23-10 QUEENS PLAZA SOUTH
QUEENS COUNTY
LONG ISLAND CITY, NEW YORK

SITE MANAGEMENT PLAN

NYSDEC BCP Site No.: C241160

Prepared for:
QPS 23-10 Development LLC
c/o Property Markets Group, Inc.
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New York, New York 10001

Prepared by:
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Revisions to Final Approved Site Management Plan:

Revision No.	Date Submitted	Summary of Revision	NYSDEC Approval Date

SEPTEMBER 2019

CERTIFICATION STATEMENT

I, Michael D. Burke, certify that I am currently a Qualified Environmental Professional as defined in 6 NYCRR Part 375 and that this Site Management Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).

Michael D. Burke

MICHAEL D. BURKE, PG, CHMM

9/25/2019

DATE

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LIST OF ACRONYMS

BCA	Brownfield Cleanup Agreement
BCP	Brownfield Cleanup Program
CAMP	Community Air Monitoring Plan
CFR	Code of Federal Regulation
COC	Certificate of Completion
CP	Commissioner Policy
DER	Division of Environmental Remediation
EC	Engineering Control
ECL	Environmental Conservation Law
ELAP	Environmental Laboratory Approval Program
EWP	Excavation Work Plan
HASP	Health and Safety Plan
IC	Institutional Control
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYCRR	New York Codes, Rules and Regulations
OSHA	Occupational Safety and Health Administration
PID	Photoionization Detector
PRR	Periodic Review Report
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
RAO	Remedial Action Objective
RAWP	Remedial Action Work Plan
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RSO	Remedial System Optimization
SCG	Standards, Criteria and Guidelines
SCO	Soil Cleanup Objective
SMP	Site Management Plan
SSD	Sub-slab Depressurization
TAL	Target Analyte List
TCL	Target Compound List
TCLP	Toxicity Characteristic Leachate Procedure
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank

EXECUTIVE SUMMARY

This Site Management Plan (SMP) is a required element of the remedial program for 23-10 Queens Plaza South, located in Long Island City, New York (hereinafter referred to as the "Site"). The Site is in the New York State (NYS) Brownfield Cleanup Program (BCP), which is administered by New York State Department of Environmental Conservation (NYSDEC), and was assigned BCP Site No. C241160. QPS 23-10 Development LLC entered into a Brownfield Cleanup Agreement (BCA) on 8 August 2014 with the NYSDEC to investigate and remediate the Site.

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

Site Identification:	BCP Site No.: C241160, 23-10 Queens Plaza South, Long Island City, New York
Institutional and Engineering Controls (IC/EC) Summary	
Institutional Controls:	Compliance with the Environmental Easement and this SMP by the Grantor and the Grantor's successors and assigns
	All ECs must be operated and maintained as specified in this SMP
	All ECs on the Controlled Property must be inspected at a frequency and in a manner defined in the SMP
	Data and information pertinent to Site Management of the Controlled Property must be reported at the frequency and in a manner defined in this SMP
	The property may be used for commercial and industrial use only
	The property may not be used for a higher level use, such as restricted-residential, residential or unrestricted use, without additional remediation and/or amendment of the Environmental Easement, as approved by the NYSDEC
	The use of groundwater underlying the property is prohibited without necessary water quality treatment as determined by the NYSDOH or NYCDOH to render it safe for use as drinking water or for industrial purposes, and the user must first notify and obtain written approval to do so from the NYSDEC

	All future activities that will disturb remaining contaminated material must be conducted in accordance with this SMP
	Access to the Site must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice to the property owner to assure compliance with the restrictions identified by the Environmental Easement
	Vegetable gardens and farming on the Site are prohibited
	The Site owner or remedial party will submit to NYSDEC a written statement that certifies, under penalty of perjury, that: • Controlled Property controls are unchanged from the previous certification or that any changes to the controls were NYSDEC approved • Nothing has occurred that impairs the ability of the controls to protect public health and environment or that constitute a violation or failure to comply with the SMP. NYSDEC retains the right to access such Controlled Property at any time to evaluate the maintenance of any and all controls. This certification shall be submitted annually, or an alternate period of time that NYSDEC may allow, and will be made by an expert that the NYSDEC finds acceptable
Engineering Controls:	Composite Cover System
	Sub-slab Depressurization (SSD) System
Inspection, Monitoring, Maintenance, and Reporting Schedule	
Inspections and Monitoring:	**Frequency:**
Site-Wide	Annually
Composite Cover System	Annually
SSD System	Quarterly during the first year of operation; annually thereafter

Maintenance:	**Frequency:**
Composite Cover System	As needed
SSD System	As needed
Reporting:	**Frequency:**
Periodic Review Report	Annually

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

1.0 INTRODUCTION

1.1 General

This Site Management Plan (SMP) is a required element of the remedial program for 23-10 Queens Plaza South, located in Long Island City, New York (hereinafter referred to as the "Site"). A site location map is included as Figure 1. The Site is currently in the New York State (NYS) Brownfield Cleanup Program (BCP), which is administered by New York State Department of Environmental Conservation (NYSDEC), and was assigned BCP Site No. C241160.

QPS 23-10 Development LLC entered into a Brownfield Cleanup Agreement (BCA) on 8 August 2014 with the NYSDEC to investigate and remediate the Site. A figure showing the Site location and boundaries of this Site is provided in Figure 2. A figure showing the architectural site plan is provided in Figure 3. The boundaries of the Site are fully described in the metes and bounds Site description that is part of the Environmental Easement Survey provided in Appendix A. After completion of the remedial work described in the July 2015 Interim Remedial Measures Work Plan (IRMWP) and the September 2019 Remedial Action Work Plan (RAWP), remaining contamination in soil, groundwater and soil vapor, hereafter referred to as "remaining contamination", remains at the Site. Institutional and Engineering Controls (ICs and ECs) have been incorporated into the Site remedy to control exposure to remaining contamination and ensure protection of public health and the environment. An Environmental Easement granted to the NYSDEC, and recorded with the Queens County Clerk, requires compliance with this SMP and all ECs and ICs placed on the Site.

This SMP was prepared to manage remaining contamination at the Site until the Environmental Easement is extinguished in accordance with Environmental Conservation Law (ECL) Article 71, Title 36. The Environmental Easement can be extinguished if remaining contamination at the Site is further remediated in accordance with an NYSDEC-approved work plan. This SMP has been approved by the NYSDEC, and compliance with this SMP is required by the grantor of the Environmental Easement and the grantor's successors and assigns. This SMP may only be revised with the approval of the NYSDEC.

This SMP details the Site-specific implementation procedures that are required by the Environmental Easement. Failure to properly implement the SMP is a violation of the Environmental Easement, which is grounds for revocation of the Certificate of Completion (COC). Failure to comply with this SMP is also a violation of ECL, NYSDEC Title 6 of the Official Compilation of New York Codes, Rules, and Regulations (6 NYCRR) Part 375 and the BCA (Index No. C241160-05-14) for the Site, and thereby subject to applicable penalties.

All reports associated with the Site can be viewed by contacting the NYSDEC or its successor agency managing environmental issues in NYS. A list of contacts for persons involved with the Site is provided in Section 1.3 of this SMP and Appendix B.

This SMP was prepared by Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology D.P.C. (Langan), on behalf of QPS 23-10 Development LLC, in accordance with the requirements of the NYSDEC Division of Environmental Remediation (DER)-10 ("Technical Guidance for Site Investigation and Remediation"), dated 3 May 2010 , and the guidelines provided by the NYSDEC. This SMP addresses the means for implementing the ICs and ECs that are required by the Environmental Easement for the Site.

1.2 Revisions

Revisions to this plan will be proposed in writing to the NYSDEC's project manager. Revisions will be necessary upon, but not limited to, the following occurring:

- A change in media monitoring requirements
- Upgrades to or shut-down of a remedial system
- Post-remedial removal of contaminated sediment or soil
- Other significant change to the Site conditions

In accordance with the Environmental Easement for the Site, the NYSDEC will provide a notice of any approved changes to the SMP, and append these notices to the SMP that is retained in its files.

1.3 Notifications

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

- 60-day advance notice of any proposed changes in Site use that are required under the terms of the BCA, 6 NYCRR Part 375, and/or ECL
- 7-day advance notice of any field activity associated with the remedial program
- 15-day advance notice of any proposed ground-intrusive activity pursuant to the Excavation Work Plan (EWP)
- Notice within 48-hours of any damage or defect to the foundation, structures or ECs that reduces or has the potential to reduce the effectiveness of an EC, and likewise, any action to be taken to mitigate the damage or defect
- Verbal notice by noon of the following day of any emergency, such as a fire, flood, or earthquake that reduces or has the potential to reduce the effectiveness of ECs in place at the Site, with written confirmation within 7 days that includes a

summary of actions taken, or to be taken, and the potential impact to the environment and the public

- Follow-up status reports on actions taken to respond to any emergency event requiring ongoing responsive action submitted to the NYSDEC within 45 days describing and documenting actions taken to restore the effectiveness of the ECs

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

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

The following table includes contact information for the above notification. The information on this table will be updated as necessary to provide accurate contact information.

Name	Contact Information
NYSDEC Project Manager:	Ronnie E. Lee, P.E. (518) 402-9767
NYSDEC Region 2 HW Engineer	Jane O'Connell (718) 482-4599
NYSDEC Site Control	Kelly A. Lewandowski (518) 402-9569
Owner Representative:	Randy Marble (212) 610-2854
Program Engineer	Jason Hayes, PE (212) 479-5413
Program Manager:	Michael D. Burke, PG, CHMM (212) 479-5413
Project Manager:	Paul McMahon, P.E. (212) 479-5451
Health & Safety Officer (HSO):	William Bohrer, PG (212) 479-5333
Field Safety Officer (FSO):	Vinicius De Paula, EIT (212) 479-5499 x5774

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

1.4 Potential Redevelopment Post Certificate of Completion

Following issuance of the COC, the Volunteer may redevelop the Site into a multistory building. Redevelopment plans and schedule are being conceptualized. Subsequent redevelopment may include partial or full demolition of the existing building, removal of additional contaminated material, construction of a multistory office/retail building and deepening of the existing cellar. Such activities are subject to compliance with the SMP and NYSDEC will be notified as prescribed in this SMP.

2.0 SUMMARY OF PREVIOUS INVESTIGATION AND REMEDIAL ACTIONS

2.1 Site Location and Description

The Site is located in Long Island City, Queens County, New York and is identified as Block 425 and Lot 5 on the Queens County Tax Map. The Site encompasses an area of about 27,200 square feet (0.62 acres) and is bounded by Queens Plaza South to the north, 24th Street to the east, a multi-story residential building to the south, and 23rd Street to the west. The boundaries of the Site are fully described in the Environmental Easement Survey included in Appendix A. The owner representative of the Site at the time of issuance of this SMP is Randy Marble.

2.2 Physical Setting

2.2.1 Land Use

The Site consists of a vacant four-story building with a full cellar, and was most recently used as construction field offices during redevelopment of the south-adjoining lot, and as a private parking garage. The Site is located in the Special Long Island City Mixed Use District and it is part of the M1-5/R9 zone, which allows for light industrial use and moderate to high density residential use. The cellar slab elevation (el) is about 11 feet referenced to the North American Vertical Datum of 1988 (NAVD88).

The properties adjoining the Site and in the neighborhood surrounding the Site primarily include residential, commercial, industrial, and institutional properties. The property immediately north of the Site includes a multi-story mixed-use commercial and residential building (41-42 24th Street); the property immediately east of the Site includes a multi-story institutional building (24-02 Queens Plaza South); the property immediately south of the Site includes a multi-story residential building (23-01 42nd Road); and the property to the west of the Site includes an open-air parking lot (42-02 23rd Street). An elevated New York City Transit Authority subway line (7, N, and W) runs above the roadway along Queens Plaza South and 23rd Street.

2.2.2 Geology

Historic fill material, characterized as brown, fine- to coarse-grained sand with varying amounts of silt, gravel, brick, asphalt and concrete, was identified below the cellar slab, extending to about 8 feet below cellar slab (bcs). Historic fill material is underlain by a layer of gray and brown, fine- to coarse-grained sand with varying amounts of gravel and silt, followed by a layer of grey clay with varying amounts of sand and silt. The thicknesses of these sand and clay layers varies across the Site. Bedrock (evidenced by drilling rig refusal) was encountered below the native soil at depths ranging from 9 to 20 feet bcs. Bedrock, consisting of quartz-mica-garnet gneiss of the Ravenwood Granodiorite, was observed at depths ranging from 12.5 to 31 feet bcs during a July 2013 Langan Geotechnical Engineering Study for the south-adjoining lot.

2.2.3 Hydrogeology

Synoptic groundwater level measurements were collected on 14 August 2013 and 11 April 2016. Groundwater depths ranged from about 4 to 8 feet bcs. The groundwater elevation is highest in the eastern portion of the Site and flows west-southwest. Regional groundwater is presumed to flow west towards the East River.

2.3 Investigation and Remedial History

The following narrative provides a remedial history timeline and a brief summary of the available project records to document key investigative and remedial milestones for the Site. Full titles for each of the reports referenced below are provided in Section 8.

2.3.1 28 August 2012 Phase I Environmental Site Assessment, prepared by Cardno ATC

The Phase I Environmental Site Assessment (ESA) identified the following recognized environmental conditions (REC):

- *Federal Agency Database Listings:* The Site was identified on the federal agency databases Facility Index System/Facility Registry System and Resource Conservation and Recovery Act (RCRA) Small Quantity Generator (SQG) (United State Environmental Protection Agency [EPA] ID NYR00125492). There were no reported violations.
- *Historical use of the Site:* The historical records review indicated that the Site was used for manufacturing. Gasoline tanks had been identified at the Site and southern adjoining property. In addition, oil staining from the on-site metal fabrication machines was observed on the cellar floor.
- *Underground Storage Tanks (UST):* Cardno ATC identified records of at least two USTs in the northwestern corner of the Site. The USTs are at least 75 years old and closure documentation is not available.
- *Petroleum staining and sheen:* Petroleum staining and a petroleum sheen were observed on standing water within a sump adjacent to the boiler room. According to the property manager, the sump discharges to the New York City municipal sewer system.

2.3.2 8 November 2012 Phase II Environmental Site Investigation, prepared by Cardno ATC

Cardno ATC implemented the Phase II Environmental Site Investigation (ESI) between 21 and 24 September 2012. The Phase II ESI was completed for the Site and the southern-adjoining property (23-01 42nd Road), and included a geophysical survey, advancement of nine soil borings, installation of three temporary groundwater monitoring wells, and collection of nine grab soil and three groundwater samples. Soil analytical data was compared to the NYSDEC Title 6 of the Official Compilation of the New York Codes, Rules, and Regulations (NYCRR) Part 375 Unrestricted Use (UU) and/or Restricted Use Restricted-Residential (RURR) Soil Cleanup Objectives (SCO) and groundwater analytical data was compared to NYSDEC Technical and Operational Guidance Series (TOGS) 1.1.1 Ambient Water Quality Standards and Guidance Values for Class GA Water (herein referred to NYSDEC SGVs). The findings of this investigation relevant to the Site are summarized below:

- The subsurface stratigraphy generally consisted of historic fill material predominately characterized as brown and gray, fine to medium sand with varying amounts of silt and clay.
- Groundwater was encountered at depths ranging from approximately 7 to 9 feet bcs.
- Bedrock was not encountered in any of the borings, which were advanced to a maximum depth of 15 feet bcs.
- Staining and petroleum-like odor were observed in boring SB-6, near the eastern site perimeter along 24th Street, at approximately 9 to 9.5 feet bcs.
- The following analytes were detected in soil at concentrations that exceed their respective UU SCOs:
  - One volatile organic compound (VOC), benzene
  - One semivolatile organic compound (SVOC), benzo(b)fluoranthene
  - Four metals, including copper, lead, mercury, and zinc
- The following analytes were detected in groundwater at concentrations that exceed their respective NYSDEC SGVs
  - Eight VOCs, including benzene, 1,1-dichloroethane, cis-1,2-dichloroethane, trans-1,2-dichloroethane, isopropylbenzene, tetrachloroethene (PCE), trichloroethene (TCE) and vinyl chloride
  - Three SVOCs, including phenol, benzo(a)anthracene, and chrysene
  - Twelve metals, including arsenic, beryllium, chromium, copper, iron, lead, magnesium, manganese, nickel, sodium, vanadium, and zinc

2.3.3 February 2014 Phase I ESA, prepared by Langan

The Phase I ESA identified the following RECs:

- *Historical Site Use:* Prior to becoming vacant, the Site was used for manufacturing since at least 1947. Former manufacturing use included the generation of hazardous wastes including various heavy metals (cadmium, lead, barium and mercury) and ignitable waste. The Site was a RCRA SQG of hazardous waste in 2004 - 2005 (Copper Wiring Devices) and is included in the petroleum bulk storage database for an active 10,000-gallon fuel oil aboveground storage tank (AST). Two gasoline tanks were located at the Site in 1936. Based on the results of a Phase II ESI performed in 2012, chlorinated VOCs (CVOC), including PCE and TCE, which are assumed to be associated with historical site use, were identified in groundwater at concentrations that exceed applicable New York State standards. Evidence of former industrial equipment, extensive piping, discoloration and staining of the floors, product supplies and work areas are apparent throughout the building.
- *On-Site Petroleum Bulk Storage:* An active 10,000-gallon No. 6 fuel oil AST has been present at the Site since around 1940.
- *Historical Gasoline Storage:* Four approximately 550-gallon USTs were identified in the northwestern corner of the Site. These USTs appear to be in the same area as those identified on the 1936 Sanborn map. In addition, an apparent vent pipe was identified on the exterior of the building (along the 24th Street sidewalk) that is presumed to be associated with one or more additional former USTs.
- *Petroleum Sheen in Sump:* A sump, located adjacent to the boiler in the building, was identified during a site inspection. Petroleum-like staining was identified in the vicinity of the sump and petroleum-like sheen was apparent on standing water in the sump.
- *Spills at the Site and Southern-Adjoining Property:* A November 2012 Phase II ESI was performed at the Site and southern-adjoining property (23-01 42nd Road). Evidence of petroleum releases were identified at the Site and the south-adjoining property. The NYSDEC was notified and NYSDEC Spill Nos. 1302812 and 1302811 were assigned to the Site and southern-adjoining property, respectively. The southern adjoining property, 23-01 42nd Road, entered into a Brownfield Cleanup Agreement (BCA Site No. C241152) with the NYSDEC on 30 September 2013 to investigate and remediate releases associated with its historical use.

- *Historical Use of Surrounding Properties:* Potential petroleum and solvent releases associated with the following historical surrounding property uses may have adversely impacted soil, groundwater, and/or soil vapor at the Site:
  - A filling station with two gasoline tanks on the eastern adjoining property (1947)
  - An automotive repair shop located across 42nd Road to the south of the Site (1977)
  - A garage on the western adjoining property, across 23rd Street (1947)

2.3.4 June 2015 Remedial Investigation Report, prepared by Langan

This Remedial Investigation Report is comprised of the results of subsurface testing conducted between September 2012 and May 2015. The findings are as follows:

- *Stratigraphy:* Historic fill material, characterized as brown, fine- to coarse-grained sand with varying amounts of silt, gravel, brick, asphalt and concrete, was identified below the cellar slab, extending to about 8 feet below cellar slab (bcs). Historic fill material is underlain by a layer of gray and brown, fine- to coarse-grained sand with varying amounts of gravel and silt, followed by a layer of grey clay with varying amounts of sand and silt. The thicknesses of these sand and clay layers varies across the Site. Bedrock (evidenced by drilling rig refusal) was encountered below the native soil at depths ranging from 9 to 20 feet bcs. Bedrock, consisting of quartz-mica-garnet gneiss of the Ravenwood Granodiorite, was observed at depths ranging from 12.5 to 31 feet bcs during a July 2013 Langan Geotechnical Engineering Study for the south-adjoining lot.
- *Groundwater Depth:* Synoptic groundwater level measurements were collected on August 14, 2013. Based on the gauging event, groundwater depths range from about 4.06 to 6.89 feet bcs. The groundwater elevation is highest in the eastern portion of the Site and appears to slope toward the west across the majority of the Site. The lowest groundwater elevation was documented at MW11 located in southwest corner of the Site. Regional groundwater is presumed to flow west towards the East River.
- *Historical Fill/Soil:* The historic fill layer contains concentrations of VOCs, SVOCs, and metals at concentrations that exceed their respective Unrestricted Use and/or Restricted Use Commercial (RUC) SCOs. Metals were detected at concentrations exceeding the Unrestricted Use SCOs throughout the fill layer. Metals were detected at concentrations that exceed RUC SCOs in fill/soil between 5 and 13 feet bcs in multiple borings in the northern and southern portions of the Site. Metals are common constituents of historic fill material and are not associated

with former Site use. The metals found in the native soil are likely the result of naturally-occurring soil minerals. The metals found in fill and soil are not a source of groundwater contamination.

- *USTs and ASTs:* Four gasoline USTs and a former pump island were identified in the northwest corner of the Site building during the 2013 geophysical survey. In addition, vent pipes along the east side of the Site building were identified. The USTs still remain; however, based on field observations and analytical results, the USTs have not impacted surrounding soil or groundwater. A 10,000-gallon AST containing fuel oil was identified within the northeast corner of the Site building.

- *CVOC-Impacted Groundwater:* CVOCs were detected at concentrations exceeding NYSDEC SGVs in all three groundwater samples collected during the September 2012 Phase II ESI, and in four of seven groundwater samples collected during the subsequent Supplemental Investigation (SI). CVOC concentrations in groundwater were greatest in the northern and central portions of the Site, and decreased in both upgradient and downgradient directions. All soil borings were advanced to refusal, likely encountering the shallow bedrock, and there was no evidence of a CVOC source area. There were no detections of CVOCs at concentrations above their respective Unrestricted Use SCOs in any of the soil samples collected during the September 2012 Phase II ESI and the SI. CVOC concentrations in groundwater were not high enough to indicate the presence of dense non-aqueous phase liquid (DNAPL) in the subsurface. The source of CVOCs is likely due to incidental releases during former manufacturing/industrial processes. Groundwater sample results from off-site monitoring wells were not indicative of an off-site source or downgradient off-site migration.

- *Additional Groundwater Impacts:* LNAPL was detected in monitoring well MW11 during the October 2014 sampling event. Based on analytical results, the LNAPL is likely from an old release and impacts to soil and groundwater have degraded. Concentrations of one or more metals were detected at concentrations exceeding NYSDEC SGVs in all groundwater samples collected. These metals are typical of regional groundwater quality.

- *Soil Vapor Impacts:* Six CVOCs were detected at concentrations above the minimum concentration 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) during the RI.

- Supplemental off-site soil, groundwater, and soil vapor sampling was conducted to evaluate potential up-gradient sources of contamination and downgradient migration of Site contaminant of concerns. Off-site soil vapor samples were collected to the north, east, and west of the Site, and soil vapor concentrations of Site contaminants of concern were two orders of magnitude lower than on-site concentrations. Concentrations of Site contaminants of concern were analogous in soil vapor samples collected from the south-adjacent property. The off-site investigation did not reveal up-gradient sources or downgradient migration of Site contaminants of concern in soil or groundwater.
- Sufficient analytical data were gathered during the SI to develop a remedy for the Site. The remedy will need to address historical fill impacted with metals, groundwater impacted with CVOCs, the potential for soil vapor intrusion, and a contingency for the removal and closure of unknown USTs.

