPA 8260D
	EPA 8260C
Methylene chloride	EPA 8260D
	EPA 8260C
	EPA 624.1
Tetrachloroethene	EPA 8260D
	EPA 8260C
	EPA 624.1
trans-1,2-Dichloroethene	EPA 8260D
	EPA 8260C
	EPA 624.1
trans-1,3-Dichloropropene	EPA 8260D
	EPA 8260C
	EPA 624.1
trans-1,4-Dichloro-2-butene	EPA 8260D
	EPA 8260C
Trichloroethene	EPA 8260D
	EPA 8260C

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Volatile Halocarbons	
Trichloroethene	EPA 624.1
Trichlorofluoromethane	EPA 8260D
	EPA 8260C
	EPA 624.1
Vinyl chloride	EPA 8260D
	EPA 8260C
	EPA 624.1
Volatiles Organics	
1,4-Dioxane	EPA 8260D
	EPA 8260C
	EPA 8270D SIM
	EPA 8270E
	EPA 8270E SIM
2-Butanone (Methylethyl ketone)	EPA 8260D
	EPA 8260C
2-Hexanone	EPA 8260D
	EPA 8260C
4-Methyl-2-Pentanone	EPA 8260D
	EPA 8260C
Acetone	EPA 8260D
	EPA 8260C
Carbon Disulfide	EPA 8260D
	EPA 8260C
Cyclohexane	EPA 8260D
	EPA 8260C
Volatiles Organics	
Methyl acetate	EPA 8260D
	EPA 8260C
Methyl cyclohexane	EPA 8260D
	EPA 8260C
Vinyl acetate	EPA 8260D
	EPA 8260C
Sample Preparation Methods	
	SM 4500-P B(5)-2011
	EPA 5030C
	SM 4500-CN B-2011 and C-201
	EPA 3015A
	EPA 3010A
	EPA 3005A
	EPA 3510C
	SM 4500-N Org B-2011 or C-20

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All approved analytes are listed below:

Acrylates	
Acrolein (Propenal)	EPA 8260D
	EPA 8260C
Acrylonitrile	EPA 8260D
	EPA 8260C
Methyl methacrylate	EPA 8260D
	EPA 8260C
Amines	
1,2-Diphenylhydrazine	EPA 8270D
	EPA 8270E
2-Nitroaniline	EPA 8270D
	EPA 8270E
3-Nitroaniline	EPA 8270D
	EPA 8270E
4-Chloroaniline	EPA 8270D
	EPA 8270E
4-Nitroaniline	EPA 8270D
	EPA 8270E
Aniline	EPA 8270D
	EPA 8270E
Carbazole	EPA 8270D
	EPA 8270E
Diphenylamine	EPA 8270D
	EPA 8270E
Benzidines	
3,3'-Dichlorobenzidine	EPA 8270D

Benzidines	
3,3'-Dichlorobenzidine	EPA 8270E
Benzidine	EPA 8270D
	EPA 8270E
Characteristic Testing	
Corrosivity (pH)	EPA 9045D
Free Liquids	EPA 9095B
Ignitability	EPA 1010A
Synthetic Precipitation Leaching Proc.	EPA 1312
TCLP	EPA 1311
Chlorinated Hydrocarbon Pesticides	
4,4'-DDD	EPA 8081B
4,4'-DDE	EPA 8081B
4,4'-DDT	EPA 8081B
Aldrin	EPA 8081B
alpha-BHC	EPA 8081B
alpha-Chlordane	EPA 8081B
Atrazine	EPA 8270D
	EPA 8270E
beta-BHC	EPA 8081B
Chlordane Total	EPA 8081B
delta-BHC	EPA 8081B
Dieldrin	EPA 8081B
Endosulfan I	EPA 8081B
Endosulfan II	EPA 8081B
Endosulfan sulfate	EPA 8081B

Serial No.: 62805

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2022
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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

MR. ROBERT Q. BRADLEY
YORK ANALYTICAL LABORATORIES INC
120 RESEARCH DRIVE
STRATFORD, CT 06615

NY Lab Id No: 10854

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2016) for the category ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved analytes are listed below:

Chlorinated Hydrocarbon Pesticides	
Endrin	EPA 8081B
Endrin aldehyde	EPA 8081B
Endrin Ketone	EPA 8081B
gamma-Chlordane	EPA 8081B
Heptachlor	EPA 8081B
Heptachlor epoxide	EPA 8081B
Lindane	EPA 8081B
Methoxychlor	EPA 8081B
Mirex	EPA 8081B
Toxaphene	EPA 8081B
Chlorinated Hydrocarbons	
1,2,3-Trichlorobenzene	EPA 8260D
	EPA 8260C
1,2,4,5-Tetrachlorobenzene	EPA 8270D
	EPA 8270E
1,2,4-Trichlorobenzene	EPA 8270D
	EPA 8270E
2-Chloronaphthalene	EPA 8270D
	EPA 8270E
Hexachlorobenzene	EPA 8270D
	EPA 8270E
Hexachlorobutadiene	EPA 8270D
	EPA 8270E
Hexachlorocyclopentadiene	EPA 8270D
	EPA 8270E
Chlorinated Hydrocarbons	
Hexachloroethane	EPA 8270D
	EPA 8270E
Chlorophenoxy Acid Pesticides	
2,4,5-T	EPA 8151A
2,4,5-TP (Silvex)	EPA 8151A
2,4-D	EPA 8151A
Dicamba	EPA 8151A
Haloethers	
2,2'-Oxybis(1-chloropropane)	EPA 8270D
	EPA 8270E
4-Bromophenylphenyl ether	EPA 8270D
	EPA 8270E
4-Chlorophenylphenyl ether	EPA 8270D
	EPA 8270E
Bis(2-chloroethoxy)methane	EPA 8270D
	EPA 8270E
Bis(2-chloroethyl)ether	EPA 8270D
	EPA 8270E
Metals I	
Barium, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
Cadmium, Total	EPA 6010C

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Metals I		**Metals I**	
Cadmium, Total	EPA 6010D	Nickel, Total	EPA 6010D
	EPA 6020A		EPA 6020A
	EPA 6020B		EPA 6020B
Calcium, Total	EPA 6010C	Potassium, Total	EPA 6010C
	EPA 6010D		EPA 6010D
Chromium, Total	EPA 6010C	Silver, Total	EPA 6010C
	EPA 6010D		EPA 6010D
	EPA 6020A		EPA 6020A
	EPA 6020B		EPA 6020B
Copper, Total	EPA 6010C	Sodium, Total	EPA 6010C
	EPA 6010D		EPA 6010D
	EPA 6020A	**Metals II**	
	EPA 6020B	Aluminum, Total	EPA 6010C
Iron, Total	EPA 6010C		EPA 6010D
	EPA 6010D		EPA 6020A
Lead, Total	EPA 6010C		EPA 6020B
	EPA 6010D	Antimony, Total	EPA 6010C
	EPA 6020A		EPA 6010D
	EPA 6020B		EPA 6020A
Magnesium, Total	EPA 6010C		EPA 6020B
	EPA 6010D	Arsenic, Total	EPA 6010C
Manganese, Total	EPA 6010C		EPA 6010D
	EPA 6010D		EPA 6020A
	EPA 6020A		EPA 6020B
	EPA 6020B	Beryllium, Total	EPA 6010C
Nickel, Total	EPA 6010C		

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Metals II	
Beryllium, Total	EPA 6010D
Chromium VI	EPA 7196A
Mercury, Total	EPA 7471B
	EPA 7473
Selenium, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
Vanadium, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
Zinc, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
Metals III	
Cobalt, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
Molybdenum, Total	EPA 6020A
Thallium, Total	EPA 6010C
	EPA 6010D
	EPA 6020A

Metals III	
Thallium, Total	EPA 6020B
Tin, Total	EPA 6020A
	EPA 6020B
Titanium, Total	EPA 6020A
Miscellaneous	
Boron, Total	EPA 6020A
	EPA 6020B
Cyanide, Total	EPA 9014
Extractable Organic Halides	EPA 9023
Nitroaromatics and Isophorone	
2,4-Dinitrotoluene	EPA 8270D
	EPA 8270E
2,6-Dinitrotoluene	EPA 8270D
	EPA 8270E
Isophorone	EPA 8270D
	EPA 8270E
Nitrobenzene	EPA 8270D
	EPA 8270E
Pyridine	EPA 8270D
	EPA 8270E
Nitrosoamines	
N-Nitrosodimethylamine	EPA 8270D
	EPA 8270E
N-Nitrosodi-n-propylamine	EPA 8270D