2.3.5 29 July 2019 Construction Completion Report, prepared by Langan

The Construction Completion Report describes and documents the interim remedial measures implemented in accordance with the NYSDEC-approved 14 August 2015 IRMWP. The following interim remedial measures were implemented between 11 April 2016 and 11 July 2019:

- Implementation of a remedial design verification investigation, including advancement of seven soil borings, collection of seven soil samples, and collection of six baseline groundwater samples from existing monitoring wells
- Replacement of four existing groundwater monitoring wells
- Decommissioning and removal of one 10,000-gallon AST
- Decommissioning and removal of three 275-gallon and four 550-gallon USTs
- Demolition of the existing cellar slab and excavation, as practicable, to about 2.5 feet bcs
- Field screening of excavated and exposed soil for environmental impacts using visual and olfactory methods and with a photoionization detector (PID)
- Additional excavation, to the extent practicable, to remove grossly-impacted media
- Collection of base-of-excavation and hotspot endpoint documentation samples
- In-situ groundwater treatment via one injection event of an electron donor (HRC®) and an activated carbon product (PlumeStop™), and a supplemental direct-mix application of HRC®, PlumeStop™ and zero-valent iron (AquaZVI™) for chemical reduction and stimulation of anaerobic biodegradation of CVOCs in groundwater

- Post-injection groundwater sampling and remediation performance monitoring to demonstrate containment/stabilization of the CVOC plume and reduction in CVOC concentrations
- Backfilling of over-excavation areas with ¾-inch stone or recycled concrete aggregate (RCA) to about 2.5 feet bcs
- Installation of sub-slab depressurization (SSD) system components including communication points, geotextile fabric, gas permeable layer, perforated piping, stub-up riser pipes, and monitoring points
- Installation of the composite cover system consisting of a new 4-inch-thick concrete slab, wire mesh reinforcement, sealed expansion joints and polyethylene underlayment, and existing slabs

2.4 Remedial Action Objectives

The Remedial Action Objectives (RAO) for the Site as listed in the Decision Document dated 11 September 2019 are as follows:

2.4.1 Groundwater

RAOs for Public Health Protection

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

RAOs for Environmental Protection

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

2.4.2 Soil

RAOs for Public Health Protection

- Prevent ingestion/direct contact with contaminated soil.

RAOs for Environmental Protection

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

2.4.3 Soil Vapor

RAOs for Public Health Protection

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

2.5 Remaining Contamination

Historical Site features, including former USTs, impacted soil areas, monitoring wells are shown on Figure 4.

2.5.1 Soil

Base-of-excavation endpoint documentation soil samples were collected following removal of the top 2.5 feet of historic fill material and decommissioning and removal of seven USTs. The endpoint documentation soil samples were analyzed for Part 375/Target Compound List (TCL) VOCs and SVOCs and Target Analyte List (TAL) metals. Sample locations and analytical results are shown on Figure 5. Sample analytical results were compared to Unrestricted Use and RUC SCOs, and are summarized in Table 1.

- The following constituents were detected in soil at concentrations that exceed their respective Unrestricted Use SCOs:
  - One VOC: acetone
  - Seven SVOCs: benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene and indeno(1,2,3-c,d)pyrene
  - Four metals: copper, lead, mercury and zinc
- The following constituents were detected in soil at concentrations that exceed their respective RUC SCOs:
  - Three SVOCs: benzo(a)pyrene, benzo(b)fluoranthene and dibenzo(a,h)anthracene
  - Two metals: copper and lead.

Base-of-excavation and sidewall samples were collected following over-excavation in three petroleum-impacted soil areas discovered during site-wide excavation. All of the samples were analyzed for Part 375/TCL VOCs and SVOCs; three samples were also analyzed for TAL metals. Sample locations and analytical results are shown on Figure 5. Sample analytical results were compared to Unrestricted Use and RUC SCO and the NYSDEC CP-51 Soil Cleanup Levels (SCL) for Gasoline and Fuel Oil Contaminated Soils (herein referenced as CP-51 SCLs), and are summarized in Table 2.

- The following constituents were detected in soil at concentrations that exceed their respective Unrestricted Use SCOs:
    - Four VOC: 1,2,4-trimethylbenzene, acetone, toluene, total xylenes
    - Six SVOCs: benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, chrysene, dibenz(a,h)anthracene and indeno(1,2,3-c,d)pyrene
    - One metal: copper
- The following contaminant was also detected at a concentration above the RUC SCOs was one SVOC – benzo(a)pyrene:
- The following constituents were detected in soil at concentrations that exceed their respective CP-51 SCLs:
    - Three VOCs: 1,2,4-trimethylbenzene, toluene, total xylenes
    - Six SVOCs: benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, chrysene, dibenz(a,h)anthracene and indeno(1,2,3-c,d)pyrene

The SVOCs and metals detected at concentrations above the RUC SCOs and CP-51 SCLs are typical of historic fill throughout New York City. Although the detected SVOCs can be associated with fuels, they are likely incomplete combustion byproducts from the burning of wood or coal that were a component of the backfill source used for Site infilling. Groundwater sampling conducted during previous investigations demonstrated that SVOCs and metals in soil have not impacted groundwater. Post-remediation groundwater monitoring events demonstrated that the VOCs detected at concentrations above the CP-51 SCLs have not impacted groundwater.

Following completion of the excavation activities, an 8-inch-thick layer of ¾-inch stone followed by a composite cover system were installed at the Site. The composite cover system, comprised of a new 4-inch-thick concrete cellar slab with wire mesh reinforcement, sealed expansion joints, and 6-mil polyethylene sheeting underlayment, and existing slabs, will make exposure pathways to remaining contamination incomplete.

2.5.2 Groundwater

Groundwater contaminants of concern include CVOCs and petroleum-related VOCs. Groundwater contaminants of concern were remediated during the IRMWP implementation via in-situ groundwater treatment for CVOCs and source removal, including UST decommissioning and soil excavation, for petroleum-impacted VOCs.

Multiple groundwater monitoring events were conducted to evaluate remediation performance of the in-situ treatment. The final groundwater monitoring event (March 2019) showed total CVOC concentration reduction percentages between 74% and 95% for monitoring wells with CVOC concentrations above NYSDEC SGVs in the RI samples.

The results show containment/stabilization of the CVOC plume and reduction in total CVOC concentrations. The results also indicate that, to the extent practicable, groundwater quality has been restored to pre-disposal/pre-release conditions, and the on-site plume has been stabilized, in accordance with Part 375-1.8(d). Groundwater monitoring event analytical results are summarized in Table 3. Groundwater monitoring well locations and results are shown on Figure 6.

Groundwater base-of-excavation samples were collected in areas of source removal if the excavation extended to the top of the groundwater table in each source area. A groundwater sample collected from MW11 on 24 September 2018 was analyzed for Part 375/TCL VOCs and SVOCs; results were compared to NYSDEC SGVs. SVOCs and petroleum-related VOCs were not detected at concentrations above NYSDEC SGVs, indicating that SVOCs and petroleum-related VOCs were not impacting groundwater quality. Groundwater sample results are summarized in Table 4.

- The following constituents were detected in groundwater during the last monitoring event at concentrations that exceed their respective NYSDEC SGVs:
    - VOCs: 1,1,1-trichloroethane, 1,1-dichloroethane, acetone, cis-1,2-dichloroethene, PCE and vinyl chloride

Potential exposure pathways for groundwater will be mitigated by the presence of the composite cover system and because groundwater in Long Island City is not used as a source of drinking water.

2.5.3 Soil Vapor

Six CVOCs were detected at concentrations above the minimum concentration recommending mitigation as set forth in the 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) during the RI. Soil vapor samples results are summarized in Table 5. In-situ groundwater treatment was implemented to address CVOC impacts to groundwater. The SSD system will mitigate soil vapor intrusion related to remaining CVOC impacts to groundwater and off-site sources of soil vapor contamination.

3.0 INSTITUTIONAL AND ENGINEERING CONTROL PLAN

3.1 General

Since remaining contamination exists at the Site, ICs and ECs are required to protect human health and the environment. This IC/EC Plan describes the procedures for the implementation and management of all IC/ECs at the Site. The IC/EC Plan is one component of the SMP and is subject to revision by the NYSDEC.

This plan provides:

- A description of all IC/ECs on the Site
- The basic implementation and intended role of each IC/EC
- A description of the key components of the ICs set forth in the Environmental Easement
- A description of the controls to be evaluated during each required inspection and periodic review
- A description of plans and procedures to be followed for implementation of IC/ECs, such as the implementation of the EWP for the proper handling of remaining contamination that may be disturbed during maintenance or redevelopment work on the Site
- Any other provisions necessary to identify or establish methods for implementing the IC/ECs required by the Site remedy, as determined by the NYSDEC

3.2 Institutional Controls

A series of ICs is required by the Decision Document to: (1) implement, maintain and monitor Engineering Control systems; (2) prevent future exposure to remaining contamination; and, (3) limit the use and development of the Site to commercial and industrial uses only. Additional excavation will be required to allow restricted residential use at the Site. Adherence to these ICs on the Site is required by the Environmental Easement and will be implemented under this SMP. ICs identified in the Environmental Easement may not be discontinued without an amendment to or extinguishment of the Environmental Easement. These ICs are:

- Compliance with the Environmental Easement and this SMP by the Grantor and the Grantor’s successors and assigns
- All ECs must be operated and maintained as specified in this SMP
- All ECs on the Controlled Property must be inspected at a frequency and in a manner defined in the SMP
- Data and information pertinent to Site Management of the Controlled Property must be reported at the frequency and in a manner defined in this SMP

ICs identified in the Environmental Easement may not be discontinued without an amendment to or extinguishment of the Environmental Easement.

The Site has a series of ICs in the form of site restrictions. Adherence to these ICs is required by the Environmental Easement. Site restrictions that apply to the Controlled Property are:

- The property may be used for commercial and industrial use only
- The property may not be used for a higher level use, such as restricted-residential, residential or unrestricted use, without additional remediation and/or amendment of the Environmental Easement, as approved by the NYSDEC
- The use of groundwater underlying the property is prohibited without necessary water quality treatment as determined by the NYSDOH or the New York City Department of Health (NYCDOH) to render it safe for use as drinking water or for industrial purposes, and the user must first notify and obtain written approval to do so from the NYSDEC
- All future activities that will disturb remaining contaminated material must be conducted in accordance with this SMP
- Access to the Site must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice to the property owner to assure compliance with the restrictions identified by the Environmental Easement
- Vegetable gardens and farming on the Site are prohibited
- The Site owner or remedial party will submit to NYSDEC a written statement that certifies, under penalty of perjury, that:
    - Controlled Property controls are unchanged from the previous certification or that any changes to the controls were NYSDEC approved
    - Nothing has occurred that impairs the ability of the controls to protect public health and environment or that constitute a violation or failure to comply with the SMP. NYSDEC retains the right to access such Controlled Property at any time to evaluate the maintenance of any and all controls. This certification shall be submitted annually, or an alternate period of time that NYSDEC may allow, and will be made by an expert that the NYSDEC finds acceptable

3.3 Engineering Controls

3.3.1 Composite Cover System

Exposure to remaining contamination is prevented by the new 4-inch-thick concrete cellar slab (minimum 3,000 pounds per square inch [psi]) and existing slabs that collectively span the entire Site footprint. The concrete slab includes wire mesh reinforcement, polyurethane-sealed expansion joints, and 6-mil polyethylene underlayment. Figure 7 presents the location of the composite cover system. The EWP provided in Appendix C outlines the procedures required to be implemented in the event the cover system is breached, penetrated, or temporarily removed, and any underlying contaminated soil is disturbed. Procedures for the inspection of this cover system are provided in the Monitoring Plan included in Section 4 of this SMP. Any work conducted pursuant to the EWP must also be conducted in accordance with the procedures defined in the Site-specific Health and Safety Plan (HASP) and associated Community Air Monitoring Program (CAMP) provided in Appendix D.

A site cover comprised of the building slab spans the Site footprint and will be maintained to allow for commercial or industrial use of the Site. Any site redevelopment will maintain a site cover as required by the proposed level of site use. The composite cover system may include paved surface parking areas, sidewalks, and/or soil where the upper one (commercial or industrial use) foot of exposed surface soil meets the applicable SCOs for the proposed site use. Soil cover material, including any fill material brought to the Site, will meet the SCOs for cover material as set forth in 6 NYCRR Part 375-6.7(d).

3.3.2 Sub-slab Depressurization System

An SSD system will mitigate potential soil vapor intrusion into the Site building. The SSD system was designed in general accordance with the NYSDOH October 2006 Guidance for Evaluating Soil Vapor Intrusion in the State of New York (NYSDOH Guidance). Below-ground components of the SSD system were previously installed; above-ground components of the SSD systems will be installed and the system will be commissioned prior to issuance of a Certificate of Occupancy (COO) for the Site by the New York City Department of Buildings (NYCDOB). The SSD system layout, including the existing below-ground components are shown on Figure 8. The SSD system design drawings are included as Appendix E.

SSD systems create a low vacuum field beneath the existing building floor slab, and extract the subsurface air using a vacuum blower. Four 5-inch-diameter communication points were cored through the southern and western interior boiler room walls to allow for slab depressurization within the boiler room footprint. A 4-inch-diamater, filter fabric-wrapped cast iron pipe was installed in each communication point and secured in place with cement. Geotextile fabric was placed across the Site at the base of the excavation. An 8-inch-thick, ¾-inch stone gas permeable layer was installed above the geotextile fabric. Two networks of 4-inch-diameter perforated high density polyethylene piping was installed in the center of the gas permeable layer on either side of the Site (east and west). Each network is connected to a stub-up riser pipe that extends about 8 inches above the top of the cellar slab. Seven vacuum monitoring points were also installed. When completed, the riser will continue upward along the interior of the building, to the roof where it will connect with a roof-mounted regenerative blower unit. The riser includes a sample port above the cellar slab.

Procedures for system start-up, operation and maintenance of the SSD system are documented in the Operation and Maintenance Plan (Section 5 of this SMP). Procedures for monitoring the system are included in the Monitoring Plan (Section 4 of this SMP).

Upon completion of the SSD system installation, as-built drawings, signed and sealed by a professional engineer, will be included in Appendix E in the revised version of this SMP.

3.3.3 Criteria for Completion of Remediation/Termination of Remedial Systems

Generally, remedial processes are considered completed when monitoring indicates that the remedy has achieved the remedial action objectives identified by the decision document. The framework for determining when remedial processes are complete is provided in Section 6.4 of NYSDEC DER-10.

3.3.3.1 Composite Cover System

The composite cover system is a permanent control and the quality and integrity of this system will be inspected at defined, regular intervals in accordance with this SMP in perpetuity.

3.3.3.2 SSD System

Following system start-up, the active SSD system will not be discontinued unless prior written approval is granted by the NYSDEC and the NYSDOH. In the event that monitoring data indicates that the SSD system may no longer be required, a proposal to discontinue the SSD system will be submitted by the remedial party to the NYSDEC and NYSDOH.

4.0 MONITORING PLAN

4.1 General

This Monitoring Plan describes the measures for evaluating the overall performance and effectiveness of the remedy. This Monitoring Plan may only be revised with the approval of the NYSDEC. Details regarding the sampling procedures, data quality usability objectives, analytical methods, etc. for all samples collected as part of site management for the Site are included in the Quality Assurance Project Plan (QAPP) provided in Appendix F.

This Monitoring Plan describes the methods to be used for:

- Assessing achievement of the remedial performance criteria
- Evaluating site information periodically to confirm that the remedy continues to be effective in protecting public health and the environment
- Preparing the necessary reports for the various monitoring activities

To adequately address these issues, this Monitoring Plan provides information on:

- All designed monitoring systems
- Reporting requirements
- Annual inspection and periodic certification

Reporting requirements are provided in Section 7 of this SMP.

The Site is not considered a source of groundwater contamination, therefore, groundwater monitoring is not discussed in this Monitoring Plan. Quarterly monitoring of the SSD system will be conducted for the first year. The frequency thereafter will be annually unless otherwise directed by the NYSDEC. Monitoring programs are summarized in the following table.

Monitoring Program	Frequency	Analysis
Site-Wide Inspections	Annually	Visual inspection of general Site conditions and ECs
Composite Cover System Inspections	Annually	Visual inspection of composite cover system components
SSD System Inspections	Quarterly (1st year); annually thereafter	Visual inspection of above-ground system components and alarm testing

Note: The frequency of events will be conducted as specified until otherwise approved by the NYSDEC.

4.2 Site-Wide Inspection

Site-wide inspections will be performed annually. Modification to the frequency or duration of the inspections will require approval from the NYSDEC. Site-wide inspections will also be performed after all severe weather conditions that may affect ECs or monitoring devices. During these inspections, an inspection form will be completed as provided in Appendix G. The form will compile sufficient information to assess the following:

- Compliance with all ICs, including Site usage
- An evaluation of the condition and continued effectiveness of ECs
- General site conditions at the time of the inspection
- Site management activities being conducted including, where appropriate, confirmation sampling and a health and safety inspection
- Confirm that site records are up to date

Inspections of all remedial components installed at the Site will be conducted. A comprehensive site-wide inspection will be conducted and documented according to the SMP schedule, regardless of the frequency of the PRR. The inspections will determine and document the following:

- Whether ECs continue to perform as designed
- If these controls continue to be protective of human health and the environment
- Compliance with requirements of this SMP and the Environmental Easement
- Achievement of remedial performance criteria
- If site records are complete and up to date

Reporting requirements are outlined in Section 7 of this plan.

Inspections will also be performed in the event of an emergency. If an emergency, such as a natural disaster or an unforeseen failure of any of the ECs occurs that reduces or has the potential to reduce the effectiveness of ECs in place at the Site, verbal notice to the NYSDEC must be given by noon of the following day. In addition, an inspection of the Site will be conducted within 5 days of the event to verify the effectiveness of the IC/ECs implemented at the Site by a qualified environmental professional, as determined by the NYSDEC. Written confirmation must be provided to the NYSDEC within 7 days of the event that includes a summary of actions taken, or to be taken, and the potential impact to the environment and the public.

4.3 Composite Cover System Monitoring

A composite cover system, comprised of the 4-inch-thick concrete cellar slab serves as a protective barrier mitigating the risk of exposure to the remaining contamination. The cover system plan is presented as Figure 7. Inspection of the cover system by a professional engineer, or a qualified environmental professional under the direction of a professional engineer, is required on a regular schedule at a minimum of once per year and following any severe weather or other conditions that could affect the cover. Unscheduled inspections may take place when a suspected failure of the cover system has been reported or an emergency occurs that is deemed likely to affect the cover system. Modification to the frequency or sampling requirements will require approval from the NYSDEC. During these inspections, a site inspection form will be completed. The inspection requires sufficient information to certify the all elements of the cover system described above and should document any cover system disturbances. Any damage to the cover system identified during the inspection will be repaired in kind and in compliance with this SMP.

4.4 SSD System Monitoring

Inspection will be conducted on a quarterly basis during the first year of operation to establish that it is operational and performing within the design specifications. Thereafter, the frequency will be determined by NYSDEC and NYSDOH but is assumed to be annually. A visual inspection of the above-ground system components will be conducted during the monitoring event. SSD system components to be monitored include, but are not limited to the following:

- Vacuum blower
- General system piping
- Vacuum Monitoring points

A complete list of components to be checked is provided in the Inspection Checklist, included in Appendix G. If any equipment readings are not within their typical range, any equipment is observed to be malfunctioning, or the system is not performing within specifications, applicable maintenance and repairs will be conducted per the Operation and Maintenance Plan, and the SSD system will be restarted.

This Monitoring Plan may only be modified with the approval of NYSDEC. Unscheduled inspections and/or sampling may take place when a suspected failure of the SSD system has been reported or an emergency occurs that is deemed likely to affect the operation of the system. Monitoring deliverables for the SSD systems are specified below, in Section 5 of this SMP.

4.5 Media Monitoring Quality Assurance/Quality Control

With the exception of the post-construction indoor and SSD system effluent air sampling, which will follow the procedure discussed in Section 5, media monitoring is not required under this SMP. Potential sources of groundwater contamination were removed as part of the IRMWP, and the Remedial Investigation established that historic fill does not impact groundwater. Based on the NYSDOH Guidance, indoor air monitoring is not necessary after the active SSD system has been properly installed and is maintaining a vacuum underneath the slab. In addition to post-construction sampling, future indoor air and SSD system sampling events may be conducted to evaluate SSD system operation.

Any future soil, groundwater or soil vapor sampling will adhere to the following protocols. All sampling and analyses will be performed in accordance with the requirements of the QAPP prepared for the Site (Appendix F). Components of the QAPP include:

- Quality assurance/quality control (QA/QC) objectives for data measurement
- Sampling Program:
    - Sample containers will be properly washed, decontaminated, and appropriate preservative will be added (if applicable) prior to their use by the analytical laboratory – Containers with preservative will be tagged as such
    - Sample holding times will be in accordance with the NYSDEC Analytical Services Protocol (ASP) requirements
    - Field QC samples (e.g., trip blanks, coded field duplicates, and matrix spike/matrix spike duplicates) will be collected as necessary
- Sample Tracking and Custody
- Calibration Procedures:
    - All field analytical equipment will be calibrated immediately prior to each day's use – Calibration procedures will conform to manufacturer's standard instructions
    - The laboratory will follow all calibration procedures and schedules as specified in United States Environmental Protection Agency (EPA) SW-846 and subsequent updates that apply to the instruments used for the analytical methods
- Analytical Procedures
- Preparation of a Data Usability Summary Report (DUSR), which 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
- Internal QC and Checks
- QA Performance and System Audits
- Preventative Maintenance Procedures and Schedules
- Corrective Action Measures

5.0 OPERATION AND MAINTENANCE PLAN

5.1 General

This Operation and Maintenance Plan provides a brief description of the measures necessary to operate, monitor and maintain the mechanical components of the remedy selected for the Site. This Operation and Maintenance Plan:

- Includes the procedures for SSD system start-up and testing
- Includes the steps necessary to allow individuals unfamiliar with the Site to operate and maintain the SSD system
- Includes an operation and maintenance contingency plan
- Will be updated periodically to reflect changes in site conditions or the manner in which the SSD system are operated and maintained

Information on non-mechanical ECs (i.e., cover system) is provided in Section 3. A copy of this Operation and Maintenance Plan, along with the complete SMP, will be kept at the Site. This Operation and Maintenance Plan is not to be used as a stand-alone document, but as a component document of the SMP.

5.2 SSD System Operation and Maintenance

5.2.1 Scope

This section provides operation and maintenance requirements for the SSD system. The Operation and Maintenance Program has been prepared based on the NYSDOH Guidance and EPA guidance document EPA/625/R-92/016 concerning active depressurization of large buildings and schools (June 1994).

Details of the SSD system design and layout are provided in the Engineering and Institutional Control Plan section of the SMP. SSD system design drawings are included in Appendix E. Upon completion of the SSD system installation, as-built drawings, signed and sealed by a professional engineer, will be included in Appendix E in the revised version of this SMP. SSD system component manuals will also be appended to the revised version of this SMP.

5.2.2 System Start-Up and Testing

The remaining above-ground SSD system components will be installed prior to issuance of a Certificate of Occupancy (CO) for the Site by the NYCDOB. Prior to initial start-up of the SSD system, all accessible SSD components will be inspected. The equipment will then be started in accordance with the manufacturer's recommendations. The system component manuals will also be included as attachments in the subsequent Periodic

Review Report (PRR). System testing following the initial system start-up will be performed as follows:

- While the system is operating, smoke tubes will be used to check for leaks through concrete cracks, floor joints, and at the suction points. Any leaks identified will then be properly sealed.
- The blower-malfunction warning device will be tested.
- Shortly after installation of the system and completion of building construction, post-construction indoor air and SSD system sample port samples will be collected. The post-construction samples will be analyzed for VOCs to confirm that concentrations in indoor air are below the air guideline values derived by the NYSDOH, and to test sub-slab air concentrations. If the sampling results indicate a concentration in indoor air above the air guideline values, the source or cause (e.g., indoor or outdoor sources, improper operation of the SSD system, etc.) will be identified and corrected as necessary. Additional indoor air and SSD system air samples are not required under this SMP.

The system testing described above will be conducted if, in the course of the SSD system lifetime, significant changes are made to the system and the system is restarted.

5.2.3 System Operation

5.2.3.1 Routine Operating Procedures

The vacuum blowers will operate continuously after initial startup. All equipment will be operated in accordance with manufacturer's recommendations.

5.2.3.2 Trouble Shooting

During the course of operation for the active SSD system, especially immediately after start-up, some technical difficulties may be encountered and the SSD system may not operate within design specifications. Any required maintenance, adjustments, or repairs to the system will be conducted as per manufacturer's recommendations and Section 5.2.4 of this Operation and Maintenance Plan.

5.2.4 System Maintenance

5.2.4.1 Routine Maintenance

Routine equipment maintenance (e.g., replacing vent fans), repairs, and/or adjustments will be determined based on the life expectancy and warranty for the specific part as well as visual observations over time. The need for repairs and/or adjustments will depend upon the results of a specific activity compared to the results obtained when system operations were initiated. Routine maintenance activities and minimum schedules will be provided in the SSD system manual (to be appended to this SMP after SSD system is fully installed). Routine maintenance of the accessible, non-mechanical SSD system components (i.e., riser) is not anticipated.

5.2.4.2 Non-Routine Maintenance

Non-routine maintenance may also be required during the operation of the SSD system, including the following situations:

- The building's owner or occupants report that the warning device indicates the SSD system is not operating properly
- The SSD system becomes damaged
- The building has undergone renovations that may reduce the effectiveness of the SSD system

Activities conducted during non-routine maintenance visits will vary. NYSDEC will be informed of SSD system failure within 48 hours. Repairs or adjustments will be made to the system as appropriate and as per manufacturer guidelines within 15 days of the equipment failure, whenever possible (i.e., pending availability of parts). If necessary, the system will be redesigned and restarted.

5.3 SSD System Performance Monitoring

Performance monitoring will be conducted to determine whether the SSD system is operating as designed.

5.3.1 Monitoring Schedule

A baseline inspection of the blower and other equipment will be conducted within 24 hours following initial start-up of the system. Inspections will be conducted on a quarterly basis during the first year of implementation to establish that it is operational and performing within the design specifications. Thereafter, inspections will be conducted on an annual basis. Inspection frequency is subject to change with the approval of the NYSDEC and NYSDOH. Unscheduled inspections or sampling may take place when a suspected failure of the SSD system has been reported or an emergency occurs that is deemed likely to affect the operation of the system. SSD system monitoring deliverables are specified in Section 5.4.

5.3.2 General Equipment Monitoring

A visual inspection of the above-ground components of the SSD system will be conducted during the monitoring events. SSD system components to be monitored include, but are not limited to, the following:

- Vacuum blower

- Alarm system
- Pressure Gauges
- Vacuum monitoring points
- Rate of discharge
- General system piping

A complete list of components to be checked is provided in the Inspection Checklist, presented in Appendix G. If any equipment readings are not within their typical range, any equipment is observed to be malfunctioning, or the system is not performing within specifications, maintenance and repair as per the Operation and Maintenance Plan are required immediately, and the SSD system restarted.

5.3.3 System Monitoring Devices and Alarms

The SSD system will have a warning device to indicate that the system is not operating properly. In the event that the warning device is activated, applicable maintenance and repairs will be conducted, as specified in the Operation and Maintenance Plan, and the SSD system restarted. Operational problems will be noted in the subsequent PRR.

The seven monitoring points will be used to monitor vacuum during system operation. The vacuum at each monitoring point will be measured using a manometer during site inspections to confirm the SSD system is operating as designed.

5.3.4 Sampling Event Protocol

Based on the NYSDOH Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York (October 2006), air monitoring is not necessary after the SSD system has been properly installed and is maintaining a vacuum underneath the entire slab. However, some repairs and adjustments will be made during the lifetime of the SSD system. SSD system testing, as outlined in Section 5.2 of the Operation and Maintenance Plan, will be conducted in case of redesign and start-up, or to determine the need to continue SSD system operation.

5.4 Maintenance and Performance Monitoring Reporting Requirements

Maintenance reports and any other information generated during regular operations will be filed on-site. All reports, forms, and other relevant information generated will be available to the NYSDEC and submitted as part of the PRR, as specified in Section 7 of this SMP.

5.4.1 Routine Maintenance Reports

Checklists or forms (see Appendix G) will be completed during each routine maintenance event. Checklists and forms will include the following information:

- Date
- Name, company, and position of person(s) conducting maintenance activities;
- Maintenance activities conducted
- Any modifications to the system
- Photographs or sketches showing the approximate location of any problems or incidents noted
- Other relevant documentation (e.g., maintenance invoices, replacement equipment receipts, contractor logs, etc.)

5.4.2 Non-Routine Maintenance Reports

Completed non-routine maintenance forms will include the following information:

- Date
- Name, company, and position of person(s) conducting non-routine maintenance or repair activities
- Presence of leaks
- Date of leak repair
- Other repairs or adjustments made to the system
- Photographs or sketches showing the approximate location of any problems or incidents noted
- Other relevant documentation (e.g., maintenance invoices, replacement equipment receipts, contractor logs, etc.)

6.0 PERIOD ASSESSMENTS/EVALUATIONS

6.1 Climate Change Vulnerability Assessment

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

According to the preliminary Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map No. 3604970089F effective 5 September 2007, the Subject Property is located within an area of minimal flood hazard.

The building, which encompasses the entire Site footprint, will protects the SSD system and composite cover system from extreme wind conditions and stormwater drainage overflow.

The SSD system receives electrical service from Consolidated Edison, Inc. (Con Ed). A power loss and/or dips/surges in voltage during a severe weather event, including lightning strikes, may impact the SSD system equipment and operations.

6.2 Green Remediation Evaluation

NYSDEC DER-31 Green Remediation requires that green remediation concepts and techniques be considered during all stages of the remedial program including site management, with the goal of improving the sustainability of the cleanup and summarizing the net environmental benefit of any implemented green technology. This section of the SMP provides a summary of any green remediation evaluations to be completed for the Site during site management, and as reported in the PRR. Waste resulting from soil and/or groundwater sampling is not anticipated to be generated.

6.2.1 Timing of Green Remediation Evaluations

For major remedial system components, green remediation evaluations and corresponding modifications will be undertaken as part of a formal Remedial System Optimization (RSO), or at any time that the Project Manager feels appropriate (e.g., during significant maintenance events or in conjunction with storm recovery activities).

Modifications resulting from green remediation evaluations will be routinely implemented and scheduled to occur during planned/routine operation and maintenance activities. Reporting of these modifications will be presented in the PRR.

6.2.2 Remedial Systems

Remedial systems will be operated properly considering the current site conditions to conserve materials and resources to the greatest extent possible. Consideration will be given to operating rates and use of reagents and consumables. Spent materials will be sent for recycling, as appropriate.

An SSD system effluent air sample will be collected during system start-up to monitor emissions. Analytical results will be used to verify that contaminant concentrations detected in the vapor sample comply with NYSDEC Policy DAR-1.

6.2.3 Frequency of System Checks, Sampling and Other Periodic Activities

Transportation to and from the Site and use of consumables in relation to visiting the Site to conduct system checks and or collect samples and shipping samples to a laboratory for analyses have direct and/or inherent energy costs. The schedule and/or means of these periodic activities have been prepared so that these tasks can be accomplished in a manner that does not impact remedy protectiveness but reduces expenditure of energy or resources.

6.3 Remedial System Optimization

A RSO study will be conducted any time that the NYSDEC or the remedial party requests in writing that an in-depth evaluation of the remedy is needed. An RSO may be appropriate if any of the following occur:

- Remedial actions have not met or are not expected to meet RAOs in the time frame estimated in the Decision Document
- Management and operation of the remedial system is exceeding the estimated costs
- Remedial system is not performing as expected or as designed
- Previously unidentified source material may be suspected
- Plume shift has potentially occurred
- Site conditions change due to development, change of use, change in groundwater use, etc.
- There is an anticipated transfer of the Site management to another remedial party or agency
- A new and viable remedial technology becomes available to remediate contaminants that are not listed in the Certificate of Completion – Contaminants

listed in the Certificate of Completion are associated with a liability release for further action.

An RSO will provide a critique of a Site's conceptual model, give a summary of past performance, document current cleanup practices, summarize progress made toward the Site's cleanup goals, gather additional performance or media specific data and information and provide recommendations for improvements to enhance the ability of the present system to reach RAOs or to provide a basis for changing the remedial strategy.

The RSO study will focuses on overall site cleanup strategy, process optimization and management with the intent of identifying impediments to cleanup and improvements to site operations to increase efficiency, cost effectiveness and remedial time frames. Green remediation technology and principals are to be considered when performing the RSO.

7.0 REPORTING REQUIREMENTS

7.1 Site Management Reports

All site management inspection, maintenance and monitoring events will be recorded on the appropriate site management forms provided in Appendix G. These forms are subject to NYSDEC revision.

All applicable inspection forms and other records, including media sampling data and system maintenance reports, generated for the Site during the reporting period will be provided in electronic format to the NYSDEC in accordance with the requirements of the following table and summarized in the PRR.

Task/Report	Reporting Frequency
Inspection Reports	Annually
PRR	Annually, or as otherwise determined by NYSDEC

Note: The frequency of events will be conducted as specified until otherwise approved by the NYSDEC.

All interim monitoring/inspections reports will include, at a minimum:

- Date of event or reporting period
- Name, company, and position of person(s) conducting monitoring/inspection activities
- Description of the activities performed
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents noted (included either on the checklist/form or on an attached sheet)
- Type of samples collected (e.g., sub-slab vapor, indoor air, outdoor air, etc.)
- Copies of all field forms completed (e.g., well sampling logs, chain-of-custody documentation, etc.)
- Sampling results in comparison to appropriate standards/criteria
- A figure illustrating sample type and sampling locations
- Copies of all laboratory data sheets and the required laboratory data deliverables required for all points sampled (to be submitted electronically in the NYSDEC-identified format)
- Any observations, conclusions, or recommendations
- A determination as to whether contaminant conditions have changed since the last reporting event

Routine maintenance event reporting forms will include, at a minimum:

- Date of event
- Name, company, and position of person(s) conducting maintenance activities
- Description of maintenance activities performed
- Any modifications to the system
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents noted (included either on the checklist/form or on an attached sheet)
- Other documentation such as copies of invoices for maintenance work, receipts for replacement equipment, etc., (attached to the checklist/form)

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

- Date of event
- Name, company, and position of person(s) conducting non-routine maintenance/repair activities
- Description of non-routine activities performed
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents (included either on the form or on an attached sheet)
- Other documentation such as copies of invoices for repair work, receipts for replacement equipment, etc. (attached to the checklist/form)

Data will be reported in digital format as determined by the NYSDEC. Currently, data is to be supplied electronically and submitted to the NYSDEC EQuIS™ database in accordance with the requirements found at this link http://www.dec.ny.gov/chemical/62440.html.

7.2 Periodic Review Report

A PRR will be submitted to the Department beginning 16 months after the COC is issued. After submittal of the initial PRR, the next PRR shall be submitted annually to the Department or at another frequency as may be required by the Department. In the event that the Site is subdivided into separate parcels with different ownership, a single PRR will be prepared. The report will be prepared in accordance with NYSDEC's DER-10 and submitted within 30 days of the end of each certification period. Media sampling results will also be incorporated into the PRR. The report will include:

- Identification, assessment and certification of all ECs/ICs required by the remedy for the Site
- Results of the required annual site inspections and severe condition inspections, if applicable

- All applicable site management forms and other records generated for the Site during the reporting period in the NYSDEC-approved electronic format, if not previously submitted
- A summary of any discharge monitoring data and/or information generated during the reporting period, with comments and conclusions
- Data summary tables and graphical representations of contaminants of concern, which include a listing of all compounds analyzed, along with the applicable standards, with all exceedances highlighted – These will include a presentation of past data as part of an evaluation of contaminant concentration trends
- Results of all analyses, copies of all laboratory data sheets, and the required laboratory data deliverables for all samples collected during the reporting period will be submitted in digital format as determined by the NYSDEC – Currently, data is supplied electronically and submitted to the NYSDEC EQuIS™ database in accordance with the requirements found at this link: http://www.dec.ny.gov/chemical/62440.html.
- A site evaluation, which includes the following:
  - The compliance of the remedy with the requirements of the Site-specific Decision Document
  - The operation and the effectiveness of all treatment units, etc., including identification of any needed repairs or modifications
  - Any new conclusions or observations regarding Site contamination based on inspections or data generated by the Monitoring Plan
  - Recommendations regarding any necessary changes to the remedy and/or Monitoring Plan
  - The overall performance and effectiveness of the remedy

7.2.1 Certification of Institutional and Engineering Controls

Following the last inspection of the reporting period, a Professional Engineer licensed to practice in New York State will prepare, and include in the PRR, the following certification as per the requirements of NYSDEC DER-10:

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

- *The inspection of the Site to confirm the effectiveness of the institutional and engineering controls required by the remedial program was performed under my direction*
- *The institutional control and/or engineering control employed at this site is unchanged from the date the control was put in place, or last approved by the Department*

- *Nothing has occurred that would impair the ability of the control to protect the public health and environment*
- *Nothing has occurred that would constitute a violation or failure to comply with any site management plan for this control*
- *Access to the Site will continue to be provided to the Department to evaluate the remedy, including access to evaluate the continued maintenance of this control*
- *If a financial assurance mechanism is required under the oversight document for the Site, the mechanism remains valid and sufficient for the intended purpose under the document*
- *Use of the Site is compliant with the environmental easement*
- *The engineering control systems are performing as designed and are effective*
- *To the best of my knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the Site remedial program and generally accepted engineering practices*
- *The information presented in this report is accurate and complete*

I certify that all information and statements in this certification form are true. I understand that a false statement made herein is punishable as a Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law. I, Jason J. Hayes, of Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C., am certifying as the Remedial Party's Designated Site Representative for the Site."

Every five years, the following certification will be added to the above list:

- *"The assumptions made in the qualitative exposure assessment remain valid"*

The signed certification will be included in the PRR.

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

7.3 Corrective Measures Work Plan

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

8.0 REFERENCES

The following references were reviewed as part of this SMP:

1. 6 NYCRR Part 375 – Environmental Remediation Programs (December 14, 2006).
2. 6 NYCRR Part 703.5 – Water Quality Standards (January 31, 2017).
3. Construction Completion Report, prepared by Langan, dated 29 July 2019.
4. Draft Remedial Action Work Plan, prepared by Langan, dated 29 July 2019.
5. Geotechnical Engineering Study, prepared by Langan, dated 26 July 2013.
6. Interim Remedial Measures Work Plan, prepared by Langan, dated 14 August 2015.
7. NYSDEC – Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1 (June 1998, April 2000 addendum).
8. NYSDEC DAR-1 – Guidelines for the Evaluation and Control of Ambient Air Contaminants under Part 212 (June 2016).
9. NYSDEC DER-10 – Technical Guidance for Site Investigation and Remediation (May 2010).
10. NYSDEC DER-31 – Green Remediation (August 2010).
11. NYSDOH – Guidance for Evaluating Soil Vapor Intrusion in the State of New York (October 2006).
12. Phase I Environmental Site Assessment, prepared by Cardno ATC, dated 28 August 2012.
13. Phase I Environmental Site Assessment, prepared by Langan, dated February 2014.
14. Phase II Environmental Site Investigation, prepared by Cardno ATC, 8 November 2012.
15. Remedial Investigation Report, prepared by Langan, dated 15 June 2015.

TABLES

Table 1
Site Management Plan
Endpoint Documentation Soil Sample Analytical Results Summary

23-10 Queens Plaza South
Long Island City, New York
NYSDEC BCP Site No.: C241160
Langan Project No.: 170244603

Location Sample ID Laboratory ID Sample Date Depth Range (feet bcs)	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Restricted Use - Commercial SCOs	EPB01 EPB01_2.5 L1841813-04 10/15/2018 2.5		EPB02 EPB02_2.5 L1836693-04 9/14/2018 2.5		EPB03 EPB03_2.5 L1833320-03 8/23/2018 2.5		EPB04 EPB04_2.5 L1833320-02 8/23/2018 2.5		EPB04 DUP01_082318 L1833320-09 8/23/2018 2.5		EPB05 EPB05_2.5 L1841813-03 10/15/2018 2.5		EPB06 EPB06_2.5 L1841813-02 10/15/2018 2.5		EPB07 EPB07_2.5 L1833320-04 8/23/2018 2.5		EPB08 EPB08_2.5 L1833320-05 8/23/2018 2.5	
Volatile Organic Compounds (mg/kg)																				
1,1,1-Trichloroethane	0.68	500	0.00051	U	0.00046	UJ	0.0038		0.00051	U	0.00048	U	0.00041	J	0.007		0.00056	U	0.00051	U
1,1-Dichloroethane	0.27	240	0.001	U	0.00091	U	0.0011	U	0.001	U	0.00095	U	0.00027	J	0.0092		0.0011	U	0.001	U
1,2,3-Trichlorobenzene	~	~	0.002	U	0.0018	U	0.0012	J	0.002	U	0.0019	U	0.002	U	0.0018	U	0.0022	U	0.002	U
1,2-Dichlorobenzene	1.1	500	0.002	U	0.0018	U	0.0022	U	0.002	U	0.0019	U	0.002	U	0.00057	J	0.0022	U	0.002	U
1,4-Diethyl Benzene	~	~	0.002	U	0.0018	U	0.0022	U	0.002	U	0.0019	U	0.002	U	0.0018	U	0.0022	U	0.002	U
Acetone	0.05	500	0.038		0.024	J	0.006	J	0.0065	J	0.02	J	0.018	J	0.02		0.0083	J	0.01	U
Carbon Disulfide	~	~	0.01	U	0.0091	UJ	0.011	UJ	0.01	UJ	0.0095	U	0.01	UJ	0.005	J	0.011	UJ	0.01	UJ
Chloroethane	~	~	0.002	U	0.0018	U	0.0022	U	0.002	U	0.0019	U	0.002	UJ	0.00045	J	0.0022	U	0.002	U
Chloroform	0.37	350	0.00014	J	0.0014	U	0.0017	U	0.0015	U	0.0014	U	0.0015	U	0.0014	U	0.0017	U	0.0015	U
Methylene Chloride	0.05	500	0.0051	U	0.0046	U	0.0056	U	0.0051	U	0.0048	U	0.005	U	0.0092		0.0056	U	0.0051	U
Tetrachloroethene (PCE)	1.3	150	0.00079		0.00046	U	0.00056	U	0.00054		0.00038	J	0.0017	J	0.0042		0.00056	U	0.00051	U
Trichloroethene (TCE)	0.47	200	0.00051	U	0.00046	U	0.00056	U	0.00055		0.00044	J	0.0005	U	0.00026	J	0.00056	U	0.00051	U
Semivolatile Organic Compounds (mg/kg)																				
2-Methylnaphthalene	~	~	0.22	U	0.23	U	0.27	U	0.22	U	0.22	U	0.055	J	0.22	U	0.25	U	0.2	U
3 & 4 Methylphenol (m&p Cresol)	0.33	~	0.26	U	0.28	U	0.32	U	0.27	U	0.27	U	0.29	U	0.26	U	0.3	U	0.24	U
Acenaphthene	20	500	0.15	U	0.15	U	0.18	U	0.15	U	0.15	U	0.36		0.076	J	0.17	U	0.14	U
Acenaphthylene	100	500	0.15	U	0.15	U	0.18	U	0.15	U	0.15	U	0.18		0.046	J	0.17	U	0.14	U
Anthracene	100	500	0.11	U	0.11	U	0.13	U	0.11	U	0.11	U	0.67		0.19		0.12	U	0.1	U
Benzo(a)Anthracene	1	5.6	0.058	J	0.11	U	0.13	U	0.11		0.038	J	**1.6**		0.43		0.12	U	0.1	U
Benzo(a)Pyrene	1	1	0.048	J	0.15	U	0.18	U	0.11	J	0.15	U	**1.4**		0.37		0.17	U	0.14	U
Benzo(b)Fluoranthene	1	5.6	0.065	J	0.11	U	0.13	U	0.16		0.059	J	**1.8**		0.48		0.12	U	0.1	U
Benzo(g,h,i)Perylene	100	500	0.038	J	0.15	U	0.18	U	0.077	J	0.034	J	0.99		0.27		0.17	U	0.14	U
Benzo(k)Fluoranthene	0.8	56	0.11	U	0.11	U	0.13	U	0.053	J	0.11	U	0.55		0.15		0.12	U	0.1	U
Bis(2-Ethylhexyl) Phthalate	~	~	0.18	U	0.19	U	0.22	U	0.19	U	0.18	U	0.2	U	0.18	U	0.21	U	0.17	U
Carbazole	~	~	0.18	U	0.19	U	0.22	U	0.19	U	0.18	U	0.24		0.069	J	0.21	U	0.17	U
Chrysene	1	56	0.061	J	0.11	U	0.13	U	0.12		0.046	J	**1.5**		0.42		0.12	U	0.1	U
Dibenz(a,h)Anthracene	0.33	0.56	0.11	U	0.11	U	0.13	U	0.11	U	0.11	U	0.2		0.06	J	0.12	U	0.1	U
Dibenzofuran	7	350	0.18	U	0.19	U	0.22	U	0.19	U	0.18	U	0.16	J	0.047	J	0.21	U	0.17	U
Fluoranthene	100	500	0.077	J	0.11	U	0.13	U	0.24		0.062	J	3.5		0.88		0.12	U	0.1	U
Fluorene	30	500	0.18	U	0.19	U	0.22	U	0.19	U	0.18	U	0.27		0.065	J	0.21	U	0.17	U
Indeno(1,2,3-c,d)Pyrene	0.5	5.6	0.033	J	0.15	U	0.18	U	0.087	J	0.033	J	**0.98**		0.24		0.17	U	0.14	U
Naphthalene	12	500	0.18	U	0.19	U	0.22	U	0.19	U	0.18	U	0.13	J	0.036	J	0.21	U	0.17	U
Phenanthrene	100	500	0.041	J	0.11	U	0.13	U	0.18		0.031	J	3		0.87		0.12	U	0.1	U
Pyrene	100	500	0.083	J	0.11	U	0.13	U	0.19		0.059	J	3.2		0.83		0.12	U	0.1	U
Inorganics (mg/kg)																				
Aluminum	~	~	6,240		15,300		9,830		4,560		2,830		4,770		5,510		8,570		2,560	
Antimony	~	~	4.33	U	2.88	J	0.805	J	0.777	J	4.36	U	4.64	U	4.46	U	0.627	J	4.08	U
Arsenic	13	16	3.16		1.68		1.42		3.81	J	0.95	J	3.27		2.28		2.06		1.04	
Barium	350	400	42.6		48.6		47.6		34.2	J	12.6	J	64.9		45.5		34.1		8.32	
Beryllium	7.2	590	0.286	J	0.577		0.366	J	0.21	J	0.113	J	0.223	J	0.25	J	0.309	J	0.082	J
Cadmium	2.5	9.3	0.147	J	0.916	U	1.04	U	0.873	U	0.872	U	0.929	U	0.892	U	0.965	U	0.817	U
Calcium	~	~	9,560	J	827		894	J	507	J	248	J	5,910	J	4,840	J	238	J	562	J
Chromium, Total	~	~	16.4		41.3	J	38.9		14.3		14.4		15.7		20.4		66.1		191	
Cobalt	~	~	4.72		8.84		8.34		3.25		1.98		5.96		5.04		6.62		1.99	
Copper	50	270	38.7		18.4		**232**	J	**147**	J	**57.4**	J	**86.1**		**1,470**		**129**	J	**217**	J
Iron	~	~	9,780		19,200		16,800	J	7,970	J	4,470	J	15,700		10,200		16,400	J	8,240	J
Lead	63	1000	37.8	J	11.2		5.07	J	53	J	15.1	J	**172**	J	**106**	J	19.9		4.98	
Magnesium	~	~	1,890	J	3,040	J	3,810	J	1,500	J	950	J	2,430	J	2,930	J	2,850	J	1,250	J
Manganese	1600	10000	232		187		410		112		70.1		155		179		277		55.2	
Mercury	0.18	2.8	0.074	J	0.075	U	0.086	U	0.062	J	0.111	J	0.165	J	0.091	J	0.08	U	0.066	U
Nickel	30	310	9.11		17.2		16		7.46		4.43		11.1		24.8		13.2		4.31	
Potassium	~	~	614		862		1,060		399		205	J	908		843		757		208	
Selenium	3.9	1500	1.73	U	0.934	J	2.09	U	1.74	U	1.74	U	0.242	J	1.78	U	1.93	U	1.63	U
Sodium	~	~	111	J	122	J	49.6	J	50.8	J	23	J	114	J	118	J	82.9	J	54	J
Vanadium	~	~	17.9		35		28.9		11.6	J	5.98	J	16.7		17.9		22.7		7.73	
Zinc	109	10000	86		42.8		**144**		**152**	J	69.9	J	**172**		**201**		65.7		**392**	

Notes provided on Page 3.
Concentrations above Unrestricted Use SCOs are bolded.
Concentrations above Restricted Use - Commercial SCOs are shaded.