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Nitrosoamines	
N-Nitrosodi-n-propylamine	EPA 8270E
N-Nitrosodiphenylamine	EPA 8270D
	EPA 8270E
Organophosphate Pesticides	
Parathion ethyl	EPA 8270D
	EPA 8270E
Petroleum Hydrocarbons	
Diesel Range Organics	EPA 8015D
Gasoline Range Organics	EPA 8015D
Phthalate Esters	
Benzyl butyl phthalate	EPA 8270D
	EPA 8270E
Bis(2-ethylhexyl) phthalate	EPA 8270D
	EPA 8270E
Diethyl phthalate	EPA 8270D
	EPA 8270E
Dimethyl phthalate	EPA 8270D
	EPA 8270E
Di-n-butyl phthalate	EPA 8270D
	EPA 8270E
Di-n-octyl phthalate	EPA 8270D
	EPA 8270E
Polychlorinated Biphenyls	
Aroclor 1016 (PCB-1016)	EPA 8082A

Polychlorinated Biphenyls	
Aroclor 1016 (PCB-1016) in Oil	EPA 8082A
Aroclor 1221 (PCB-1221)	EPA 8082A
Aroclor 1221 (PCB-1221) in Oil	EPA 8082A
Aroclor 1232 (PCB-1232)	EPA 8082A
Aroclor 1232 (PCB-1232) in Oil	EPA 8082A
Aroclor 1242 (PCB-1242)	EPA 8082A
Aroclor 1242 (PCB-1242) in Oil	EPA 8082A
Aroclor 1248 (PCB-1248)	EPA 8082A
Aroclor 1248 (PCB-1248) in Oil	EPA 8082A
Aroclor 1254 (PCB-1254)	EPA 8082A
Aroclor 1254 (PCB-1254) in Oil	EPA 8082A
Aroclor 1260 (PCB-1260)	EPA 8082A
Aroclor 1260 (PCB-1260) in Oil	EPA 8082A
Aroclor 1262 (PCB-1262)	EPA 8082A
Aroclor 1262 (PCB-1262) in Oil	EPA 8082A
Aroclor 1268 (PCB-1268)	EPA 8082A
Aroclor 1268 (PCB-1268) in Oil	EPA 8082A
Polynuclear Aromatic Hydrocarbons	
Acenaphthene	EPA 8270D
	EPA 8270E
Acenaphthylene	EPA 8270D
	EPA 8270E
Anthracene	EPA 8270D
	EPA 8270E
Benzo(a)anthracene	EPA 8270D

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STRATFORD, CT 06615

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All approved analytes are listed below:

Polynuclear Aromatic Hydrocarbons

Benzo(a)anthracene	EPA 8270E
Benzo(a)pyrene	EPA 8270D
	EPA 8270E
Benzo(b)fluoranthene	EPA 8270D
	EPA 8270E
Benzo(g,h,i)perylene	EPA 8270D
	EPA 8270E
Benzo(k)fluoranthene	EPA 8270D
	EPA 8270E
Chrysene	EPA 8270D
	EPA 8270E
Dibenzo(a,h)anthracene	EPA 8270D
	EPA 8270E
Fluoranthene	EPA 8270D
	EPA 8270E
Fluorene	EPA 8270D
	EPA 8270E
Indeno(1,2,3-cd)pyrene	EPA 8270D
	EPA 8270E
Naphthalene	EPA 8270D
	EPA 8270E
Phenanthrene	EPA 8270D
	EPA 8270E
Pyrene	EPA 8270D
	EPA 8270E

Priority Pollutant Phenols

2,3,4,6 Tetrachlorophenol	EPA 8270D
	EPA 8270E
2,4,5-Trichlorophenol	EPA 8270D
	EPA 8270E
2,4,6-Trichlorophenol	EPA 8270D
	EPA 8270E
2,4-Dichlorophenol	EPA 8270D
	EPA 8270E
2,4-Dimethylphenol	EPA 8270D
	EPA 8270E
2,4-Dinitrophenol	EPA 8270D
	EPA 8270E
2-Chlorophenol	EPA 8270D
	EPA 8270E
2-Methyl-4,6-dinitrophenol	EPA 8270D
	EPA 8270E
2-Methylphenol	EPA 8270D
	EPA 8270E
2-Nitrophenol	EPA 8270D
	EPA 8270E
4-Chloro-3-methylphenol	EPA 8270D
	EPA 8270E
4-Methylphenol	EPA 8270D
	EPA 8270E
4-Nitrophenol	EPA 8270D
	EPA 8270E