Table 1
Site Management Plan
Endpoint Documentation Soil Sample Analytical Results Summary

23-10 Queens Plaza South
Long Island City, New York
NYSDEC BCP Site No.: C241160
Langan Project No.: 170244603

Location	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Restricted Use - Commercial SCOs	EPB09	EPB10	EPB11	EPB12	EPB13	EPB13	EPB14	EPB15	EPB16
Sample ID			EPB09_2.5	EPB10_2.5	EPB11_2.5	EPB12_2.5	EPB13_2.5	DUP02_091418	EPB14_2.5	EPB15_2.5	EPB16_2.5
Laboratory ID			L1841813-01	L1836693-07	L1833320-06	L1833320-01	L1836693-05	L1836693-03	L1836693-06	L1833320-07	L1833320-08
Sample Date			10/15/2018	9/14/2018	8/23/2018	8/23/2018	9/14/2018	9/14/2018	9/14/2018	8/23/2018	8/23/2018
Depth Range (feet bcs)			2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Volatile Organic Compounds (mg/kg)											
1,1,1-Trichloroethane	0.68	500	0.0015	0.00057 UJ	0.0005 U	0.00049 U	0.00058 UJ	0.0006 UJ	0.00051 UJ	0.00057 U	0.0005 U
1,1-Dichloroethane	0.27	240	0.0016	0.0011 U	0.001 U	0.00098 U	0.0012 U	0.0012 U	0.001 U	0.0011 U	0.001 U
1,2,3-Trichlorobenzene	~	~	0.0018 U	0.0023 U	0.002 U	0.002 U	0.0023 U	0.0024 U	0.002 U	0.0023 U	0.002 U
1,2-Dichlorobenzene	1.1	500	0.00018 J	0.0023 U	0.002 U	0.002 U	0.0023 U	0.0024 U	0.002 U	0.0023 U	0.002 U
1,4-Diethyl Benzene	~	~	0.00019 J	0.0023 U	0.002 U	0.002 U	0.0023 U	0.0024 U	0.002 U	0.0023 U	0.002 U
Acetone	0.05	500	0.036	**0.058** J	0.021	0.0098 U	0.038 J	**0.13** J	0.01 UJ	0.012	0.01 UJ
Carbon Disulfide	~	~	0.0092 U	0.011 UJ	0.01 U	0.0098 UJ	0.012 UJ	0.012 UJ	0.01 UJ	0.011 UJ	0.01 U
Chloroethane	~	~	0.0018 U	0.0023 U	0.002 U	0.002 U	0.0023 U	0.0024 U	0.002 U	0.0023 U	0.002 U
Chloroform	0.37	350	0.0014 U	0.0017 U	0.0015 U	0.0015 U	0.0017 U	0.0018 U	0.0015 U	0.0017 U	0.0015 U
Methylene Chloride	0.05	500	0.0027 J	0.0057 U	0.005 U	0.0049 U	0.0058 U	0.006 U	0.0051 U	0.0057 U	0.005 U
Tetrachloroethene (PCE)	1.3	150	0.0046	0.0022	0.0005 U	0.00049 U	0.00058 U	0.00037 J	0.00051 U	0.00051 J	0.0005 U
Trichloroethene (TCE)	0.47	200	0.00046 U	0.0037	0.0028	0.00049 U	0.00058 U	0.0006 U	0.00051 U	0.015	0.00022 J
Semivolatile Organic Compounds (mg/kg)											
2-Methylnaphthalene	~	~	0.22 U	0.08 J	0.22 U	0.21 U	0.24 U	0.26 U	0.22 U	0.035 J	0.22 U
3 & 4 Methylphenol (m&p Cresol)	0.33	~	0.26 U	0.039 J	0.27 U	0.25 U	0.29 U	0.31 U	0.26 U	0.28 U	0.27 U
Acenaphthene	20	500	0.15 U	0.45	0.15 U	0.14 U	0.025 J	0.17 U	0.037 J	0.21	0.15 U
Acenaphthylene	100	500	0.041 J	0.47	0.15 U	0.14 U	0.16 U	0.17 U	0.15 U	0.12 J	0.15 U
Anthracene	100	500	0.11 U	1.7	0.11 U	0.1 U	0.087 J	0.13 U	0.086 J	0.44	0.11 U
Benzo(a)Anthracene	1	5.6	0.092 J	**5.1**	0.16	0.1 U	0.33 J	0.063 J	0.3	**1.4**	0.12
Benzo(a)Pyrene	1	1	0.083 J	**4.4**	0.17	0.14 U	0.3	0.062 J	0.27	**1.3**	0.12 J
Benzo(b)Fluoranthene	1	5.6	0.11	**6.2**	0.23	0.1 U	0.39 J	0.086 J	0.36	**1.7**	0.15
Benzo(g,h,i)Perylene	100	500	0.098 J	3	0.13 J	0.14 U	0.22	0.047 J	0.17	0.86	0.082 J
Benzo(k)Fluoranthene	0.8	56	0.04 J	**1.8**	0.065 J	0.1 U	0.12	0.13 U	0.11	0.46	0.051 J
Bis(2-Ethylhexyl) Phthalate	~	~	0.35	0.18 U	0.18 U	0.17 U	0.2 U	0.21 U	0.18 U	0.19 U	0.18 U
Carbazole	~	~	0.18 U	0.68	0.18 U	0.17 U	0.2 U	0.21 U	0.038 J	0.18 J	0.18 U
Chrysene	1	56	0.087 J	**4.6**	0.17	0.1 U	0.31	0.06 J	0.29	**1.3**	0.13
Dibenz(a,h)Anthracene	0.33	0.56	0.11 U	**0.76**	0.033 J	0.1 U	0.05 J	0.13 U	0.041 J	0.2	0.11 U
Dibenzofuran	7	350	0.18 U	0.27	0.18 U	0.17 U	0.2 U	0.21 U	0.023 J	0.076 J	0.18 U
Fluoranthene	100	500	0.13	9.7	0.29	0.1 U	0.67 J	0.1 J	0.64	3	0.22
Fluorene	30	500	0.18 U	0.44	0.18 U	0.17 U	0.02 J	0.21 U	0.03 J	0.13 J	0.18 U
Indeno(1,2,3-c,d)Pyrene	0.5	5.6	0.082 J	**3.3**	0.13 J	0.14 U	0.22	0.05 J	0.18	**0.92**	0.088 J
Naphthalene	12	500	0.18 U	0.21	0.036 J	0.17 U	0.2 U	0.21 U	0.18 U	0.09 J	0.18 U
Phenanthrene	100	500	0.057 J	6.3	0.15	0.1 U	0.38 J	0.041 J	0.49	2	0.12
Pyrene	100	500	0.13	8.2	0.28	0.1 U	0.64 J	0.097 J	0.58	2.8	0.22
Inorganics (mg/kg)											
Aluminum	~	~	4,900	1,700	6,060	5,680	6,420	7,530	5,960	7,040	5,180
Antimony	~	~	0.958 J	10.6	0.657 J	0.43 J	4.76 U	2.29 J	4.32 U	0.822 J	0.591 J
Arsenic	13	16	2.42	9.46	3.52	0.884	2.27	1.63	2.04	3.26	1.97
Barium	350	400	42.9	192	66.2	19.1	45.2	59	43.3	74.6	103
Beryllium	7.2	590	0.163 J	0.142 J	0.268 J	0.211 J	0.181 J	0.328 J	0.138 J	0.298 J	0.235 J
Cadmium	2.5	9.3	0.334 J	0.886 U	0.864 U	0.811 U	0.324 J	0.249 J	0.329 J	0.903 U	0.869 U
Calcium	~	~	2,110 J	582	669 J	302 J	2,890 J	5,520 J	9,860	2,350 J	1,580 J
Chromium, Total	~	~	32.4	113 J	28.8	12.4	18.1	19.7 J	76.2	18.2	12.6
Cobalt	~	~	3.03	1.94	2.41	3.13	6.93	8.3	4.34	4.87	3.09
Copper	50	270	**141**	**336**	**502** J	26.1 J	**768**	**1,070**	**3,130**	32.3 J	19.6 J
Iron	~	~	9,660	7,230	8,890 J	7,650 J	11,200	12,600	9,380	12,700 J	7,450 J
Lead	63	1000	48.7 J	**634**	**263**	3.96 J	**70.4**	50.6	**144**	**246**	**1,300**
Magnesium	~	~	1,400 J	438 J	1,180 J	1,670 J	2,860	2,760 J	2,370	2,480 J	1,290 J
Manganese	1600	10000	127	53.1	63.9	46.1	343	346	198	164	95.7
Mercury	0.18	2.8	0.032 J	**1.09**	**0.481** J	0.067 U	0.044 J	0.131	0.092	**0.804** J	**0.205** J
Nickel	30	310	17.4	3.97	6.73	7.86	10.7	13.4	8.66	10.6	7.73
Potassium	~	~	1,050	378	258	270	869	1,130	719	641	381
Selenium	3.9	1500	0.244 J	1.24 J	1.73 U	1.62 U	1.91 U	0.677 J	1.73 U	1.81 U	1.74 U
Sodium	~	~	109 J	99.2 J	82.3 J	37.2 J	101 J	149 J	129 J	67 J	72.7 J
Vanadium	~	~	14.6	6.91	11.5	12.2	18.8	20.5	15.7	19.7	11.3
Zinc	109	10000	**229**	62.8	**113**	37.5	**512**	**745**	**485**	**114**	103

Notes provided on Page 3.
Concentrations above Unrestricted Use SCOs are bolded.
Concentrations above Restricted Use - Commercial SCOs are shaded.

Notes:

1. 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 and Restricted Use - Commercial Soil Cleanup Objectives
2. Only detected analytes are shown in the table.
3. Analytes detected with concentrations above Unrestricted Use SCOs are bolded.
4. Analytes detected with concentrations above Restricted Use - Commercial SCOs are shaded.
5. Analytical results with reporting limits (RL) above Unrestricted Use SCOs are italicized.
6. Sample DUP01_082318 is a duplicate sample of EPB04_2.5 and sample DUP02_091418 is a duplicate sample of EPB13_2.5.
7. ~ = Regulatory limit for this analyte does not exist
8. bcs = below cellar slab
9. mg/kg = milligrams per kilogram
10. BCP = Brownfield Cleanup Program

Qualifiers:

J – The analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample.
UJ – The analyte was not detected at a level greater than or equal to the reporting limit (RL); however, the reported RL is approximate and may be inaccurate or imprecise.
U – The analyte was analyzed for, but was not detected at a level greater than or equal to the level of the RL or the sample concentration for results impacted by blank contamination.

Table 2
Site Management Plan
Hotspot Endpoint Documentation Soil Sample Analytical Results Summary

23-10 Queens Plaza South
Long Island City New York
NYSDEC BCP Site No.: C241160
Langan Project No.: 170244603

Location Sample ID Laboratory ID Sample Date Depth Range (feet bcs)	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Restricted Use - Commercial SCOs	NYSDEC CP-51 SCLs for Gasoline and Fuel Oil Contaminated Soils	UST Nos. 5 and 6 EPSW_E_5-6 17C0267-02 3/6/2017 5-6	UST Nos. 5 and 6 EPSW_N_5-6 17C0267-03 3/6/2017 5-6	UST Nos. 5 and 6 EPSW_S_7-8 17C0267-01 3/6/2017 7-8	UST No. 7 EPE02_E L1830160-04 8/3/2018 6	UST No. 7 EPE02_N L1830160-02 8/3/2018 6	UST No. 7 EPE02_S L1830160-03 8/3/2018 6	UST No. 7 EPE02_W L1830160-05 8/3/2018 6	UST No. 8 EPE04_E L1834061-04 8/29/2018 6	UST No. 8 EPE04_N L1834061-02 8/29/2018 6	UST No. 8 EPE04_S L1834061-03 8/29/2018 6	UST No. 8 EPE04_W L1834061-05 8/29/2018 6
Volatile Organic Compounds (mg/kg)														
1,1,1-Trichloroethane	0.68	500	~	0.0035 J	0.0026 UJ	0.26 UJ	0.00056 U	0.00059 U	0.00068 U	0.00055 U	0.00066 U	0.00078 U	0.0006 U	0.00057 U
1,1-Dichloroethane	0.27	240	~	0.003 U	0.0026 U	0.26 U	0.0011 U	0.0012 U	0.0014 U	0.0011 U	0.0013 U	0.0016 U	0.0012 U	0.0011 U
1,2,3-Trichlorobenzene	~	~	~	0.003 U	0.0026 U	0.26 U	0.0022 U	0.0024 U	0.0027 UJ	0.0022 U	0.0027 U	0.0031 U	0.0024 U	0.0023 U
1,2,3-Trichloropropane	~	~	~	0.003 U	0.0026 U	0.26 U	0.0022 U	0.0024 U	0.0027 U	0.0022 U	0.0027 U	0.0031 U	0.0024 U	0.0023 U
1,2,4,5-Tetramethylbenzene	~	~	~	NA	NA	NA	0.0022 U	0.0024 U	0.0027 U	0.0022 U	0.0027 U	0.0031 U	0.0024 U	0.0023 U
1,2,4-Trichlorobenzene	~	~	~	0.003 U	0.0026 U	0.26 U	0.0022 U	0.0024 U	0.0027 UJ	0.0022 U	0.0027 U	0.0031 U	0.0024 U	0.0023 U
1,2,4-Trimethylbenzene	3.6	190	3.6	0.003 U	0.0026 U	**4.1** D	0.0022 U	0.0024 U	0.0027 U	0.0022 U	0.00046 J	0.0031 U	0.0024 U	0.0023 U
1,2-Dichlorobenzene	1.1	500	~	0.003 U	0.0026 U	0.26 U	0.0022 U	0.0024 U	0.0027 UJ	0.0022 U	0.0027 U	0.0031 U	0.0024 U	0.0023 U
1,3,5-Trimethylbenzene (Mesitylene)	8.4	190	8.4	0.003 U	0.0026 U	1.3 D	0.0022 U	0.0024 U	0.0027 U	0.0022 U	0.0027 U	0.0031 U	0.0024 U	0.0023 U
1,3-Dichlorobenzene	2.4	280	~	0.003 U	0.0026 U	0.26 U	0.0022 U	0.0024 U	0.0027 U	0.0022 U	0.0027 U	0.0031 U	0.0024 U	0.0023 U
1,4-Dichlorobenzene	1.8	130	~	0.003 U	0.0026 U	0.26 U	0.0022 U	0.0024 U	0.0027 UJ	0.0022 U	0.0027 U	0.0031 U	0.0024 U	0.0023 U
1,4-Diethyl Benzene	~	~	~	NA	NA	NA	0.0022 U	0.0024 U	0.0027 U	0.0022 U	0.0027 U	0.0031 U	0.0024 U	0.0023 U
4-Ethyltoluene	~	~	~	NA	NA	NA	0.0022 U	0.0024 U	0.0027 U	0.0022 U	0.0027 U	0.0031 U	0.0024 U	0.0023 U
Acetone	0.05	500	~	0.035	0.025	*0.51* U	0.017 J	0.029 J	0.014 UJ	0.014 U	0.03	**0.11**	0.032	**0.1**
Benzene	0.06	44	0.06	0.006	0.0026 U	*0.26* U	0.00056 U	0.00059 U	0.00068 U	0.00055 U	0.00066 U	0.00078 U	0.0006 U	0.00057 U
Cis-1,2-Dichloroethylene	0.25	500	~	0.003 UJ	0.0026 UJ	*0.26* UJ	0.0011 U	0.0012 U	0.0014 U	0.0011 U	0.0013 U	0.0016 U	0.0012 U	0.0011 U
Cyclohexane	~	~	~	0.018	0.0026 U	0.26 U	NA	NA	NA	NA	NA	NA	NA	NA
Cymene	~	~	10	NA	NA	NA	0.0011 U	0.0012 U	0.0014 U	0.0011 U	0.0013 U	0.0016 U	0.0012 U	0.0011 U
Ethylbenzene	1	390	1	0.003 UJ	0.0026 UJ	0.85 J	0.0011 U	0.0012 U	0.0014 U	0.0011 U	0.0013 U	0.0016 U	0.0012 U	0.0011 U
Isopropylbenzene (Cumene)	~	~	2.3	0.003 U	0.0026 U	0.26 U	0.0011 U	0.0012 U	0.0014 U	0.0011 U	0.0013 U	0.0016 U	0.0012 U	0.0011 U
M,P-Xylene	~	~	~	0.006 U	0.0051 U	3.9 D	0.0022 U	0.0024 U	0.0027 U	0.0022 U	0.0027 U	0.0031 U	0.0024 U	0.0023 U
Methyl Ethyl Ketone (2-Butanone)	0.12	500	~	0.003 U	0.0026 U	*0.26* U	0.011 UJ	0.012 UJ	0.014 U	0.011 UJ	0.013 U	0.0034 J	0.012 U	0.003 J
Methylcyclohexane	~	~	~	0.04	0.0026 U	0.42 JD	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	12	500	12	NA	NA	NA	0.0044 U	0.0047 U	0.0054 U	0.0044 U	0.0053 U	0.0062 U	0.0048 U	0.0045 U
n-Butylbenzene	12	500	12	0.003 U	0.0026 U	0.26 U	0.0011 U	0.0012 U	0.0014 U	0.0011 U	0.0013 U	0.0016 U	0.0012 U	0.0011 U
n-Propylbenzene	3.9	500	3.9	0.003 U	0.0026 U	0.5 JD	0.0011 U	0.0012 U	0.0014 U	0.0011 U	0.0013 U	0.0016 U	0.0012 U	0.0011 U
o-Xylene (1,2-Dimethylbenzene)	~	~	~	0.003 U	0.0026 U	2 D	0.0011 U	0.0012 U	0.0014 U	0.0011 U	0.0013 U	0.0016 U	0.0012 U	0.0011 U
Sec-Butylbenzene	11	500	11	0.003 U	0.0026 U	0.26 U	0.0011 U	0.0012 U	0.0014 U	0.0011 U	0.0013 U	0.0016 U	0.0012 U	0.0011 U
T-Butylbenzene	5.9	500	5.9	0.003 U	0.0026 U	0.26 U	0.0022 U	0.0024 U	0.0027 U	0.0022 U	0.0027 U	0.0031 U	0.0024 U	0.0023 U
Tetrachloroethene (PCE)	1.3	150	~	0.019 J	0.0026 UJ	0.26 UJ	0.00056 U	0.00059 U	0.00068 U	0.00055 U	0.0033	0.0015	0.0006 U	0.00057 U
Toluene	0.7	500	0.7	0.021 J	0.0026 UJ	**1.1** J	0.0011 U	0.00077 J	0.0014 U	0.0011 U	0.0013 U	0.0016 U	0.0012 U	0.0011 U
Total 1,2-Dichloroethene (Cis and Trans)	~	~	~	NA	NA	NA	0.0011 U	0.0012 U	0.0014 U	0.0011 U	0.0013 U	0.0016 U	0.0012 U	0.0011 U
Total Xylenes	0.26	500	0.26	0.009 U	0.0077 U	**5.9** D	0.0011 U	0.0012 U	0.0014 U	0.0011 U	0.0013 U	0.0016 U	0.0012 U	0.0011 U
Trichloroethene (TCE)	0.47	200	~	0.003 U	0.0026 U	0.26 U	0.0011	0.00054 J	0.0062	0.0036	0.00029 J	0.00034 J	0.0002 J	0.00057 U
Semivolatile Organic Compounds (mg/kg)														
1,2,4,5-Tetrachlorobenzene	~	~	~	0.103 U	0.0953 U	0.0987 U	0.18 U	0.18 U	0.18 U	0.18 U	0.22 U	0.23 U	0.22 U	0.21 U
1,2,4-Trichlorobenzene	~	~	~	0.0517 U	0.0478 U	0.0495 U	0.18 U	0.18 U	0.18 U	0.18 U	0.22 U	0.23 U	0.22 U	0.21 U
2-Methylnaphthalene	~	~	~	0.0517 U	0.0478 U	0.215 D	0.22 U	0.21 U	0.21 U	0.22 U	0.26 U	0.27 U	0.27 U	0.25 U
3 & 4 Methylphenol (m&p Cresol)	0.33	~	~	0.0517 U	0.0478 U	0.0495 U	0.26 U	0.25 U	0.26 U	0.26 U	0.32 U	0.33 U	0.32 U	0.3 U
Acenaphthene	20	500	20	0.0517 U	0.0478 U	0.0495 U	0.14 U	0.14 U	0.14 U	0.02 J	0.026 J	0.18 U	0.18 U	0.16 U
Acenaphthylene	100	500	100	0.0517 U	0.0478 U	0.0495 U	0.14 U	0.14 U	0.044 J	0.14 U	0.18 U	0.18 U	0.18 U	0.16 U
Anthracene	100	500	100	0.0517 U	0.0478 U	0.0495 U	0.11 U	0.1 U	0.044 J	0.044 J	0.045 J	0.14 U	0.13 U	0.12 U
Benzo(a)Anthracene	1	5.6	1	0.0517 U	0.0478 U	0.0495 U	0.034 J	0.11	0.22	0.16	0.089 J	0.14 U	0.13 U	0.024 J
Benzo(a)Pyrene	1	1	1	0.0517 U	0.0478 U	0.0495 U	0.14 U	0.095 J	0.25	0.17	0.063 J	0.18 U	0.18 U	0.16 U
Benzo(b)Fluoranthene	1	5.6	1	0.0517 U	0.0478 U	0.0495 U	0.043 J	0.14	0.35	0.23	0.094 J	0.14 U	0.13 U	0.12 U
Benzo(g,h,i)Perylene	100	500	100	0.0517 UJ	0.0478 UJ	0.0495 UJ	0.023 J	0.066 J	0.18	0.12 J	0.054 J	0.18 U	0.18 U	0.16 U
Benzo(k)Fluoranthene	0.8	56	0.8	0.0517 U	0.0478 U	0.0495 U	0.11 U	0.032 J	0.11	0.071 J	0.036 J	0.14 U	0.13 U	0.12 U
Biphenyl (Diphenyl)	~	~	~	0.0517 U	0.0478 U	0.0495 U	0.41 U	0.4 U	0.41 U	0.41 U	0.5 U	0.52 U	0.51 U	0.47 U
Bis(2-Ethylhexyl) Phthalate	~	~	~	0.0517 U	0.0478 U	0.0495 U	0.18 U	0.18 U	0.18 U	0.18 U	0.22 U	0.23 U	0.22 U	0.21 U
Carbazole	~	~	~	0.0517 U	0.0478 U	0.0495 U	0.18 U	0.18 U	0.021 J	0.022 J	0.22 U	0.23 U	0.22 U	0.21 U
Chrysene	1	56	1	0.0517 U	0.0478 U	0.0495 U	0.029 J	0.11	0.26	0.18	0.088 J	0.14 U	0.13 U	0.12 U
Dibenz(a,h)Anthracene	0.33	0.56	0.33	0.0517 UJ	0.0478 UJ	0.0495 UJ	0.11 U	0.02 J	0.047 J	0.03 J	0.13 U	0.14 U	0.13 U	0.12 U
Dibenzofuran	7	350	~	0.0517 U	0.0478 U	0.0495 U	0.18 U	0.18 U	0.18 U	0.18 U	0.22 U	0.23 U	0.22 U	0.21 U
Fluoranthene	100	500	100	0.0517 U	0.0478 U	0.0495 U	0.048 J	0.21	0.42	0.38	0.23	0.14 U	0.13 U	0.039 J
Fluorene	30	500	30	0.0517 U	0.0478 U	0.0495 U	0.18 U	0.18 U	0.18 U	0.18 U	0.021 J	0.23 U	0.22 U	0.21 U
Indeno(1,2,3-c,d)Pyrene	0.5	5.6	0.5	0.0517 UJ	0.0478 UJ	0.0495 UJ	0.025 J	0.066 J	0.19	0.11 J	0.056 J	0.18 U	0.18 U	0.16 U
Naphthalene	12	500	12	0.0517 U	0.0478 U	0.406 D	0.18 U	0.18 U	0.18 U	0.18 U	0.22 U	0.23 U	0.22 U	0.21 U
Pentachlorophenol	0.8	6.7	~	0.0517 U	0.0478 U	0.0495 U	0.14 U	0.14 U	0.14 U	0.14 U	0.12 J	0.18 U	0.18 U	0.16 U
Phenanthrene	100	500	100	0.0517 U	0.0478 U	0.0495 U	0.11 U	0.14	0.17	0.23	0.2	0.14 U	0.13 U	0.12 U
Pyrene	100	500	100	0.0517 U	0.0478 U	0.0495 U	0.047 J	0.2	0.4	0.36	0.21	0.14 U	0.13 U	0.038 J
Inorganics (mg/kg)														
Aluminum	~	~	~	6,900	10,200	8,360	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	13	16	~	1.34 J	1.94 J	1.58 J	NA	NA	NA	NA	NA	NA	NA	NA
Barium	350	400	~	26.4	41	23.7	NA	NA	NA	NA	NA	NA	NA	NA
Calcium	~	~	~	201	459	513	NA	NA	NA	NA	NA	NA	NA	NA
Chromium, Total	~	~	~	12.3 J	21.5 J	20.6 J	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	~	~	~	2.74	4.48	3.89	NA	NA	NA	NA	NA	NA	NA	NA
Copper	50	270	~	7 J	**112** J	**115** J	NA	NA	NA	NA	NA	NA	NA	NA
Iron	~	~	~	7,010	12,800	11,100	NA	NA	NA	NA	NA	NA	NA	NA
Lead	63	1000	~	14.4	3.92	5.65	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium	~	~	~	968	1,560	1,420	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	1600	10000	~	64.8 J	164 J	132 J	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	30	310	~	8.24	15.5	11.6	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	~	~	~	217	585	505	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	3.9	1500	~	1.24 UJ	1.14 UJ	1.65 J	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	~	~	~	48.9	76.1	145	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	~	~	~	11	23.2	18.8	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	109	10000	~	21.5	25.3	29.1	NA	NA	NA	NA	NA	NA	NA	NA

Notes provided on Page 3.
Concentrations above Unrestricted Use SCOs are bolded.
Concentrations above Restricted Use - Commercial SCOs are shaded.
Concentrations above CP-51 SCLs are underlined.

Table 2
Site Management Plan
Hotspot Endpoint Documentation Soil Sample Analytical Results Summary

23-10 Queens Plaza South
Long Island City New York
NYSDEC BCP Site No.: C241160
Langan Project No.: 170244603

Location	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Restricted Use - Commercial SCOs	NYSDEC CP-51 SCLs for Gasoline and Fuel Oil Contaminated Soils	ISA No. 1	ISA No. 1	ISA No. 1	ISA No. 1	ISA No. 1	ISA No. 2	ISA No. 2	ISA No. 2	ISA No. 3	ISA No. 3	ISA No. 3	ISA No. 3	ISA No. 3
Sample ID				EPNE01_BASE	EPNE01_E	EPNE01_N	EPNE01_S	EPNE01_W	EPNE03_BASE	EPNE03_S	EPNE03_W	EPE05_BASE_SOIL	EPE05_E	EPE05_N	EPE05_S	EPE05_W
Laboratory ID				L1829115-01	L1829115-03	L1829115-02	L1829115-04	L1829115-05	L1831303-01	L1831303-02	L1831303-03	L1837628-03	L1835357-04	L1835357-02	L1835357-03	L1835357-05
Sample Date				7/27/2018	7/27/2018	7/27/2018	7/27/2018	7/27/2018	8/10/2018	8/10/2018	8/10/2018	9/20/2018	9/6/2018	9/6/2018	9/6/2018	9/6/2018
Depth Range (feet bcs)				7	6	6	6	6	2.5	2.5	2.5	7	6	6	6	6
Volatile Organic Compounds (mg/kg)																
1,1,1-Trichloroethane	0.68	500	~	0.042 U	0.00069 U	0.001 U	0.089	0.0003 J	0.29	0.31	0.078	0.032 U	0.00067 UJ	0.00062 J	0.00033 J	0.00053 UJ
1,1-Dichloroethane	0.27	240	~	0.084 U	0.0014 U	0.002 U	0.065 U	0.0014 U	0.11	0.039	0.0086	0.017 J	0.0013 U	0.0014 U	0.0012 U	0.0011 U
1,2,3-Trichlorobenzene	~	~	~	0.17 U	0.0027 UJ	0.004 UJ	0.13 U	0.0028 U	0.42	0.005 J	0.13 J	0.13 U	0.0027 U	0.0027 U	0.0025 U	0.0021 U
1,2,3-Trichloropropane	~	~	~	0.17 U	0.0027 U	0.004 U	0.13 U	0.0028 U	0.06 J	0.0023 U	0.0024 U	0.13 U	0.0027 U	0.0027 U	0.0025 U	0.0021 U
1,2,4,5-Tetramethylbenzene	~	~	~	1.8	0.0027 U	0.00084 J	0.051 J	0.0014 J	1.7	0.0098 J	0.0003 J	0.24	0.00026 J	0.0027 U	0.0025 U	0.0021 U
1,2,4-Trichlorobenzene	~	~	~	0.17 U	0.0027 U	0.004 U	0.13 U	0.0028 U	2.1	0.017 J	0.15 J	0.13 U	0.0027 U	0.0027 U	0.0025 U	0.0021 U
1,2,4-Trimethylbenzene	3.6	190	3.6	0.44	0.0027 U	0.0007 J	0.047 J	0.0024 J	**5.8**	0.042	0.00078 J	0.18	0.0013 J	0.0017 J	0.0025 U	0.0021 U
1,2-Dichlorobenzene	1.1	500	~	0.17 U	0.0027 UJ	0.004 UJ	0.13 U	0.0028 U	0.38	0.0011 J	0.002 J	0.13 U	0.0027 U	0.0027 U	0.0025 U	0.0021 U
1,3,5-Trimethylbenzene (Mesitylene)	8.4	190	8.4	0.15 J	0.0027 U	0.004 U	0.13 U	0.00087 J	1.8	0.022	0.00043 J	0.11 J	0.00043 J	0.00064 J	0.0025 U	0.0021 U
1,3-Dichlorobenzene	2.4	280	~	0.17 U	0.0027 UJ	0.004 UJ	0.13 U	0.0028 U	0.96	0.0056 J	0.016 J	0.13 U	0.0027 U	0.0027 U	0.0025 U	0.0021 U
1,4-Dichlorobenzene	1.8	130	~	0.17 U	0.0027 UJ	0.004 UJ	0.13 U	0.0028 U	0.082 J	0.00062 J	0.0047 J	0.13 U	0.0027 U	0.00035 J	0.0025 U	0.00024 J
1,4-Diethyl Benzene	~	~	~	0.36	0.0027 U	0.00084 J	0.051 J	0.0016 J	4.5	0.031	0.00087 J	0.43	0.00051 J	0.0007 J	0.0025 U	0.0021 U
4-Ethyltoluene	~	~	~	0.17	0.0027 U	0.004 U	0.13 U	0.00067 J	2.7	0.025	0.00073 J	0.079 J	0.00058 J	0.00072 J	0.0025 U	0.0021 U
Acetone	0.05	500	~	*0.84* UJ	0.014 UJ	0.017 J	*0.65* UJ	0.014 U	*0.63* U	0.024 J	**0.078** J	*0.65* U	**0.078**	0.037	0.022	0.015
Benzene	0.06	44	0.06	0.042 U	0.00069 U	0.001 U	0.032 U	0.00071 U	0.031 U	0.00059 U	0.0006 U	0.032 U	0.00067 U	0.00068 U	0.00063 U	0.00053 U
Cis-1,2-Dichloroethylene	0.25	500	~	0.084 U	0.0014 U	0.002 U	0.065 U	0.0014 U	0.015 J	0.0012 U	0.0012 U	0.065 U	0.0013 U	0.0014 U	0.0012 U	0.0011 U
Cyclohexane	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cymene	~	~	10	0.086	0.0014 U	0.002 U	0.065 U	0.00023 J	0.86	0.0063	0.00035 J	0.053 J	0.00017 J	0.00016 J	0.0012 U	0.0011 U
Ethylbenzene	1	390	1	0.056 J	0.0014 U	0.002 U	0.065 U	0.0014 U	0.3	0.00094 J	0.0012 U	0.065 U	0.0013 U	0.0014 U	0.0012 U	0.0011 U
Isopropylbenzene (Cumene)	~	~	2.3	0.13	0.0014 U	0.002 U	0.065 U	0.00034 J	0.28	0.0022	0.0012 U	0.014 J	0.00018 J	0.0014 U	0.0012 U	0.0011 U
M,P-Xylene	~	~	~	0.17 U	0.0027 UJ	0.004 UJ	0.13 U	0.0028 U	0.84	0.0051	0.0024 U	0.13 U	0.0027 U	0.0027 U	0.0025 U	0.0021 U
Methyl Ethyl Ketone (2-Butanone)	0.12	500	~	*0.84* UJ	0.014 UJ	0.02 UJ	*0.65* UJ	0.014 U	*0.63* U	0.003 J	0.012 U	*0.65* UJ	0.013 UJ	0.014 UJ	0.012 UJ	0.011 UJ
Methylcyclohexane	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	12	500	12	1.3	0.0055 U	0.008 U	0.26 U	0.0012 J	4.3	0.026 J	0.0014 J	0.063 J	0.0053 U	0.0055 U	0.005 U	0.0043 U
n-Butylbenzene	12	500	12	0.79	0.0014 U	0.002 U	0.023 J	0.0003 J	0.98	0.0049	0.0012 U	0.1	0.00031 J	0.0014 U	0.0012 U	0.0011 U
n-Propylbenzene	3.9	500	3.9	0.24	0.0014 U	0.002 U	0.065 U	0.00038 J	0.7	0.0045	0.0012 U	0.065 U	0.00045 J	0.00034 J	0.0012 U	0.0011 U
o-Xylene (1,2-Dimethylbenzene)	~	~	~	0.053 J	0.0014 UJ	0.002 UJ	0.065 U	0.0014 U	0.75	0.007	0.0012 U	0.065 U	0.0013 U	0.0014 U	0.0012 U	0.0011 U
Sec-Butylbenzene	11	500	11	0.46	0.0014 U	0.002 U	0.015 J	0.00059 J	0.72	0.0042	0.0012 U	0.085	0.00031 J	0.00023 J	0.0012 U	0.0011 U
T-Butylbenzene	5.9	500	5.9	0.037 J	0.0027 U	0.004 U	0.13 U	0.0028 U	0.13	0.0013 J	0.0024 U	0.13 U	0.0027 U	0.0027 U	0.0025 U	0.0021 U
Tetrachloroethene (PCE)	1.3	150	~	0.042 U	0.00069 U	0.0022	0.12	0.0016	0.031 U	0.0014	0.0074	0.052	0.0066	0.015	0.034	0.018
Toluene	0.7	500	0.7	0.084 U	0.0014 U	0.002 U	0.065 U	0.0014 U	0.14	0.0015	0.0012	0.065 U	0.0013 U	0.0012 J	0.0012 U	0.0011 U
Total 1,2-Dichloroethene (Cis and Trans)	~	~	~	0.084 U	0.0014 U	0.002 U	0.065 U	0.0014 U	0.015 J	0.0012 U	0.0012 U	0.065 U	0.0013 U	0.0014 U	0.0012 U	0.0011 U
Total Xylenes	0.26	500	0.26	0.053 J	0.0014 U	0.002 U	0.065 U	0.0014 U	**1.6**	0.012	0.0012 U	0.065 U	0.0013 U	0.0014 U	0.0012 U	0.0011 U
Trichloroethene (TCE)	0.47	200	~	0.042 U	0.00069 U	0.00082 J	0.067	0.0017 J	0.0089 J	0.00038 J	0.00033 J	0.032 U	0.00067 U	0.00068 U	0.00035 J	0.00053 U
Semivolatile Organic Compounds (mg/kg)																
1,2,4,5-Tetrachlorobenzene	~	~	~	0.22 U	0.21 U	0.3 U	0.2 U	0.19 U	3 U	0.4 U	1.1	0.21 U	0.19 U	0.19 U	0.19 U	0.19 U
1,2,4-Trichlorobenzene	~	~	~	0.22 U	0.21 U	0.3 U	0.2 U	0.19 U	3 U	0.24 J	0.18 U	0.21 U	0.19 U	0.19 U	0.19 U	0.19 U
2-Methylnaphthalene	~	~	~	2	0.25 U	0.37 U	0.12 J	0.14 J	7.8	0.72	0.036 J	0.36	0.14 J	0.15 J	0.024 J	0.22 U
3 & 4 Methylphenol (m&p Cresol)	0.33	~	~	0.31 U	0.3 U	*0.44* U	0.29 U	0.27 U	*4.3* U	*0.58* U	0.27 U	0.3 U	0.28 U	0.04 J	0.054 J	0.27 U
Acenaphthene	20	500	20	0.1 J	0.17 U	0.24 U	0.16 U	0.15 U	2.4 U	0.32 U	0.15 U	0.18	0.084 J	0.36	0.032 J	0.15 U
Acenaphthylene	100	500	100	0.17 U	0.17 U	0.24 U	0.16 U	0.15 U	2.4 U	0.32 U	0.15 U	0.25	0.45	0.52	0.58	0.05 J
Anthracene	100	500	100	0.072 J	0.12 U	0.18 U	0.057 J	0.11 U	1.8 U	0.24 U	0.11 U	0.28	0.43	0.87	0.36	0.055 J
Benzo(a)Anthracene	1	5.6	1	0.049 J	0.12 U	0.18 U	0.12 U	0.039 J	*1.8* U	0.24 U	0.041 J	0.8	**1.5**	**2.5**	**1.7**	0.14
Benzo(a)Pyrene	1	1	1	0.17 U	0.17 U	0.24 U	0.16 U	0.15 U	*2.4* U	0.32 U	0.049 J	0.91	**1.5**	**2.1**	**1.6**	0.14 J
Benzo(b)Fluoranthene	1	5.6	1	0.13 U	0.12 U	0.18 U	0.12 U	0.043 J	*1.8* U	0.24 U	0.11 U	**1.1**	**1.9**	**3**	**2.3**	0.2
Benzo(g,h,i)Perylene	100	500	100	0.036 J	0.17 U	0.24 U	0.048 J	0.025 J	2.4 U	0.32 U	0.15 U	0.56	1.1	1.6	1.4	0.17
Benzo(k)Fluoranthene	0.8	56	0.8	0.13 U	0.12 U	0.18 U	0.12 U	0.11 U	*1.8* U	0.24 U	0.11 U	0.42	0.61	0.74	0.71	0.066 J
Biphenyl (Diphenyl)	~	~	~	0.51	0.47 U	0.7 U	0.085 J	0.43 U	0.96 J	0.91 U	0.42 U	0.48 U	0.44 U	0.43 U	0.43 U	0.42 U
Bis(2-Ethylhexyl) Phthalate	~	~	~	0.8	0.21 U	0.3 U	2.3	0.28	3 U	0.4 U	0.18 U	0.21 U	0.19 U	0.19 U	0.19 U	0.19 U
Carbazole	~	~	~	0.22 U	0.21 U	0.3 U	0.2 U	0.19 U	3 U	0.4 U	0.18 U	0.21 U	0.12 J	0.31	0.11 J	0.19 U
Chrysene	1	56	1	0.09 J	0.12 U	0.18 U	0.087 J	0.052 J	*1.8* U	0.24 U	0.048 J	0.87	**1.6**	**2.6**	**1.8**	0.15
Dibenz(a,h)Anthracene	0.33	0.56	0.33	0.13 U	0.12 U	0.18 U	0.12 U	0.11 U	*1.8* U	0.24 U	0.11 U	0.16	0.3	**0.41**	**0.38**	0.047 J
Dibenzofuran	7	350	~	0.13 J	0.21 U	0.3 U	0.045 J	0.19 U	0.28 J	0.4 U	0.18 U	0.21	0.061 J	0.13 J	0.023 J	0.19 U
Fluoranthene	100	500	100	0.12 J	0.12 U	0.18 U	0.12 U	0.068 J	1.8 U	0.058 J	0.054 J	1.6	2	3.8	2	0.21
Fluorene	30	500	30	0.31	0.21 U	0.3 U	0.12 J	0.023 J	0.34 J	0.092 J	0.18 U	0.36	0.092 J	0.31	0.045 J	0.19 U
Indeno(1,2,3-c,d)Pyrene	0.5	5.6	0.5	0.17 U	0.17 U	0.24 U	0.16 U	0.028 J	*2.4* U	0.32 U	0.15 U	**0.56**	**1.1**	**1.5**	**1.3**	0.15
Naphthalene	12	500	12	0.58	0.21 U	0.13 J	0.2 U	0.11 J	3.5	0.14 J	0.022 J	0.23	0.23	0.18 J	0.1 J	0.045 J
Pentachlorophenol	0.8	6.7	~	0.17 U	0.17 U	0.24 U	0.16 U	0.15 U	*2.4* U	0.32 U	0.15 U	0.17 U	0.16 U	0.15 U	0.15 U	0.15 U
Phenanthrene	100	500	100	0.6	0.12 U	0.18 U	0.63	0.13	0.61 J	0.15 J	0.045 J	0.87	1.2	3.1	0.62	0.12
Pyrene	100	500	100	0.2	0.12 U	0.18 U	0.18	0.082 J	0.67 J	0.12 J	0.051 J	1.7	2	3.9	1.9	0.2
Inorganics (mg/kg)																
Aluminum	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	13	16	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	350	400	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium, Total	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	50	270	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	63	1000	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	1600	10000	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	30	310	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	3.9	1500	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	109	10000	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes provided on Page 3.
Concentrations above Unrestricted Use SCOs are bolded.
Concentrations above Restricted Use - Commercial SCOs are shaded.
Concentrations above CP-51 SCLs are underlined.

Table 2
Site Management Plan
Hotspot Endpoint Documentation Soil Sample Analytical Results Summary

23-10 Queens Plaza South
Long Island City New York
NYSDEC BCP Site No.: C241160
Langan Project No.: 170244603

Notes:

1. 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 and Restricted Use - Commercial Soil Cleanup Objectives (SCO), and NYSDEC Commissioner Policy 51 (CP-51) Soil Cleanup Levels (SCL) for Gasoline and Fuel Oil Contaminated Soils.
2. Only detected analytes are shown in the table.
3. Analytes detected with concentrations above Unrestricted Use SCOs are bolded.
4. Analytes detected with concentrations above Restricted Use - Commercial SCOs are shaded.
5. Analytes detected with concentrations above CP-51 SCLs are underlined.
6. Analytical results with reporting limits (RL) above the lowest applicable criteria are italicized.
7. BCP = Brownfield Cleanup Program
8. ISA = Impacted soil area
9. UST = Underground storage tank
10. ~ = Regulatory limit for this analyte does not exist
11. bcs = below cellar slab
12. mg/kg = milligrams per kilogram
13. NA = Not analyzed

Qualifiers:

D = The concentration reported is a result of a diluted sample.
J – The analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample.
UJ – The analyte was not detected at a level greater than or equal to the reporting limit (RL); however, the reported RL is approximate and may be inaccurate or imprecise.
U – The analyte was analyzed for, but was not detected at a level greater than or equal to the level of the RL or the sample concentration for results impacted by blank contamination.

Table 3
Site Management Plan
Groundwater Monitoring Analytical Results Summary

23-10 Queens Plaza South
Long Island City, New York
NYSDEC BCP Site No.: C241160
Langan Project No.: 170244603

Sampling Event Sample ID Laboratory ID Sample Date	NYSDEC SGVs	RI MW05 _071213 13G0547-01 7/12/2013	Baseline MW05_051716 1605G15-002A 5/17/2016	30-Day MW05_101917 L1737919-01 10/19/2017	First Quarter MW05_121817 L1746660-03 12/18/2017	Second Quarter MW05_032818 L1810673-01 3/28/2018	Third Quarter MW05R_062018 L1823312-02 6/20/2018	Third Quarter DUP01_062018 L1823312-05 6/20/2018	Fourth Quarter MW05_092418 L1838150-03 9/24/2018	Fourth Quarter DUP01_092418 L1838150-07 9/24/2018	Fifth Quarter MW05_121718 L1851948-01 12/17/2018	Sixth Quarter MW05_031519 L1910295-05 3/15/2019
Volatile Organic Compounds (µg/L)												
1,1,1-Trichloroethane	5	**5.5**	3 J	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
1,1-Dichloroethane	5	4.5 J	3 J	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 UJ	2.5 U	2.5 U
1,1-Dichloroethene	5	0.52 U	*10* UJ	0.5 U	0.76	0.41 J	0.44 J	0.44 J	0.66	0.66 J	0.81	0.55
Acetone	50	6.1 U	10 UJ	7.6 U	30	8.5	2.1 J	1.9 J	5 UJ	5 UJ	5 UJ	5 U
Chloroethane	5	2.8 U	NA	2.5 UJ	2.5 U	2.5 U	2.5 U	2.5 U	0.82 J	1.2 J	2.5 U	2.5 U
Chloroform	7	0.42 U	2 J	1.4 J	2.5 U	2.5 UJ	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Cis-1,2-Dichloroethene	5	**6.1**	**8** J	2.1 J	**11**	**8.9**	**7.6**	**7.9**	**8.4**	**8.3**	**8.1**	**5.1**
Methyl Ethyl Ketone (2-Butanone)	50	1.5 U	10 U	**63**	**78**	21 J	17 J	18 J	5 UJ	5 U	5 UJ	5 UJ
Tetrachloroethene (PCE)	5	**23**	**11** J	0.74	0.25 J	0.34 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Toluene	5	3 J	*10* U	2.5 U	2.5 U	2.5 UJ	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Total 1,2-Dichloroethene (Cis and Trans)		NA	NA	2.1 J	11	8.9	7.6	7.9	8.4	8.3	8.1	5.1
Trans-1,2-Dichloroethene	5	0.98 J	1 J	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Trichloroethene (TCE)	5	**28**	**34**	1.8	0.8	1.5 J	1.1	1.1	1.7	1.6	1.3	1.3
Vinyl Chloride	2	0.9 J	1 J	1.7 J	**2.2**	**2.9** J	**3.7**	**3.7**	**4.8** J	**4.8** J	**5.7**	**3.9**
Total CVOCs	~	68.98	61	6.34	15.01	14.05	12.84	13.14	16.38	16.56	15.91	10.85
											Percent Reduction:	82 %

Notes provided on Page 8.