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Priority Pollutant Phenols	
Pentachlorophenol	EPA 8270D
	EPA 8270E
Phenol	EPA 8270D
	EPA 8270E
Semi-Volatile Organics	
1,1'-Biphenyl	EPA 8270D
	EPA 8270E
1,2-Dichlorobenzene, Semi-volatile	EPA 8270D
	EPA 8270E
1,3-Dichlorobenzene, Semi-volatile	EPA 8270D
	EPA 8270E
1,4-Dichlorobenzene, Semi-volatile	EPA 8270D
	EPA 8270E
2-Methylnaphthalene	EPA 8270D
	EPA 8270E
Acetophenone	EPA 8270D
	EPA 8270E
Benzaldehyde	EPA 8270D
	EPA 8270E
Benzoic Acid	EPA 8270D
	EPA 8270E
Benzyl alcohol	EPA 8270D
	EPA 8270E
Caprolactam	EPA 8270D
	EPA 8270E
Semi-Volatile Organics	
Dibenzofuran	EPA 8270D
	EPA 8270E
Volatile Aromatics	
1,2,4-Trichlorobenzene, Volatile	EPA 8260D
	EPA 8260C
1,2,4-Trimethylbenzene	EPA 8260D
	EPA 8260C
1,2-Dichlorobenzene	EPA 8260D
	EPA 8260C
1,3,5-Trimethylbenzene	EPA 8260D
	EPA 8260C
1,3-Dichlorobenzene	EPA 8260D
	EPA 8260C
1,4-Dichlorobenzene	EPA 8260D
	EPA 8260C
2-Chlorotoluene	EPA 8260D
	EPA 8260C
4-Chlorotoluene	EPA 8260D
	EPA 8260C
Benzene	EPA 8260D
	EPA 8260C
Bromobenzene	EPA 8260D
	EPA 8260C
Chlorobenzene	EPA 8260D
	EPA 8260C

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Volatile Aromatics	
Ethyl benzene	EPA 8260D
	EPA 8260C
Isopropylbenzene	EPA 8260D
	EPA 8260C
m/p-Xylenes	EPA 8260D
	EPA 8260C
Naphthalene, Volatile	EPA 8260D
	EPA 8260C
n-Butylbenzene	EPA 8260D
	EPA 8260C
n-Propylbenzene	EPA 8260D
	EPA 8260C
o-Xylene	EPA 8260D
	EPA 8260C
p-Isopropyltoluene (P-Cymene)	EPA 8260D
	EPA 8260C
sec-Butylbenzene	EPA 8260D
	EPA 8260C
Styrene	EPA 8260D
	EPA 8260C
tert-Butylbenzene	EPA 8260D
	EPA 8260C
Toluene	EPA 8260D
	EPA 8260C
Total Xylenes	EPA 8260D
	EPA 8260C

Volatile Halocarbons	
1,1,1,2-Tetrachloroethane	EPA 8260D
	EPA 8260C
1,1,1-Trichloroethane	EPA 8260D
	EPA 8260C
1,1,2,2-Tetrachloroethane	EPA 8260D
	EPA 8260C
1,1,2-Trichloro-1,2,2-Trifluoroethane	EPA 8260D
	EPA 8260C
1,1,2-Trichloroethane	EPA 8260D
	EPA 8260C
1,1-Dichloroethane	EPA 8260D
	EPA 8260C
1,1-Dichloroethene	EPA 8260D
	EPA 8260C
1,1-Dichloropropene	EPA 8260D
	EPA 8260C
1,2,3-Trichloropropane	EPA 8260D
	EPA 8260C
1,2-Dibromo-3-chloropropane	EPA 8260D
	EPA 8260C
1,2-Dibromoethane	EPA 8260D
	EPA 8260C
1,2-Dichloroethane	EPA 8260D
	EPA 8260C
1,2-Dichloropropane	EPA 8260D
	EPA 8260C

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Volatile Halocarbons	
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
cis-1,2-Dichloroethene	EPA 8260D
	EPA 8260C
cis-1,3-Dichloropropene	EPA 8260D
	EPA 8260C

Volatile Halocarbons	
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
Volatile Organics	
1,4-Dioxane	EPA 8260D
	EPA 8260C