Table 3
Site Management Plan
Groundwater Monitoring Analytical Results Summary

23-10 Queens Plaza South
Long Island City, New York
NYSDEC BCP Site No.: C241160
Langan Project No.: 170244603

Sampling Event Sample ID Laboratory ID Sample Date	NYSDEC SGVs	RI MW06_071513 13G0547-05 7/15/2013		30-Day MW06_101917 L1737919-02 10/19/2017		First Quarter MW06_121817 L1746660-04 12/18/2017		Second Quarter MW06_032818 L1810673-02 3/28/2018		Second Quarter DUP01_032818 L1810673-03 3/28/2018		Third Quarter MW06_062018 L1823312-01 6/20/2018	
Volatile Organic Compounds (µg/L)													
1,1,1-Trichloroethane	5	0.23	U	2.5	U	2.5	U	2.5	U	2.5	U	**10**	
1,1-Dichloroethane	5	0.42	U	2.5	U	2.5	U	2.5	U	2.5	U	2	J
Acetone	50	6.1	U	9.5	U	1.7	J	5	U	5	U	5	UJ
Chloroform	7	0.42	U	2.5	U	2.5	U	2.5	UJ	2.5	UJ	1.2	J
Cis-1,2-Dichloroethene	5	1.1	J	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
Methyl Ethyl Ketone (2-Butanone)	50	1.5	U	**52**		4.4	J	5	UJ	5	UJ	5	UJ
Sec-Butylbenzene	5	1.8	J	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
Tetrachloroethene (PCE)	5	2.2	J	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Toluene	5	2.4	J	2.5	U	2.5	U	2.5	UJ	2.5	UJ	2.5	U
Trichloroethene (TCE)	5	3.5	J	0.5	U	0.5	U	0.5	UJ	0.5	UJ	0.5	U
Vinyl Chloride	2	0.68	U	0.12	J	1	U	1	UJ	1	UJ	1	U
Total CVOCs	~	6.8		0.12		ND		ND		ND		12	
										Percent Reduction:		N/A	%

Table 3
Site Management Plan
Groundwater Monitoring Analytical Results Summary

23-10 Queens Plaza South
Long Island City, New York
NYSDEC BCP Site No.: C241160
Langan Project No.: 170244603

Sampling Event		RI	Baseline	30-Day	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Fifth Quarter	Sixth Quarter	Sixth Quarter
Sample ID	NYSDEC	MW07_071213	MW07_051616	MW07_101917	MW07_121817	MW07_032918	MW07_062018	MW07_092418	MW07_121818	MW07_031419	GWDUP01_031419
Laboratory ID	SGVs	13G0547-02	1605G15-003A	L1737919-03	L1746660-02	L1810836-03	L1823312-08	L1838150-04	L1852233-01	L1910009-01	L1910009-03
Sample Date		7/12/2013	5/16/2016	10/19/2017	12/18/2017	3/29/2018	6/20/2018	9/24/2018	12/18/2018	3/14/2019	3/14/2019
Volatile Organic Compounds (µg/L)											
1,1,1-Trichloroethane	5	**26**	4 J	*25* U	5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
1,1-Dichloroethane	5	**14**	**6** J	*25* U	5 U	2.5 U	0.71 J	2.5 U	2.5 U	0.83 J	2.5 U
1,1-Dichloroethene	5	2.6 J	*10* UJ	5 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Acetone	50	6.1 U	2 J	*120* U	**84**	8.1 J	28 J	5 U	1.7 J	9.9 U	6.8 U
Bromomethane	5	2 U	NA	*25* U	5 UJ	2.5 UJ	2.5 UJ	2.5 UJ	2.5 UJ	0.72 J	1.1 J
Chloroform	7	0.42 U	*10* U	*25* U	2.6 J	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Cis-1,2-Dichloroethene	5	**5.8**	**8** J	*25* U	5 U	2.5 U	2.5 U	2.5 U	2.5 U	1 J	0.84 J
Methyl Ethyl Ketone (2-Butanone)	50	1.5 U	10 U	**110**	**60**	14 J	47 J	6 J	2.5 J	6.8 J	5 J
Naphthalene	10	1.2 U	NA	*25* U	5 U	2.5 U	2.5 U	2.5 UJ	2.5 U	2.5 U	2.2 J
Tetrachloroethene (PCE)	5	**150**	**97** J	5 U	0.78 J	0.76	0.82	0.6	0.34 J	2.8 J	2.3
Total 1,2-Dichloroethene (Cis and Trans)	~	NA	NA	25 U	5 U	2.5 U	2.5 U	2.5 U	2.5 U	1 J	0.84 J
Trans-1,2-Dichloroethene	5	0.52 U	1 J	*25* U	5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Trichloroethene (TCE)	5	**12**	**23**	5 U	0.42 J	0.5 U	0.23 J	0.5 U	0.5 U	0.46 J	0.34 J
Vinyl Chloride	2	0.68 U	*10* UJ	*10* U	2 U	1 UJ	1 U	1 UJ	1 U	0.13 J	0.09 J
Total CVOCs	~	210.4	139	ND	1.2	0.76	1.76	0.6	0.34	5.22	3.57
									Percent Reduction:	96 %	

Table 3
Site Management Plan
Groundwater Monitoring Analytical Results Summary

23-10 Queens Plaza South
Long Island City, New York
NYSDEC BCP Site No.: C241160
Langan Project No.: 170244603

Sampling Event	NYSDEC	RI	Baseline	30-Day	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Fifth Qaurter	Fifth Quarter	Sixth Quarter
Sample ID	SGVs	MW08 _071513	MW08_051716	MW08_101817	MW08_121917	MW08_032918	MW08_062018	MW08_092018	MW08_121718	DUP01_121718	MW08_031419
Laboratory ID		13G0545-03	1605G15-006A	L1737725-01	L1746817-04	L1810836-01	L1823312-07	L1837628-01	L1851948-02	L1851948-04	L1910009-04
Sample Date		7/15/2013	5/17/2016	10/18/2017	12/19/2017	3/29/2018	6/20/2018	9/20/2018	12/17/2018	12/17/2018	3/14/2019
Volatile Organic Compounds (µg/L)											
1,1,1-Trichloroethane	5	0.23 U	*10* U	3.7	2.5	3.4	2.6	3.7	2.8	3	1.7 J
1,1-Dichloroethane	5	4.6 J	5 J	**11**	**10**	**11**	**11**	**11**	**15**	**15**	**10**
Acetone	50	6.1 U	10 UJ	5 UJ	**70** J	5 UJ	5 UJ	5 U	5 UJ	5 UJ	5 UJ
Bromomethane	5	2 U	NA	2.5 UJ	2.5 UJ	2.5 UJ	2.5 UJ	2.5 UJ	2.5 UJ	2.5 UJ	0.77 J
Chloroform	7	0.42 U	*10* U	2.6	0.91 J	1.5 J	0.83 J	1.8 J	1.1 J	1.2 J	2.5 U
Cis-1,2-Dichloroethene	5	0.43 U	*10* U	1.1 J	0.94 J	1 J	0.88 J	1 J	1.1 J	1.1 J	0.76 J
Methyl Ethyl Ketone (2-Butanone)	50	1.5 U	10 U	5 UJ	**84** J	5 UJ	5 UJ	5 U	5 UJ	5 UJ	5 UJ
Tetrachloroethene (PCE)	5	1.3 J	1 J	**12**	**8.7**	**11**	**9.8**	**12**	**10**	**11**	**7.4**
Total 1,2-Dichloroethene (Cis and Trans)	~	NA	NA	1.1 J	0.94 J	1 J	0.88 J	1 J	1.1 J	1.1 J	0.76 J
Trichloroethene (TCE)	5	0.16 U	*10* U	0.97	0.75	0.77	0.73	0.9	0.94	0.97	0.58
Total CVOCs	~	5.9	6	28.77	22.89	27.17	25.01	28.6	29.84	31.07	20.44
										Percent Reduction:	N/A %

Notes provided on Page 8.

Table 3
Site Management Plan
Groundwater Monitoring Analytical Results Summary

23-10 Queens Plaza South
Long Island City, New York
NYSDEC BCP Site No.: C241160
Langan Project No.: 170244603

Sampling Event		RI	Baseline	Baseline	30-Day	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Fifth Quarter	Sixth Quarter
Sample ID	NYSDEC	MW09 _071513	MW09_051616	DUP01_051616	MW09_101817	MW09_121917	MW09_032918	MW09R_062118	MW09_092418	MW09_121818	MW09_031519
Laboratory ID	SGVs	13G0545-02	1605G15-004A	1605G15-001A	L1737725-02	L1746817-01	L1810836-04	L1823517-01	L1838150-02	L1852233-02	L1910295-01
Sample Date		7/15/2013	5/16/2016	5/16/2016	10/18/2017	12/19/2017	3/29/2018	6/21/2018	9/24/2018	12/18/2018	3/15/2019
Volatile Organic Compounds (µg/L)											
1,1,1-Trichloroethane	5	2.2 J	**8** J	**8** J	1.5 J	2.8	2.6	2.4 J	2 J	2.3 J	3.8
1,1-Dichloroethane	5	**9.7**	**8** J	**8** J	5 U	3	3.9	**6**	**7.7** J	**7.7**	**10**
1,1-Dichloroethene	5	2.6 J	*10* UJ	*10* UJ	1 U	0.5 U	0.5 U	0.5 U	0.5 UJ	0.5 U	0.5 U
Acetone	50	6.1 U	10 UJ	10 UJ	**54** J	**150** J	8.8 J	**84**	28 U	2.8 J	**100** J
Chloroethane	5	2.8 U	NA	NA	5 U	2.5 U	2.5 UJ	2.5 U	2.5 UJ	0.89 J	2.5 U
Chloroform	7	0.42 U	**14**	**13**	2.4 J	2.4 J	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Cis-1,2-Dichloroethene	5	**28**	3 J	3 J	5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Methyl Ethyl Ketone (2-Butanone)	50	1.5 U	10 U	10 U	21 J	47 J	5 UJ	27	8.9	5 U	40 J
Methylene Chloride	5	2.4 U	*10* UJ	*10* UJ	1.8 J	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Tetrachloroethene (PCE)	5	**68**	**30** J	**27** J	1 U	0.5 U	0.5 U	0.41 J	0.5 U	0.5 U	0.5 U
Toluene	5	0.85 J	*10* U	*10* U	5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Trans-1,2-Dichloroethene	5	4.2 J	1 J	1 J	5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Trichloroethene (TCE)	5	**14**	4 J	4 J	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Vinyl Chloride	2	0.68 U	*10* UJ	*10* UJ	2 U	1 U	1 UJ	1 UJ	0.2 J	0.2 J	0.26 J
Total CVOCs	~	128.7	54	51	1.5	5.8	6.5	8.81	9.9	11.09	14.06
										Percent Reduction:	74 %

Table 3
Site Management Plan
Groundwater Monitoring Analytical Results Summary

23-10 Queens Plaza South
Long Island City, New York
NYSDEC BCP Site No.: C241160
Langan Project No.: 170244603

Sampling Event / Sample ID / Laboratory ID / Sample Date	NYSDEC SGVs	RI MW10 _071513 13G0545-01 7/15/2013	Baseline MW10_051716 1605G15-005A 5/17/2016	30-Day MW10_101817 L1737725-03 10/18/2017	30-Day DUP01_101817 L1737725-04 10/18/2017	First Quarter MW10_121917 L1746817-02 12/19/2017	First Quarter DUP01_121917 L1746817-06 12/19/2017	First Quarter MW10_F_121917 L1746817-03 12/19/2017	Second Quarter MW10_032918 L1810836-05 3/29/2018	Third Quarter MW10R_062118 L1823517-02 6/21/2018	Fourth Qaurter MW10_092018 L1837628-02 9/20/2018	Fifth Qaurter MW10_121818 L1852233-03 12/18/2018	Sixth Quarter MW10_031519 L1910295-03 3/15/2019
Volatile Organic Compounds (µg/L)													
1,1,1-Trichloroethane	5	**18**	**170**	**190**	**190**	**250**	**200**	**230**	**34**	**41**	**11**	**5.6**	**6.6**
1,1-Dichloroethane	5	**36**	**120** J	**69**	**74**	**110**	**97**	**82**	**23**	**24**	**12**	**14**	**9.7**
1,1-Dichloroethene	5	3.8 J	**6** J	**5.7**	**6.3**	**8.2**	**5.6**	*10* U	2	2.3	0.55	0.35 J	0.45 J
2-Hexanone	50	1.1 U	NA	12 UJ	5 UJ	8.5 J	6.6 J	*100* UJ	5 U	20 UJ	5 UJ	5 U	5 U
Acetone	50	6.1 U	10 UJ	**820** J	**920** J	**2,300** J	**2,300** J	**2,500** J	5 UJ	20 U	5 U	5 U	5 U
Bromodichloromethane	50	0.41 U	NA	1.2 U	0.44 J	1.2 U	1.2 U	10 U	0.33 J	2 U	0.5 U	0.5 U	0.5 U
Chlorobenzene	5	0.38 U	1 J	*6.2* U	2.5 U	*6.2* U	*6.2* U	*50* U	0.86 J	*10* U	2.5 U	2.5 U	2.5 U
Chloroethane	5	4.6 J	NA	4.8 J	**5.1**	**7.2**	**6** J	*50* U	3.1 J	3.7 J	0.9 J	2.5 U	2.5 U
Chloroform	7	0.42 U	3 J	6.6	**7.2**	4.1 J	3.1 J	*50* U	**16**	**12**	**10**	3.5	2.6
Cis-1,2-Dichloroethene	5	**25**	**16**	**6.6**	**7.3**	**9.1**	**6.6**	*50* U	**7**	**10**	3.6	1.4 J	2.7
Methyl Ethyl Ketone (2-Butanone)	50	1.5 U	10 U	**140** J	**140** J	**120** J	**180** J	**110** J	5 UJ	20 U	5 U	2 J	5 UJ
Methylene Chloride	5	2.4 U	*10* UJ	*6.2* U	2.5 U	*6.2* U	*6.2* U	*50* U	1.2 J	*10* U	2.5 U	2.5 U	2.5 U
Tetrachloroethene (PCE)	5	**490**	**260** J	**220**	**220**	**260**	**150**	**14**	**53**	**290**	**51**	3.5	**7.9**
Total 1,2-Dichloroethene (Cis and Trans)	~	NA	NA	6.6	7.3	9.1	6.6	50 U	8.1 J	10	3.6	1.4 J	2.7
Trans-1,2-Dichloroethene	5	4.8 J	1 J	*6.2* U	2.5 U	*6.2* U	*6.2* U	*50* U	1.1 J	*10* U	2.5 U	2.5 U	2.5 U
Trichloroethene (TCE)	5	**27**	**24**	**8.6**	**9.4**	**11**	**7**	*10* U	**8.6**	**15**	4.3	0.65	2
Vinyl Chloride	2	**2.4** J	*10* UJ	*2.5* U	0.33 J	0.35 J	*2.5* U	*20* U	0.56 J	0.66 J	0.14 J	0.48 J	0.32 J
Total CVOCs	~	611.6	597	504.7	512.43	655.85	472.2	326	132.36	386.66	83.49	25.98	29.67
												Percent Reduction:	95 %

Table 3
Site Management Plan
Groundwater Monitoring Analytical Results Summary

23-10 Queens Plaza South
Long Island City, New York
NYSDEC BCP Site No.: C241160
Langan Project No.: 170244603

Sampling Event		**RI**		**30-Day**		**First Quarter**		**Second Quarter**		**Third Quarter**		**Fourth Quarter**		**Fifth Quarter**		**Sixth Quarter**	
Sample ID	**NYSDEC**	**MW11 _071513**		**MW11_101917**		**MW11_121817**		**MW11_032918**		**MW11_062018**		**MW11_092418**		**MW11_121718**		**MW11_031419**	
Laboratory ID	**SGVs**	**13G0545-04**		**L1737919-04**		**L1746660-01**		**L1810836-02**		**L1823312-06**		**L1838150-01**		**L1851948-03**		**L1910009-02**	
Sample Date		**7/15/2013**		**10/19/2017**		**12/18/2017**		**3/29/2018**		**6/20/2018**		**9/24/2018**		**12/17/2018**		**3/14/2019**	
Volatile Organic Compounds (µg/L)																	
1,1-Dichloroethane	5	0.42	U	**5.1**		4.1		2.5		2.6		**5.4**		1.7	J	1.4	J
1,1-Dichloroethene	5	0.52	U	0.5	U	0.5	U	0.5	U	0.5	U	0.24	J	0.5	U	0.5	U
1,2,4-Trimethylbenzene	5	1.8	J	2.5	U	2.5	UJ	2.5	U	2.5	UJ	0.87	J	2.5	U	2.5	U
1,4-Dioxane (P-Dioxane)	~	NA		250	U	250	UJ	96	J	250	UJ	81	J	91	J	220	J
Chlorobenzene	5	1	J	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
Chloroethane	5	2.8	U	2.5	U	2.5	U	2.5	UJ	2.5	U	0.84	J	2.5	U	2.5	U
Cis-1,2-Dichloroethene	5	0.43	U	1.7	J	1.3	J	0.8	J	1.1	J	1.9	J	2.5	U	2.5	U
Isopropylbenzene (Cumene)	5	1.3	J	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
Naphthalene	10	1.2	U	2.5	U	2.5	U	2.5	U	2.5	U	1.5	J	2.5	U	2.5	U
n-Butylbenzene	5	0.93	J	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
n-Propylbenzene	5	2.1	J	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
o-Xylene (1,2-Dimethylbenzene)	5	1.1	J	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
Sec-Butylbenzene	5	1.1	J	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
Tert-Butyl Methyl Ether	10	3.1	J	0.71	J	2.5	U	0.87	J	0.83	J	1.6	J	1.2	J	1	J
Tetrachloroethene (PCE)	5	0.41	U	1.1		0.18	J	0.5	U	0.5	U	2.4		0.5	U	0.5	U
Toluene	5	**48**		2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
Total 1,2-Dichloroethene (Cis and Trans)	~	NA		1.7	J	1.3	J	0.8	J	1.1	J	1.9	J	2.5	U	2.5	U
Total Xylenes	5	1.1	J	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
Trichloroethene (TCE)	5	0.16	U	0.42	J	0.2	J	0.5	U	0.5	U	0.61		0.5	U	0.5	U
Vinyl Chloride	2	0.68	U	0.07	J	1	U	0.1	J	1	U	1	UJ	0.12	J	0.09	J
Total CVOCs	~	ND		8.39		5.78		3.4		3.7		11.39		1.82		1.49	
														Percent Reduction:		N/A	%

Notes provided on Page 8.

Table 3
Site Management Plan
Groundwater Monitoring Analytical Results Summary

23-10 Queens Plaza South
Long Island City, New York
NYSDEC BCP Site No.: C241160
Langan Project No.: 170244603

Notes:

1. 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 (NYSDEC SGVs).
2. Only detected analytes are shown in the table.
3. Analytes detected with concentrations above NYSDEC SGVs are bolded and shaded.
4. Analytical results with reporting limits (RL) above NYSDEC SGVs are italicized.
5. Sample DUP01_092418 is a duplicate sample of MW05_092418, sample DUP01_062018 is a duplicate sample of MW05R_062018, sample DUP01_032818 is a duplicate sample of MW06_032818, sample GWDUP01_031419 is a duplicate sample of MW07_031419, sample DUP01_121718 is a duplicate sample of MW08_121718, sample DUP01_051616 is a duplicate sample of MW09_051616, sample DUP01_101817 is a duplicate sample of MW10_101817. and sample DUP01_121917 is a duplicate sample of MW10_121917.
6. Sample MW10_F_121917 was field filtered.
7. Percent reduction calculated by comparing the total chlorinated volatile organic compounds (CVOC) concentration of the Sixth Quarter and Baseline events, except for wells MW06 and MW11.
8. ~ = Regulatory limit for this analyte does not exist
9. µg/L = micrograms per liter
10. N/A = Not applicable
11. NA = Not analyzed
12. ND = Not detected
13. RI = Remedial Investigation
14. BCP = Brownfield Cleanup Program

Qualifiers:

J – The analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample.
UJ – The analyte was not detected at a level greater than or equal to the reporting limit (RL); however, the reported RL is approximate and may be inaccurate or imprecise.
U – The analyte was analyzed for, but was not detected at a level greater than or equal to the level of the RL or the sample concentration for results impacted by blank contamination.

Table 4
Site Management Plan
Hotspot Endpoint Documentation Groundwater Sample Analytical Results Summary

23-10 Queens Plaza
Long Island, New York
NYSDEC BCP Site No.: C241160
Langan Project No.: 170244603

Location	NYSDEC	UST Nos. 5 and 6		UST No. 7		UST No. 8		ISA No. 3		ISA No. 3	
Sample ID	SGVs	EPB01_GW_030617		EPE02_BASE		EPE04_BASE		EPE05_BASE		MW11_092418	
Laboratory ID		17C0267-04		L1830160-01		L1834061-01		L1835357-01		L1838150-01	
Sample Date		3/6/2017		8/3/2018		8/29/2018		9/6/2018		9/24/2018	
Volatile Organic Compounds (µg/L)											
1,1,1-Trichloroethane	5	**5.8**		*6.2*	U	2.5	U	*6.2*	U	2.5	U
1,1-Dichloroethane	5	3.5		*6.2*	U	2.5	U	*6.2*	UJ	**5.4**	
1,1-Dichloroethene	5	0.25	J	1.2	U	0.5	U	1.2	UJ	0.24	J
1,2,4,5-Tetramethylbenzene	5	NA		5	U	2	U	**7.4**		2	U
1,2,4-Trimethylbenzene	5	**96**		**18**		2.5	UJ	**42**		0.87	J
1,2-Dichloroethane	0.6	0.2	U	**1**	J	0.5	U	*1.2*	U	0.5	U
1,3,5-Trimethylbenzene (Mesitylene)	5	**29**		**5.8**	J	2.5	U	**10**		2.5	U
1,4-Diethyl Benzene	~	NA		3.7	J	2	U	13		2	U
1,4-Dioxane (P-Dioxane)	~	40	UJ	620	UJ	250	UJ	620	UJ	81	J
2-Hexanone	50	4.6		15	J	5	UJ	12	U	5	UJ
4-Ethyltoluene	~	NA		12		2	U	17		2	U
Acetone	50	17		**420**	J	5.4	J	15		5	UJ
Benzene	1	**20**		**28**		0.5	U	*1.2*	U	0.5	U
Chloroethane	5	0.2	U	*6.2*	UJ	2.5	U	2.7	J	0.84	J
Cis-1,2-Dichloroethylene	5	0.56		*6.2*	U	1	J	*6.2*	U	1.9	J
Cyclohexane	~	46		NA		NA		NA		NA	
Cymene	5	NA		*6.2*	U	2.5	U	2.7	J	2.5	U
Ethylbenzene	5	**43**		**17**		2.5	U	*6.2*	U	2.5	U
Isopropylbenzene (Cumene)	5	**6.9**		*6.2*	U	2.5	U	4	J	2.5	U
M,P-Xylene	5	**180**		**66**		2.5	U	**6.1**	J	2.5	U
Methyl Ethyl Ketone (2-Butanone)	50	6.9		**140**		5	U	12	U	5	UJ
Methyl Isobutyl Ketone (4-Methyl-2-Pentanor	~	0.2	U	5.8	J	5	UJ	12	U	5	UJ
Methylcyclohexane	~	72		NA		NA		NA		NA	
Naphthalene	10	NA		2	J	2.5	U	6.2	U	1.5	J
n-Butylbenzene	5	4.5		*6.2*	U	2.5	U	**6.2**		2.5	U
n-Propylbenzene	5	**11**		*6.2*	U	2.5	U	**8.8**	J	2.5	U
o-Xylene (1,2-Dimethylbenzene)	5	**93**		**34**		2.5	U	**8.6**		2.5	U
p-Cymene (p-Isopropyltoluene)	~	2.6		NA		NA		NA		NA	
Sec-Butylbenzene	5	1.5		*6.2*	U	2.5	U	3.4	J	2.5	U
Tert-Butyl Methyl Ether	10	0.2	U	6.2	U	2.5	U	6.2	U	1.6	J
Tetrachloroethene (PCE)	5	**8.4**		1.2	U	1.2		1.2	U	2.4	
Toluene	5	**120**		**110**		2.5	U	3.3	J	2.5	U
Total 1,2-Dichloroethene (Cis and Trans)	~	NA		6.2	U	1.8	J	6.2	U	1.9	J
Total Xylenes	5	**280**		**100**		2.5	U	**15**	J	2.5	U
Trans-1,2-Dichloroethene	5	0.2	U	*6.2*	U	0.83	J	*6.2*	U	2.5	U
Trichloroethene (TCE)	5	0.2	U	2.7		**5.6**		1.2	U	0.61	
Vinyl Chloride	2	0.2	U	*2.5*	UJ	1	U	0.31	J	1	UJ
Semivolatile Organic Compounds (µg/L)											
2,4-Dimethylphenol	1	*9.62*	U	**4.4**	J	*5*	U	*120*	UJ	*5*	U
2-Methylnaphthalene	~	126	D	0.5		0.05	J	160		0.1	U
2-Methylphenol (o-Cresol)	~	9.62	UJ	7.2		5	U	120	U	5	U
3 & 4 Methylphenol (m&p Cresol)	~	9.62	U	9.5		5	U	120	U	5	U
Acenaphthene	20	19.2	UJ	0.04	J	0.1	U	8.1	J	0.07	J
Acenaphthylene	~	19.2	U	0.04	J	0.1	U	5.9		0.05	J
Acetophenone	~	19.2	UJ	17		5	U	120	U	5	U
Anthracene	50	19.2	U	0.1	U	0.1	U	3.9	J	0.05	J
Benzo(a)Anthracene	0.002	*19.2*	U	**0.03**	J	*0.1*	U	**5.1**		*0.1*	U
Benzo(a)Pyrene	0	*19.2*	UJ	*0.1*	U	*0.1*	U	**6.3**		*0.1*	U
Benzo(b)Fluoranthene	0.002	*19.2*	U	**0.03**	J	*0.1*	U	**7.8**		*0.1*	U
Benzo(g,h,i)Perylene	~	19.2	UJ	0.1	U	0.1	U	3.6	J	0.1	U
Benzo(k)Fluoranthene	0.002	*19.2*	U	*0.1*	U	*0.1*	U	**2.3**	J	*0.1*	U
Benzoic Acid	~	192	UJ	48	UJ	50	U	1200	U	9.8	J
Benzyl Alcohol	~	19.2	U	3		2	U	50	U	2	U
Bis(2-Ethylhexyl) Phthalate	5	*19.2*	U	2.9	U	1.7	J	**69**	J	3	U
Chrysene	0.002	*19.2*	U	*0.1*	U	*0.1*	U	**7.8**		*0.1*	U
Dibenz(a,h)Anthracene	~	19.2	U	0.1	U	0.1	U	0.74	J	0.1	U
Fluoranthene	50	19.2	UJ	0.04	J	0.1	U	11		0.03	J
Fluorene	50	19.2	U	0.1	U	0.1	UJ	22	J	0.11	
Indeno(1,2,3-c,d)Pyrene	0.002	*19.2*	U	*0.1*	UJ	*0.1*	U	**3**	J	*0.1*	U
Naphthalene	10	**402**	D	2.8		0.06	J	8.9		0.1	U
Pentachlorophenol	1	*19.2*	UJ	0.76	UJ	0.39	J	*32*	U	0.8	U
Phenanthrene	50	19.2	U	0.04	J	0.1	U	19		0.03	J
Phenol	1	*9.62*	UJ	**2**	J	*5*	U	*120*	U	*5*	U
Pyrene	50	19.2	U	0.04	J	0.1	U	14		0.1	U

Notes:
1. 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 (NYSDEC SGVs).
2. Only detected analytes are shown in the table.
3. Analytes detected with concentrations above NYSDEC SGVs are bolded and shaded.
4. Analytical results with reporting limits (RL) above NYSDEC SGVs are italicized.
5. ISA = Impacted soil area
6. ~ = Regulatory limit for this analyte does not exist
7. µg/L = micrograms per liter
8. NA = Not analyzed
9. BCP = Brownfield Cleanup Program
10. UST = Underground Storage Tank

Qualifiers:
D = The concentration reported is a result of a diluted sample.
J – The analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample.
UJ – The analyte was not detected at a level greater than or equal to the reporting limit (RL); however, the reported RL is approximate and may be inaccurate or imprecise.
U – The analyte was analyzed for, but was not detected at a level greater than or equal to the level of the RL or the sample concentration for results impacted by blank conta

Table 5
Site Management Plan
Soil Vapor Sample Analytical Results Summary

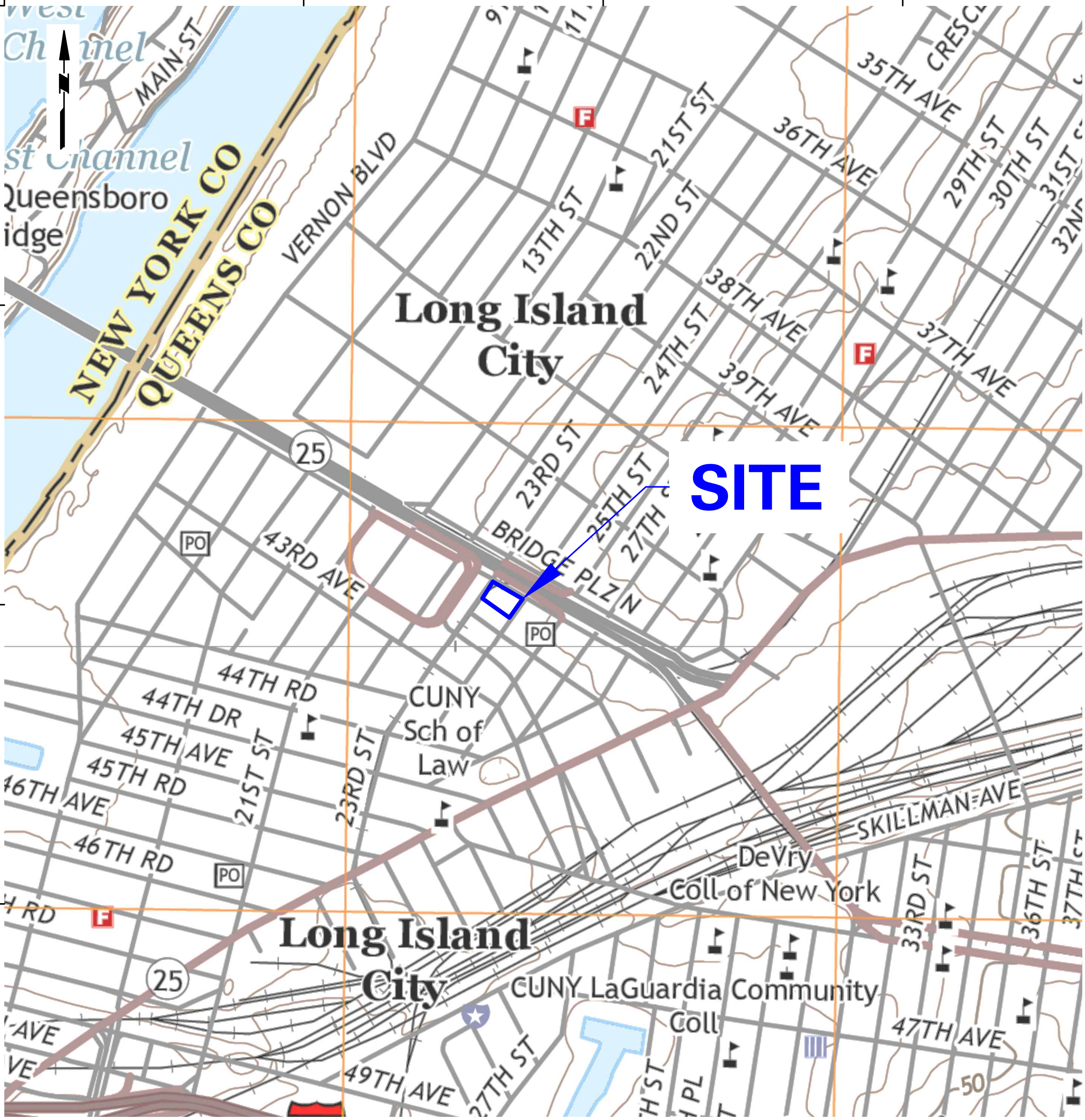
23-10 Queens Plaza South
Long Island City, New York
NYSDEC BCP Site No.: C241160
Langan Project No.: 170244603

Location		**AMB10**		**OUT10**		**SV05**		**SV06**		**SV07**		**SV08**		**SV09**		**SV10**		**SV11**	
Sample ID	**NYSDOH Decision**	**AMB10_071513**		**OUT10_071513**		**SV05_071513**		**SV06_071513**		**SV07_071513**		**SV08_071513**		**SV09_071513**		**SV10_071513**		**SV11_071513**	
Laboratory ID	**Matrices Minimum**	**13G0494-02**		**13G0494-03**		**13G0494-04**		**13G0494-05**		**13G0494-06**		**13G0494-07**		**13G0494-08**		**13G0494-09**		**13G0494-10**	
Sample Date	**Concentrations**	**7/15/2013**		**7/15/2013**		**7/15/2013**		**7/15/2013**		**7/15/2013**		**7/15/2013**		**7/15/2013**		**7/15/2013**		**7/15/2013**	
Sample Type		**AA**		**AA**		**SV**		**SV**		**SV**		**SV**		**SV**		**SV**		**SV**	
Volatile Organic Compounds (µg/m³)																			
1,1,1-Trichloroethane	100	2.1		1.5		**320**		78		**2,200**		**4,200**		**24,000**		**920**		60	
1,1,2-Trichloro-1,2,2-Trifluoroethane	~	0.62		0.78		17	U	17	U	18	U	17	U	17	U	15	U	19	U
1,1-Dichloroethane	~	2.6		1.7		93		8.9	U	720		1,800		9,500		20		11	
1,1-Dichloroethene	6	0.27	U	0.27	U	*9*	U	*8.7*	U	**77**		**96**		**680**		*8*	U	*10*	U
1,2,4-Trimethylbenzene	~	6.7		4.7		11	U	11	U	12	U	11	U	11	U	9.9	U	12	U
1,3,5-Trimethylbenzene (Mesitylene)	~	2.1		1.5		11	U	11	U	12	U	11	U	11	U	9.9	U	12	U
2-Hexanone	~	0.28	U	0.28	U	160		9	U	9.6	U	8.9	U	9.2	U	8.3	U	10	U
4-Ethyltoluene	~	5.6		4.1		56	U	54	U	58	U	53	U	55	U	50	U	62	U
Acetone	~	46		32		21		12		14		17		10		5.3		31	
Benzene	~	6.1		4.2		7.2		7	U	7.5	U	6.9	U	7.2	U	6.4	U	8.1	U
Carbon Disulfide	~	0.23		0.21	U	17		22		7.3	U	87		26		11		37	
Carbon Tetrachloride	6	0.47	J	0.55	J	*7.1*	UJ	*6.9*	UJ	*7.4*	UJ	*6.8*	UJ	**8.4**	J	*6.3*	UJ	*8*	UJ
Chloroethane	~	0.18	U	0.18	U	6	U	5.8	U	14		5.7	U	14		5.3	U	6.7	U
Chloroform	~	0.33	U	0.4		11	U	11	U	43		11	U	11	U	49		12	U
Chloromethane	~	1.8		1.9		4.7	U	4.5	U	4.8	U	4.5	U	4.6	U	4.2	U	5.2	U
Cis-1,2-Dichloroethene	6	0.27	U	0.27	U	*9*	U	*8.7*	U	**11**		**22**		**29**		**70**		*10*	U
Cyclohexane	~	3.2		2		36		7.6	U	8.1	U	7.5	U	490		6.9	U	8.7	U
Dichlorodifluoromethane	~	2.5		3		11	U	11	U	12	U	11	U	11	U	10	U	13	U
Ethylbenzene	~	4.2		3		14		9.6	U	10	U	9.4	U	9.7		8.8	U	11	
Isopropanol	~	1.8		0.17	U	5.6	U	5.4	U	5.8	U	5.3	U	5.5	U	5	U	6.2	U
M,P-Xylene	~	15		11		38		19	U	20	U	19	U	29		18	U	32	
Methyl Ethyl Ketone (2-Butanone)	~	13		9.9		6.7	U	6.5	U	6.9	U	6.4	U	6.6	U	6	U	7.5	U
Methylene Chloride	100	4.9		0.24	U	8.6		8.4		9.8		9.1		9.3		7.7		9.7	
n-Heptane	~	6.2		4.2		9.3	U	9	U	9.6	U	8.9	U	9.2	U	8.3	U	10	U
n-Hexane	~	11		7.3		8	U	7.8	U	8.2	U	7.7	U	52		7.1	U	8.9	U
o-Xylene (1,2-Dimethylbenzene)	~	5.4		3.8		13		9.6	U	10	U	9.4	U	9.7	U	8.8	U	11	U
Tetrachloroethene (PCE)	100	2.7		1.9		**590**		52		**1,400**		**840**		**3,500**		**1,900**		**180**	
Toluene	~	27		20		13,000		8.3	U	8.8	U	75		9,000		370		6,900	
Trans-1,2-Dichloroethene	~	0.27	U	0.27	U	11		8.7	U	9.3	U	8.6	U	8.9	U	8	U	10	U
Trichloroethene (TCE)	6	1.6	J	1.3	J	**1,200**	J	**440**	J	**1,100**	J	**40**	J	**1,500**	J	**1,700**	J	**74**	J
Trichlorofluoromethane	~	1.5		1.7		13	U	12	U	13	U	12	U	13	U	11	U	14	U

Notes:
1. Soil vapor sample analytical results are compared to the minimum soil vapor concentrations recommending mitigation 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
2. Only detected analytes are shown in the table.
3. Analytes detected with concentrations above the minimum soil vapor concentrations recommending mitigation are bolded and shaded.
4. ~ = Regulatory limit for this analyte does not exist
5. µg/m³ = micrograms per cubic meter
6. AA = Ambient Air
7. SV = Soil Vapor

Qualifiers:
J – The analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample.
UJ – The analyte was not detected at a level greater than or equal to the reporting limit (RL); however, the reported RL is approximate and may be inaccurate or imprecise.
U – The analyte was analyzed for, but was not detected at a level greater than or equal to the level of the RL or the sample concentration for results impacted by blank contamination.

FIGURES



WARNING: IT IS A VIOLATION OF THE NYS EDUCATION LAW ARTICLE 145 FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER THIS ITEM IN ANY WAY.

NOTES:

1. BASE MAP IS REFERENCED FROM UNITED STATES GEOLOGICAL SURVEY (USGS) 7.5-MINUTE SERIES TOPOGRAPHICAL MAPS CENTRAL PARK, NEW YORK-NEW JERSEY AND BROOKLYN, NEW YORK QUADRANGLES, DATED 2016.

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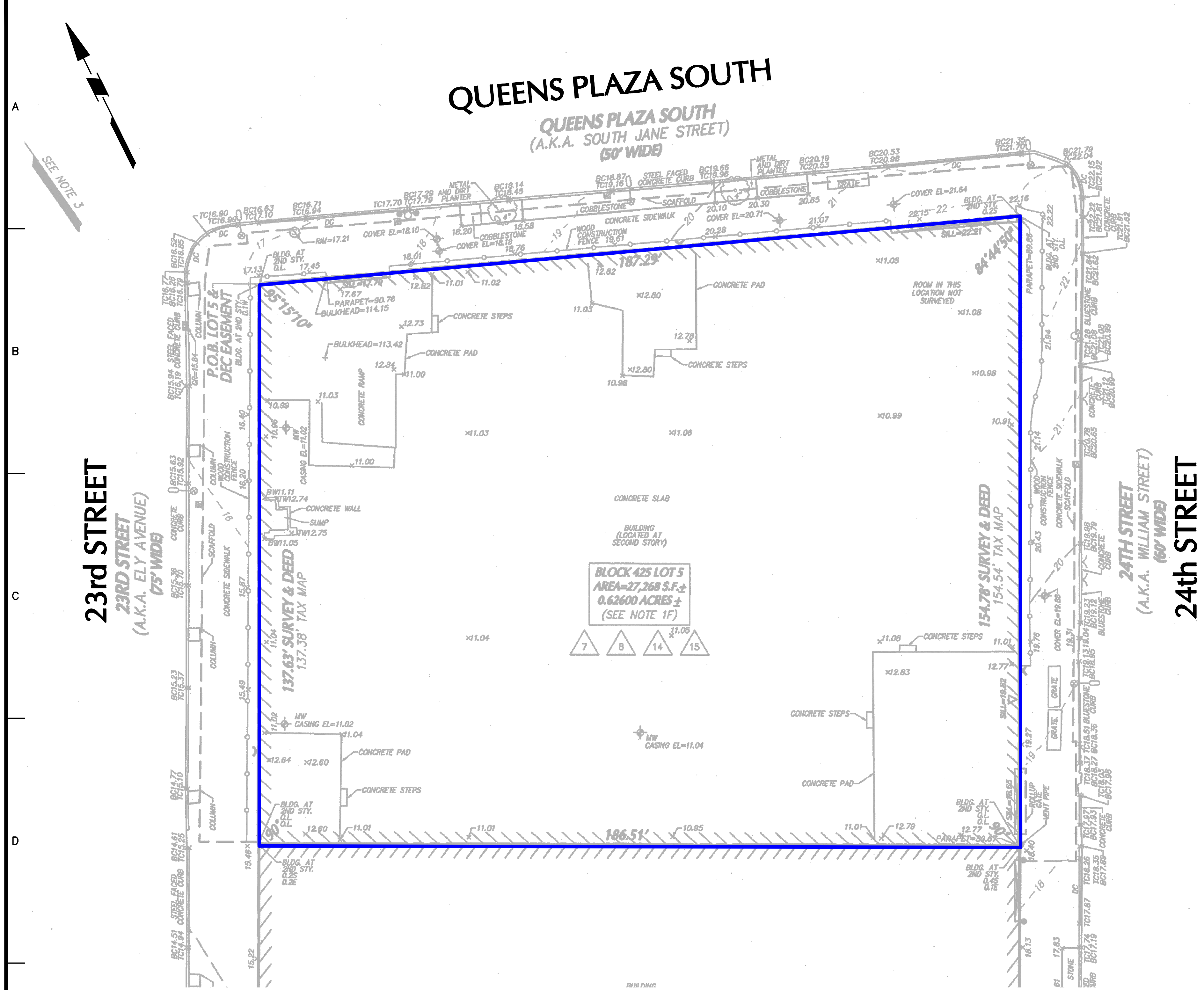
Project	Figure Title	Project No.	Figure No.
23-10 QUEENS PLAZA SOUTH BLOCK NO. 425, LOT NO. 5 QUEENS LONG ISLAND CITY NEW YORK	SITE LOCATION MAP	170244603	1
		Date: 12/27/2018	
		Scale: 1" = 1000'	
		Drawn By: VDP / Checked By: PM	
		Submission Date	Sheet 1 of 8

Filename: \\langan.com\data\NY\data6\170244601\Cadd Data - 170244601\2D-DesignFiles\Environmental\23-10 QPS SMP\Figure 1 - Site Location Map.dwg Date: 7/29/2019 Time: 17:37 User: vdepaula Style Table: Langan.stb Layout: Site Location Map



LEGEND:

SITE BOUNDARY

NOTES:

1. BASE MAP REFERENCED FROM TOPOGRAPHIC AND BOUNDARY SURVEY BY LANGAN DATED 31 AUGUST 2018, AND REVISED 25 JULY 2019 (ELEVATIONS SHOW TOP OF SLAB).
2. ELEVATIONS ARE IN FEET AND REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).