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Volatile Organics	Sample Preparation Methods
1,4-Dioxane	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
	EPA 8260C
Methyl tert-butyl ether	EPA 8260D
	EPA 8260C
tert-butyl alcohol	EPA 8260D
	EPA 8260C
Vinyl acetate	EPA 8260D
	EPA 8260C
	EPA 5035A-L
	EPA 5035A-H
	EPA 3580A
	EPA 3010A
	EPA 3050B
	EPA 3550C
	EPA 3546
	EPA 3545A
	EPA 3060A
	EPA 9010C

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ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved subcategories and/or analytes are listed below:

Miscellaneous

Lead in Dust Wipes	EPA 6010C
Lead in Paint	EPA 6010C

Sample Preparation Methods

EPA 3050B

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MR. JON WALSH
YORK ANALYTICAL LABORATORIES, INC. (II)
132-02 89TH AVENUE SUITE 217
RICHMOND HILL, NY 11418

NY Lab Id No: 12058

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2016) for the category ENVIRONMENTAL ANALYSES AIR AND EMISSIONS
All approved analytes are listed below:

Acrylates	
Acrylonitrile	EPA TO-15
Methyl methacrylate	EPA TO-15
Chlorinated Hydrocarbons	
1,2,4-Trichlorobenzene	EPA TO-15
Hexachlorobutadiene	EPA TO-15
Hexachloroethane	EPA TO-15
Purgeable Aromatics	
1,2,4-Trimethylbenzene	EPA TO-15
1,2-Dichlorobenzene	EPA TO-15
1,3,5-Trimethylbenzene	EPA TO-15
1,3-Dichlorobenzene	EPA TO-15
1,4-Dichlorobenzene	EPA TO-15
Benzene	EPA TO-15
Chlorobenzene	EPA TO-15
Ethyl benzene	EPA TO-15
Isopropylbenzene	EPA TO-15
m/p-Xylenes	EPA TO-15
o-Xylene	EPA TO-15
Styrene	EPA TO-15
Toluene	EPA TO-15
Total Xylenes	EPA TO-15
Purgeable Halocarbons	
1,1,1-Trichloroethane	EPA TO-15
1,1,2,2-Tetrachloroethane	EPA TO-15
Purgeable Halocarbons	
1,1,2-Trichloro-1,2,2-Trifluoroethane	EPA TO-15
1,1,2-Trichloroethane	EPA TO-15
1,1-Dichloroethane	EPA TO-15
1,1-Dichloroethene	EPA TO-15
1,2-Dibromoethane	EPA TO-15
1,2-Dichloroethane	EPA TO-15
1,2-Dichloropropane	EPA TO-15
3-Chloropropene (Allyl chloride)	EPA TO-15
Bromodichloromethane	EPA TO-15
Bromoform	EPA TO-15
Bromomethane	EPA TO-15
Carbon tetrachloride	EPA TO-15
Chloroethane	EPA TO-15
Chloroform	EPA TO-15
Chloromethane	EPA TO-15
cis-1,2-Dichloroethene	EPA TO-15
cis-1,3-Dichloropropene	EPA TO-15
Dibromochloromethane	EPA TO-15
Dichlorodifluoromethane	EPA TO-15
Methylene chloride	EPA TO-15
Tetrachloroethene	EPA TO-15
trans-1,2-Dichloroethene	EPA TO-15
trans-1,3-Dichloropropene	EPA TO-15
Trichloroethene	EPA TO-15
Trichlorofluoromethane	EPA TO-15
Vinyl bromide	EPA TO-15

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NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

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Issued April 01, 2021

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Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MR. JON WALSH
YORK ANALYTICAL LABORATORIES, INC. (II)
132-02 89TH AVENUE SUITE 217
RICHMOND HILL, NY 11418

NY Lab Id No: 12058

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2016) for the category ENVIRONMENTAL ANALYSES AIR AND EMISSIONS
All approved analytes are listed below:

Purgeable Halocarbons	
Vinyl chloride	EPA TO-15
Volatile Chlorinated Organics	
Benzyl chloride	EPA TO-15
Volatile Organics	
1,2-Dichlorotetrafluoroethane	EPA TO-15
1,3-Butadiene	EPA TO-15
1,4-Dioxane	EPA TO-15
2-Butanone (Methylethyl ketone)	EPA TO-15
4-Methyl-2-Pentanone	EPA TO-15
Acetone	EPA TO-15
Carbon Disulfide	EPA TO-15
Cyclohexane	EPA TO-15
Hexane	EPA TO-15
Isopropanol	EPA TO-15
Methyl tert-butyl ether	EPA TO-15
n-Heptane	EPA TO-15
Vinyl acetate	EPA TO-15

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All approved analytes are listed below:

Acrylates	
Acrolein (Propenal)	EPA 8260D
	EPA 8260C
Acrylonitrile	EPA 8260D
	EPA 8260C
Methyl methacrylate	EPA 8260D
	EPA 8260C
Chlorinated Hydrocarbons	
1,2,3-Trichlorobenzene	EPA 8260D
	EPA 8260C
Fuel Oxygenates	
Di-isopropyl ether	EPA 8260D
	EPA 8260C
Ethanol	EPA 8260D
	EPA 8260C
Methyl tert-butyl ether	EPA 8260D
	EPA 8260C
tert-amyl alcohol	EPA 8260D
	EPA 8260C
tert-amyl methyl ether (TAME)	EPA 8260D
	EPA 8260C
tert-butyl alcohol	EPA 8260D
	EPA 8260C
tert-butyl ethyl ether (ETBE)	EPA 8260D
	EPA 8260C
Volatile Aromatics	
1,2,4-Trichlorobenzene, Volatile	EPA 8260D
	EPA 8260C
1,2,4-Trimethylbenzene	EPA 8260D
	EPA 8260C
1,2-Dichlorobenzene	EPA 8260D
	EPA 8260C
1,3,5-Trimethylbenzene	EPA 8260D
	EPA 8260C
1,3-Dichlorobenzene	EPA 8260D
	EPA 8260C
1,4-Dichlorobenzene	EPA 8260D
	EPA 8260C
2-Chlorotoluene	EPA 8260D
	EPA 8260C
4-Chlorotoluene	EPA 8260D
	EPA 8260C
Benzene	EPA 8260D
	EPA 8260C
Bromobenzene	EPA 8260D
	EPA 8260C
Chlorobenzene	EPA 8260D
	EPA 8260C
Ethyl benzene	EPA 8260D
	EPA 8260C
Isopropylbenzene	EPA 8260D
	EPA 8260C

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Volatile Aromatics		**Volatile Halocarbons**	
m/p-Xylenes	EPA 8260D	1,1,1-Trichloroethane	EPA 8260D
	EPA 8260C		EPA 8260C
Naphthalene, Volatile	EPA 8260D	1,1,2,2-Tetrachloroethane	EPA 8260D
	EPA 8260C		EPA 8260C
n-Butylbenzene	EPA 8260D	1,1,2-Trichloro-1,2,2-Trifluoroethane	EPA 8260D
	EPA 8260C		EPA 8260C
n-Propylbenzene	EPA 8260D	1,1,2-Trichloroethane	EPA 8260D
	EPA 8260C		EPA 8260C
o-Xylene	EPA 8260D	1,1-Dichloroethane	EPA 8260D
	EPA 8260C		EPA 8260C
p-Isopropyltoluene (P-Cymene)	EPA 8260D	1,1-Dichloroethene	EPA 8260D
	EPA 8260C		EPA 8260C
sec-Butylbenzene	EPA 8260D	1,1-Dichloropropene	EPA 8260D
	EPA 8260C		EPA 8260C
Styrene	EPA 8260D	1,2,3-Trichloropropane	EPA 8260D
	EPA 8260C		EPA 8260C
tert-Butylbenzene	EPA 8260D	1,2-Dibromo-3-chloropropane	EPA 8260D
	EPA 8260C		EPA 8260C
Toluene	EPA 8260D	1,2-Dibromoethane	EPA 8260D
	EPA 8260C		EPA 8260C
Total Xylenes	EPA 8260D	1,2-Dichloroethane	EPA 8260D
	EPA 8260C		EPA 8260C
Volatile Halocarbons		1,2-Dichloropropane	EPA 8260D
1,1,1,2-Tetrachloroethane	EPA 8260D		EPA 8260C
	EPA 8260C	1,3-Dichloropropane	EPA 8260D
			EPA 8260C

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All approved analytes are listed below:

Volatile Halocarbons	
2,2-Dichloropropane	EPA 8260D
	EPA 8260C
2-Chloroethylvinyl ether	EPA 8260D
	EPA 8260C
Bromochloromethane	EPA 8260D
	EPA 8260C
Bromodichloromethane	EPA 8260D
	EPA 8260C
Bromoform	EPA 8260D
	EPA 8260C
Bromomethane	EPA 8260D
	EPA 8260C
Carbon tetrachloride	EPA 8260D
	EPA 8260C
Chloroethane	EPA 8260D
	EPA 8260C
Chloroform	EPA 8260D
	EPA 8260C
Chloromethane	EPA 8260D
	EPA 8260C
cis-1,2-Dichloroethene	EPA 8260D
	EPA 8260C
cis-1,3-Dichloropropene	EPA 8260D
	EPA 8260C
Dibromochloromethane	EPA 8260D
	EPA 8260C

Volatile Halocarbons	
Dibromomethane	EPA 8260D
	EPA 8260C
Dichlorodifluoromethane	EPA 8260D
	EPA 8260C
Hexachlorobutadiene, Volatile	EPA 8260D
	EPA 8260C
Methylene chloride	EPA 8260D
	EPA 8260C
Tetrachloroethene	EPA 8260D
	EPA 8260C
trans-1,2-Dichloroethene	EPA 8260D
	EPA 8260C
trans-1,3-Dichloropropene	EPA 8260D
	EPA 8260C
trans-1,4-Dichloro-2-butene	EPA 8260D
	EPA 8260C
Trichloroethene	EPA 8260D
	EPA 8260C
Trichlorofluoromethane	EPA 8260D
	EPA 8260C
Vinyl chloride	EPA 8260D
	EPA 8260C
Volatiles Organics	
1,4-Dioxane	EPA 8260D
	EPA 8260C

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All approved analytes are listed below:

Volatiles Organics

2-Butanone (Methylethyl ketone)	EPA 8260D
	EPA 8260C
2-Hexanone	EPA 8260D
	EPA 8260C
4-Methyl-2-Pentanone	EPA 8260D
	EPA 8260C
Acetone	EPA 8260D
	EPA 8260C
Carbon Disulfide	EPA 8260D
	EPA 8260C
Cyclohexane	EPA 8260D
	EPA 8260C
Methyl acetate	EPA 8260D
	EPA 8260C
Methyl cyclohexane	EPA 8260D
	EPA 8260C
Vinyl acetate	EPA 8260D
	EPA 8260C

Sample Preparation Methods

EPA 5030C

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All approved analytes are listed below:

Acrylates	
Acrolein (Propenal)	EPA 8260D
	EPA 8260C
Acrylonitrile	EPA 8260D
	EPA 8260C
Methyl methacrylate	EPA 8260D
	EPA 8260C
Chlorinated Hydrocarbons	
1,2,3-Trichlorobenzene	EPA 8260D
	EPA 8260C
Volatile Aromatics	
1,2,4-Trichlorobenzene, Volatile	EPA 8260D
	EPA 8260C
1,2,4-Trimethylbenzene	EPA 8260D
	EPA 8260C
1,2-Dichlorobenzene	EPA 8260D
	EPA 8260C
1,3,5-Trimethylbenzene	EPA 8260D
	EPA 8260C
1,3-Dichlorobenzene	EPA 8260D
	EPA 8260C
1,4-Dichlorobenzene	EPA 8260D
	EPA 8260C
2-Chlorotoluene	EPA 8260D
	EPA 8260C
4-Chlorotoluene	EPA 8260D

Volatile Aromatics	
4-Chlorotoluene	EPA 8260C
Benzene	EPA 8260D
	EPA 8260C
Bromobenzene	EPA 8260D
	EPA 8260C
Chlorobenzene	EPA 8260D
	EPA 8260C
Ethyl benzene	EPA 8260D
	EPA 8260C
Isopropylbenzene	EPA 8260D
	EPA 8260C
m/p-Xylenes	EPA 8260D
	EPA 8260C
Naphthalene, Volatile	EPA 8260D
	EPA 8260C
n-Butylbenzene	EPA 8260D
	EPA 8260C
n-Propylbenzene	EPA 8260D
	EPA 8260C
o-Xylene	EPA 8260D
	EPA 8260C
p-Isopropyltoluene (P-Cymene)	EPA 8260D
	EPA 8260C
sec-Butylbenzene	EPA 8260D
	EPA 8260C
Styrene	EPA 8260D

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All approved analytes are listed below:

Volatile Aromatics	
Styrene	EPA 8260C
tert-Butylbenzene	EPA 8260D
	EPA 8260C
Toluene	EPA 8260D
	EPA 8260C
Total Xylenes	EPA 8260D
	EPA 8260C
Volatile Halocarbons	
1,1,1,2-Tetrachloroethane	EPA 8260D
	EPA 8260C
1,1,1-Trichloroethane	EPA 8260D
	EPA 8260C
1,1,2,2-Tetrachloroethane	EPA 8260D
	EPA 8260C
1,1,2-Trichloro-1,2,2-Trifluoroethane	EPA 8260D
	EPA 8260C
1,1,2-Trichloroethane	EPA 8260D
	EPA 8260C
1,1-Dichloroethane	EPA 8260D
	EPA 8260C
1,1-Dichloroethene	EPA 8260D
	EPA 8260C
1,1-Dichloropropene	EPA 8260D
	EPA 8260C
1,2,3-Trichloropropane	EPA 8260D

Volatile Halocarbons	
1,2,3-Trichloropropane	EPA 8260C
1,2-Dibromo-3-chloropropane	EPA 8260D
	EPA 8260C
1,2-Dibromoethane	EPA 8260D
	EPA 8260C
1,2-Dichloroethane	EPA 8260D
	EPA 8260C
1,2-Dichloropropane	EPA 8260D
	EPA 8260C
1,3-Dichloropropane	EPA 8260D
	EPA 8260C
2,2-Dichloropropane	EPA 8260D
	EPA 8260C
2-Chloroethylvinyl ether	EPA 8260D
	EPA 8260C
Bromochloromethane	EPA 8260D
	EPA 8260C
Bromodichloromethane	EPA 8260D
	EPA 8260C
Bromoform	EPA 8260D
	EPA 8260C
Bromomethane	EPA 8260D
	EPA 8260C
Carbon tetrachloride	EPA 8260D
	EPA 8260C
Chloroethane	EPA 8260D

Serial No.: 63315

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All approved analytes are listed below:

Volatile Halocarbons	
Chloroethane	EPA 8260C
Chloroform	EPA 8260D
	EPA 8260C
Chloromethane	EPA 8260D
	EPA 8260C
cis-1,2-Dichloroethene	EPA 8260D
	EPA 8260C
cis-1,3-Dichloropropene	EPA 8260D
	EPA 8260C
Dibromochloromethane	EPA 8260D
	EPA 8260C
Dibromomethane	EPA 8260D
	EPA 8260C
Dichlorodifluoromethane	EPA 8260D
	EPA 8260C
Hexachlorobutadiene, Volatile	EPA 8260D
	EPA 8260C
Methylene chloride	EPA 8260D
	EPA 8260C
Tetrachloroethene	EPA 8260D
	EPA 8260C
trans-1,2-Dichloroethene	EPA 8260D
	EPA 8260C
trans-1,3-Dichloropropene	EPA 8260D
	EPA 8260C
Trichloroethene	EPA 8260D

Volatile Halocarbons	
Trichloroethene	EPA 8260C
Trichlorofluoromethane	EPA 8260D
	EPA 8260C
Vinyl chloride	EPA 8260D
	EPA 8260C
Volatile Organics	
1,4-Dioxane	EPA 8260D
	EPA 8260C
2-Butanone (Methylethyl ketone)	EPA 8260D
	EPA 8260C
2-Hexanone	EPA 8260D
	EPA 8260C
4-Methyl-2-Pentanone	EPA 8260D
	EPA 8260C
Acetone	EPA 8260D
	EPA 8260C
Carbon Disulfide	EPA 8260D
	EPA 8260C
Cyclohexane	EPA 8260D
	EPA 8260C
Methyl acetate	EPA 8260D
	EPA 8260C
Methyl cyclohexane	EPA 8260D
	EPA 8260C
Methyl tert-butyl ether	EPA 8260D

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All approved analytes are listed below:

Volatile Organics

Methyl tert-butyl ether	EPA 8260C
tert-butyl alcohol	EPA 8260D
	EPA 8260C
Vinyl acetate	EPA 8260D
	EPA 8260C

Sample Preparation Methods

	EPA 5035A-L
	EPA 5035A-H

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APPENDIX C

NYSDOH GENERIC CAMP

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.

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Appendix 1B
Fugitive Dust and Particulate Monitoring

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

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

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

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

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

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

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

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

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

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

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

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

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