30 0 15 30

SCALE IN FEET

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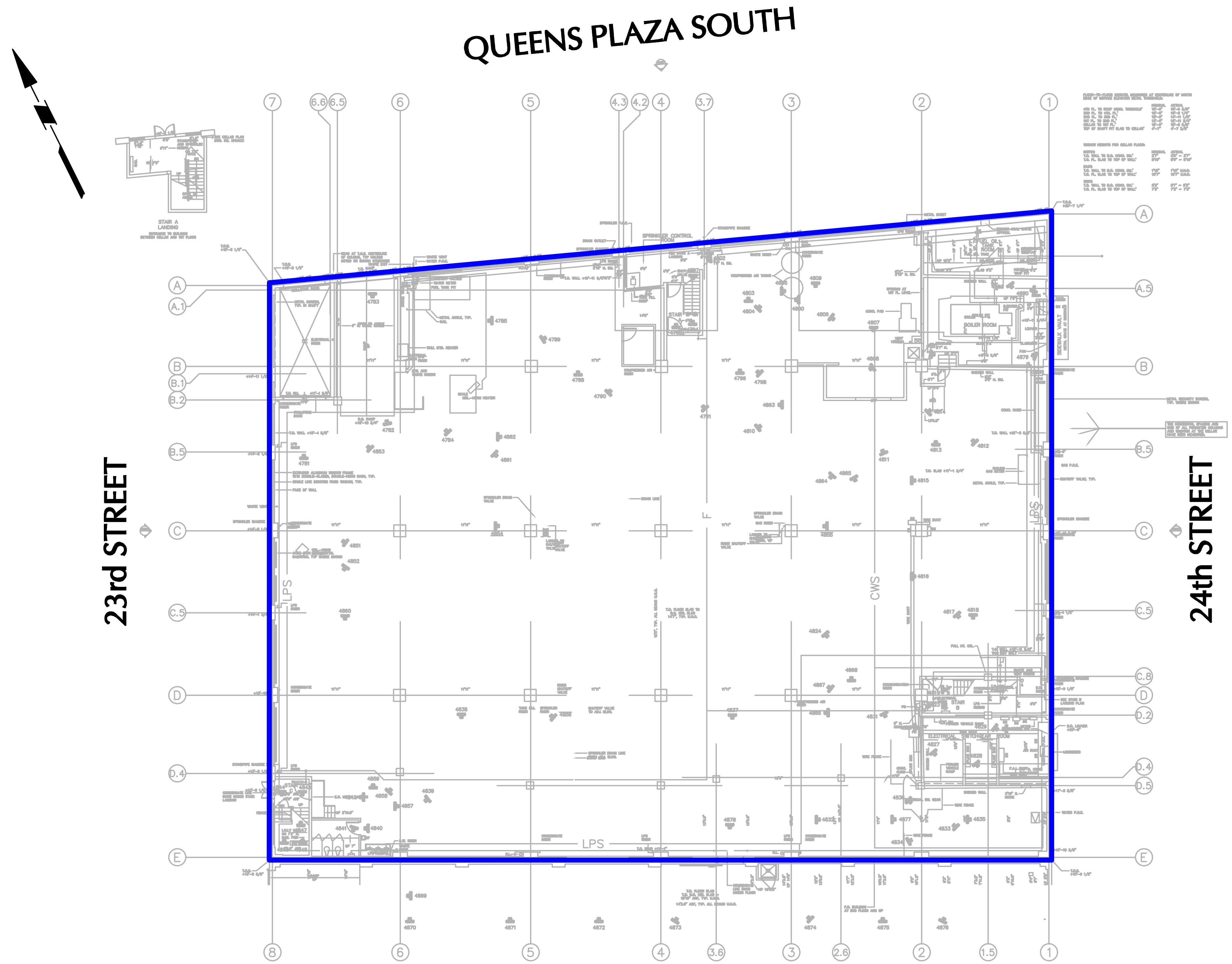
Project	Figure Title	Project No.	Figure No.
23-10 QUEENS PLAZA SOUTH BLOCK NO. 425, LOT NO. 5 QUEENS LONG ISLAND CITY NEW YORK	SITE PLAN	170244603 Date 7/29/2019 Scale 1" = 30' Drawn By RB Submission Date	2 Sheet 2 of 8



LEGEND:

SITE BOUNDARY

NOTES:

1. BASE MAP REFERENCED FROM DRAWING TITLED "CELLAR EXISTING PLAN" BY JOHN BAIN ASSOCIATES DATED 25 SEPTEMBER 2013.

30 0 15 30

SCALE IN FEET

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23-10 QUEENS PLAZA SOUTH

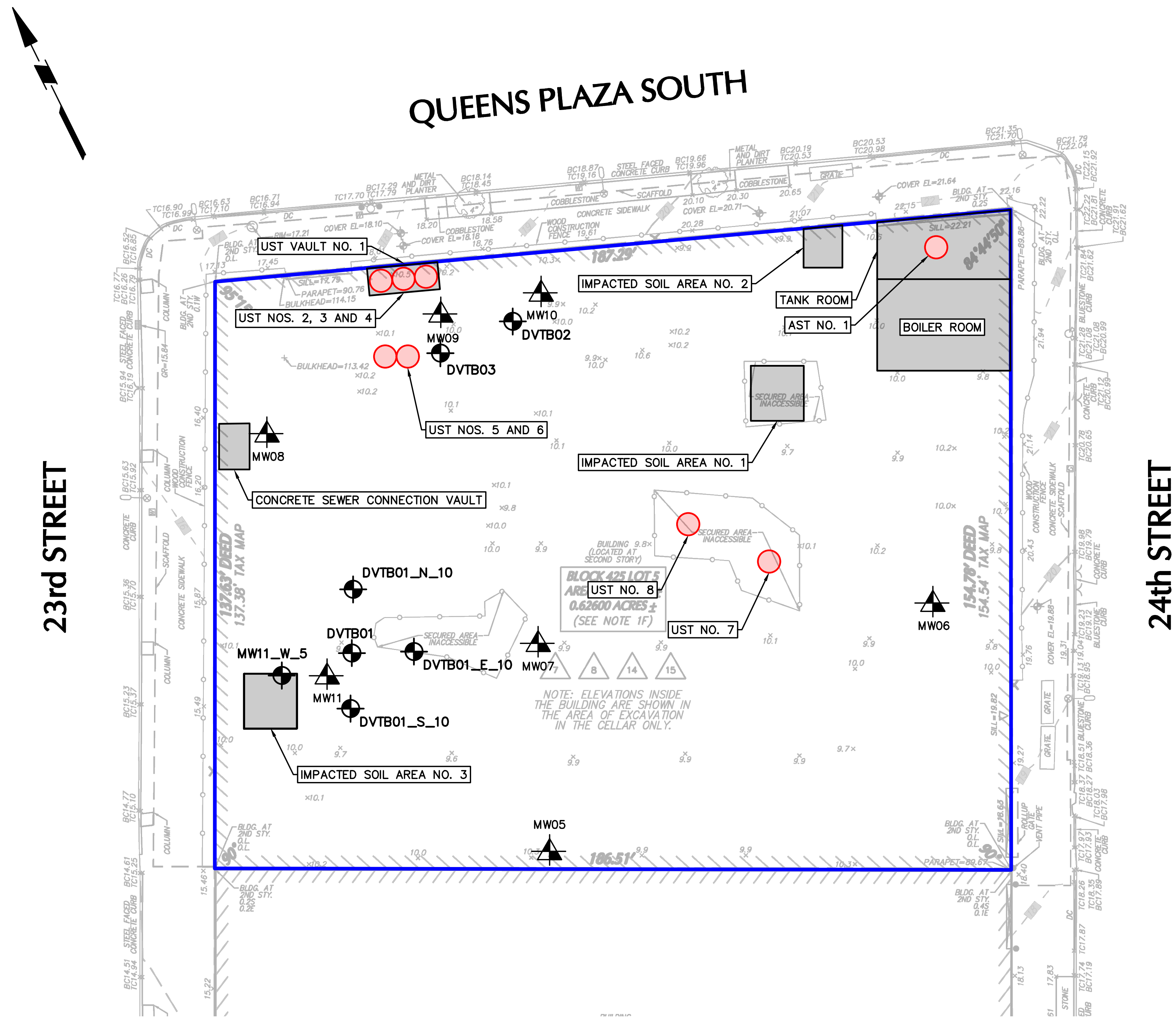
BLOCK NO. 425, LOT NO. 5
QUEENS
LONG ISLAND CITY NEW YORK

Figure Title

ARCHITECTURAL SITE PLAN

Project No.	170244603
Date	12/28/2018
Scale	1" = 30'
Drawn By	RB
Submission Date	
Figure No.	3

Filename: \\langan.com\data\NY\data6\170244601\Cadd Data - 170244601\2D-DesignFiles\Environmental\23-10 QPS SMP\Figure 3 - Architectural Site Plan.dwg Date: 7/29/2019 Time: 17:31 User: vdepaula Style Table: Langan.stb Layout: ANSIB-BL



LEGEND:

SITE BOUNDARY

APPROXIMATE PETROLEUM BULK STORAGE TANK LOCATION

APPROXIMATE SITE FEATURE LOCATION

MW05 APPROXIMATE MONITORING WELL LOCATION

DVTB01 APPROXIMATE DESIGN VERIFICATION INVESTIGATION BORING LOCATION

NOTES:

1. BASE MAP REFERENCED FROM TOPOGRAPHIC AND BOUNDARY SURVEY BY LANGAN, DATED 31 AUGUST 2018, AND REVISED 19 SEPTEMBER 2018 (ELEVATIONS SHOW BOTTOM OF EXCAVATION).
2. ELEVATIONS ARE IN FEET AND REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
3. AST = ABOVEGROUND STORAGE TANK
4. UST = UNDERGROUND STORAGE TANK

30 0 15 30
SCALE IN FEET

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Project
23-10 QUEENS PLAZA SOUTH
BLOCK NO. 425, LOT NO. 5
QUEENS
LONG ISLAND CITY NEW YORK

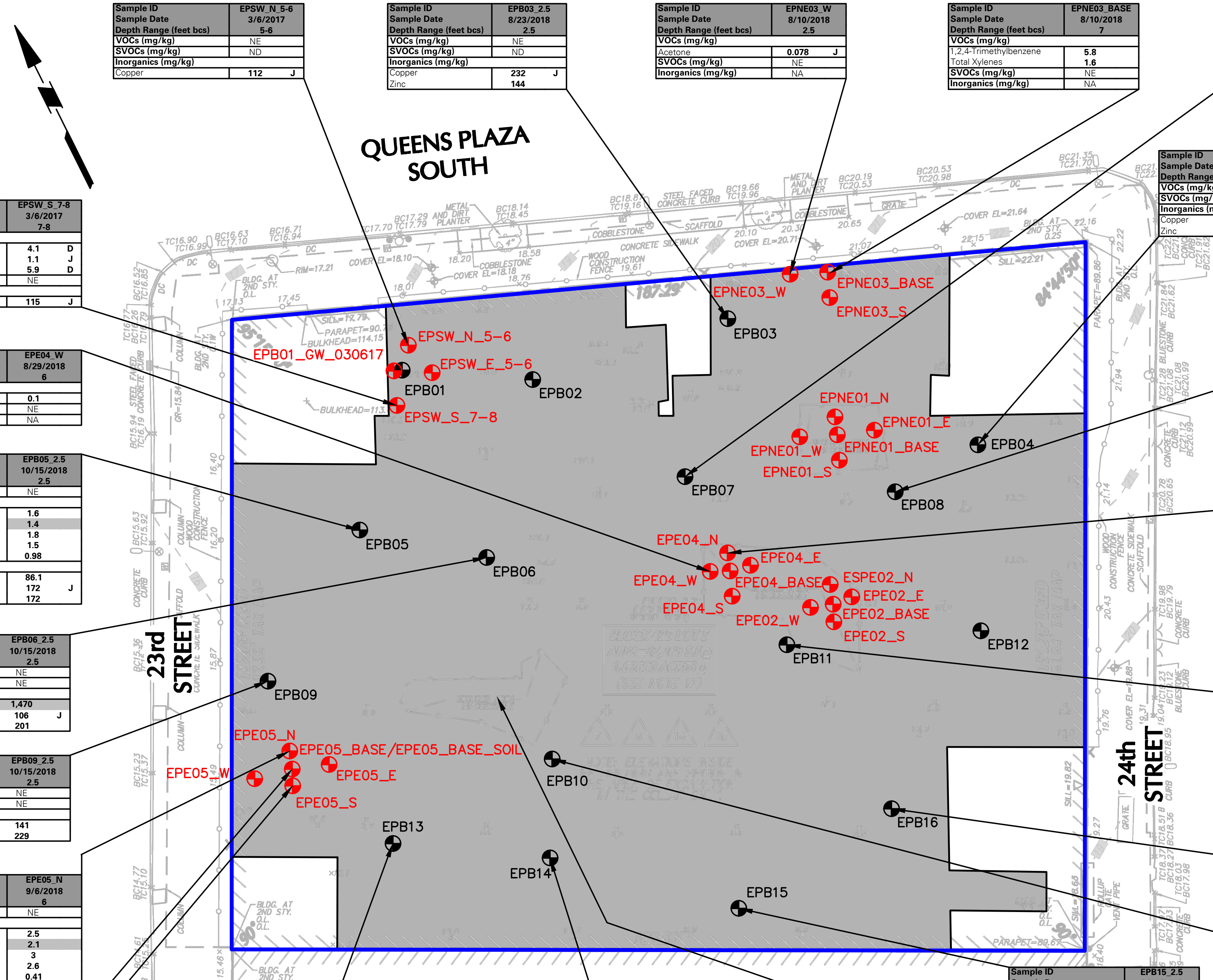
Figure Title
HISTORICAL SITE FEATURES MAP

Project No. 170244603
Date 12/10/2018
Scale 1" = 30'
Drawn By RB
Submission Date

Figure No. 4

Sheet 4 of 8

Filename: \\langan.com\data\NY\data6\170244601\Cadd Data - 170244601\2D-DesignFiles\Environmental\23-10 QPS SMP\Figure 3 - Historical Site Features Map.dwg Date: 7/29/2019 Time: 17:18 User: vdepaula Style Table: Langan.stb Layout: ANSIB-BL



Sample ID	EPSW_N_5-6
Sample Date	3/6/2017
Depth Range (feet bcs)	5-6
VOCs (mg/kg)	NE
SVOCs (mg/kg)	ND
Inorganics (mg/kg)	
Copper	112 J

Sample ID	EPB03_2.5
Sample Date	8/23/2018
Depth Range (feet bcs)	2.5
VOCs (mg/kg)	NE
SVOCs (mg/kg)	ND
Inorganics (mg/kg)	
Copper	232 J
Zinc	144

Sample ID	EPNE03_W
Sample Date	8/10/2018
Depth Range (feet bcs)	2.5
VOCs (mg/kg)	
Acetone	0.078 J
SVOCs (mg/kg)	NE
Inorganics (mg/kg)	NA

Sample ID	EPNE03_BASE
Sample Date	8/10/2018
Depth Range (feet bcs)	7
VOCs (mg/kg)	
1,2,4-Trimethylbenzene	5.8
Total Xylenes	1.6
SVOCs (mg/kg)	NE
Inorganics (mg/kg)	NA

Sample ID	EPB07_2.5
Sample Date	8/23/2018
Depth Range (feet bcs)	2.5
VOCs (mg/kg)	NE
SVOCs (mg/kg)	ND
Inorganics (mg/kg)	
Copper	129 J

Sample ID	EPSW_S_7-8
Sample Date	3/6/2017
Depth Range (feet bcs)	7-8
VOCs (mg/kg)	
1,2,4-Trimethylbenzene	4.1 D
Toluene	1.1 J
Total Xylenes	5.9 D
SVOCs (mg/kg)	NE
Inorganics (mg/kg)	
Copper	115 J

Sample ID	EPB04_2.5	DUP01_082318
Sample Date	8/23/2018	8/23/2018
Depth Range (feet bcs)	2.5	2.5
VOCs (mg/kg)	NE	NE
SVOCs (mg/kg)	NE	NE
Inorganics (mg/kg)		
Copper	147 J	57.4 J
Zinc	152 J	NE

Sample ID	EPE04_W
Sample Date	8/29/2018
Depth Range (feet bcs)	6
VOCs (mg/kg)	
Acetone	0.1
SVOCs (mg/kg)	NE
Inorganics (mg/kg)	NA

Sample ID	EPB08_2.5
Sample Date	8/23/2018
Depth Range (feet bcs)	2.5
VOCs (mg/kg)	ND
SVOCs (mg/kg)	ND
Inorganics (mg/kg)	
Copper	217 J
Zinc	392

Sample ID	EPB05_2.5
Sample Date	10/15/2018
Depth Range (feet bcs)	2.5
VOCs (mg/kg)	NE
SVOCs (mg/kg)	
Benzo(a)Anthracene	1.6
Benzo(a)Pyrene	1.4
Benzo(b)Fluoranthene	1.8
Chrysene	1.5
Indeno(1,2,3-c,d)Pyrene	0.98
Inorganics (mg/kg)	
Copper	86.1
Lead	172 J
Zinc	172

Sample ID	EPE04_N
Sample Date	8/29/2018
Depth Range (feet bcs)	6-6
VOCs (mg/kg)	
Acetone	0.11
SVOCs (mg/kg)	ND
Inorganics (mg/kg)	NA

Sample ID	EPB06_2.5
Sample Date	10/15/2018
Depth Range (feet bcs)	2.5
VOCs (mg/kg)	NE
SVOCs (mg/kg)	NE
Inorganics (mg/kg)	
Copper	1,470
Lead	106 J
Zinc	201

Sample ID	EPB11_2.5
Sample Date	8/23/2018
Depth Range (feet bcs)	2.5
VOCs (mg/kg)	NE
SVOCs (mg/kg)	NE
Inorganics (mg/kg)	
Copper	502 J
Lead	263
Mercury	0.481 J
Zinc	113

Sample ID	EPB09_2.5
Sample Date	10/15/2018
Depth Range (feet bcs)	2.5
VOCs (mg/kg)	NE
SVOCs (mg/kg)	NE
Inorganics (mg/kg)	
Copper	141
Zinc	229

Sample ID	EPB16_2.5
Sample Date	8/23/2018
Depth Range (feet bcs)	2.5
VOCs (mg/kg)	NE
SVOCs (mg/kg)	NE
Inorganics (mg/kg)	
Lead	1,300
Mercury	0.205 J

Sample ID	EPE05_N
Sample Date	9/6/2018
Depth Range (feet bcs)	6
VOCs (mg/kg)	NE
SVOCs (mg/kg)	
Benzo(a)Anthracene	2.5
Benzo(a)Pyrene	2.1
Benzo(b)Fluoranthene	3
Chrysene	2.6
Dibenz(a,h)Anthracene	0.41
Indeno(1,2,3-c,d)Pyrene	1.5
Inorganics (mg/kg)	NA

Sample ID	EPE05_BASE_SOIL
Sample Date	9/20/2018
Depth Range (feet bcs)	7
VOCs (mg/kg)	NE
SVOCs (mg/kg)	
Benzo(b)Fluoranthene	1.1
Indeno(1,2,3-c,d)Pyrene	0.56
Inorganics (mg/kg)	NA

Sample ID	EPE05_S
Sample Date	9/6/2018
Depth Range (feet bcs)	6
VOCs (mg/kg)	NE
SVOCs (mg/kg)	
Benzo(a)Anthracene	1.7
Benzo(a)Pyrene	1.6
Benzo(b)Fluoranthene	2.3
Chrysene	1.8
Dibenz(a,h)Anthracene	0.38
Indeno(1,2,3-c,d)Pyrene	1.3
Inorganics (mg/kg)	NA

Sample ID	EPB13_2.5	DUP02_091418
Sample Date	9/14/2018	9/14/2018
Depth Range (feet bcs)	2.5	2.5
VOCs (mg/kg)		
Acetone	NE	0.13 J
SVOCs (mg/kg)	NE	NE
Inorganics (mg/kg)		
Copper	768	1,070
Lead	70.4	NE
Zinc	512	745

Sample ID	EPB14_2.5
Sample Date	9/14/2018
Depth Range (feet bcs)	2.5
VOCs (mg/kg)	ND
SVOCs (mg/kg)	NE
Inorganics (mg/kg)	
Copper	3,130
Lead	144
Zinc	485

Sample ID	EPE05_E
Sample Date	9/6/2018
Depth Range (feet bcs)	6
VOCs (mg/kg)	
Acetone	0.078
SVOCs (mg/kg)	
Benzo(a)Anthracene	1.5
Benzo(a)Pyrene	1.5
Benzo(b)Fluoranthene	1.9
Chrysene	1.6
Indeno(1,2,3-c,d)Pyrene	1.1
Inorganics (mg/kg)	NA

Sample ID	EPB15_2.5
Sample Date	8/23/2018
Depth Range (feet bcs)	2.5
VOCs (mg/kg)	NE
SVOCs (mg/kg)	
Benzo(a)Anthracene	1.4
Benzo(a)Pyrene	1.3
Benzo(b)Fluoranthene	1.7
Chrysene	1.3
Indeno(1,2,3-c,d)Pyrene	0.92
Inorganics (mg/kg)	
Lead	246
Mercury	0.804 J
Zinc	114

Sample ID	EPB10_2.5
Sample Date	9/14/2018
Depth Range (feet bcs)	2.5
VOCs (mg/kg)	
Acetone	0.058 J
SVOCs (mg/kg)	
Benzo(a)Anthracene	5.1
Benzo(a)Pyrene	4.4
Benzo(b)Fluoranthene	6.2
Benzo(k)Fluoranthene	1.8
Chrysene	4.6
Dibenz(a,h)Anthracene	0.76
Indeno(1,2,3-c,d)Pyrene	3.3
Inorganics (mg/kg)	
Copper	336
Lead	634
Mercury	1.09

LEGEND:

- SITE BOUNDARY
- EPB01 — APPROXIMATE BASE OF EXCAVATION ENDPOINT DOCUMENTATION SAMPLE LOCATION
- EPE05_N — APPROXIMATE HOTSPOT ENDPOINT DOCUMENTATION SAMPLE LOCATION
- APPROXIMATE EXCAVATION EXTENTS TO ABOUT 2.5 FEET BCS

Analyte	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Restricted Use - Commercial SCOs
VOCs (mg/kg)		
1,2,4-Trimethylbenzene	3.6	190
Acetone	0.05	500
Toluene	0.7	500
Total Xylenes	0.26	500
SVOCs (mg/kg)		
Benzo(a)Anthracene	1	5.6
Benzo(a)Pyrene	1	1
Benzo(b)Fluoranthene	1	5.6
Benzo(k)Fluoranthene	0.8	56
Chrysene	1	56
Dibenz(a,h)Anthracene	0.33	0.56
Indeno(1,2,3-c,d)Pyrene	0.5	5.6
Inorganics (mg/kg)		
Copper	50	270
Lead	63	1000
Mercury	0.18	2.8
Zinc	109	10,000

NOTES:

1. BASE MAP REFERENCED FROM TOPOGRAPHIC AND BOUNDARY SURVEY BY LANGAN, DATED 31 AUGUST 2018, AND REVISED 19 SEPTEMBER 2018 (ELEVATIONS SHOW BOTTOM OF EXCAVATION).
2. ELEVATIONS ARE IN FEET AND REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
3. SAMPLES EPB01_GW_030617, EPE02_BASE, EPE04_BASE AND EPE05_BASE WERE COLLECTED FROM STANDING GROUNDWATER IN AREAS WHERE EXCAVATION EXTENDED BEYOND THE TOP OF THE GROUNDWATER TABLE; THESE ANALYTCAL RESULTS ARE SHOWN ON TABLE 6.
4. SOIL SAMPLE ANALYTICAL RESULTS ARE COMPARED TO 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 AND RESTRICTED USE - COMMERCIAL SOIL CLEANUP OBJECTIVES (SCO).
5. ONLY ANALYTES WITH CONCENTRATIONS ABOVE RELEVANT SCOs ARE SHOWN.
6. ANALYTES DETECTED WITH CONCENTRATIONS ABOVE UNRESTRICTED USE SCOs ARE BOLDED.
7. ANALYTES DETECTED WITH CONCENTRATIONS ABOVE RESTRICTED USE - COMMERCIAL ARE SHADED.
8. VOC = VOLATILE ORGANIC COMPOUND
9. SVOC = SEMIVOLATILE ORGANIC COMPOUND
10. BCS = BELOW CELLAR SLAB
11. mg/kg = MILLIGRAMS PER KILOGRAM
12. NA = NOT ANALYTED
13. ND = NOT DETECTED
14. NE = ANALYTE DOES NOT EXCEEDED RELEVANT SCOs
15. D =THE CONCENTRATION REPORTED IS A RESULT OF A DILUTED SAMPLE
16. J = THE ANALYTE WAS POSITIVELY IDENTIFIED AND THE ASSOCIATED NUMERICAL VALUES IS THE APPROXIMATE CONCENTRATION OF THE ANALYTE IN THE SAMPLE.

30 0 15 30
SCALE IN FEET

WARNING: IT IS A VIOLATION OF THE NYS EDUCATION LAW ARTICLE 145 FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER THIS ITEM IN ANY WAY.

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Langan International LLC
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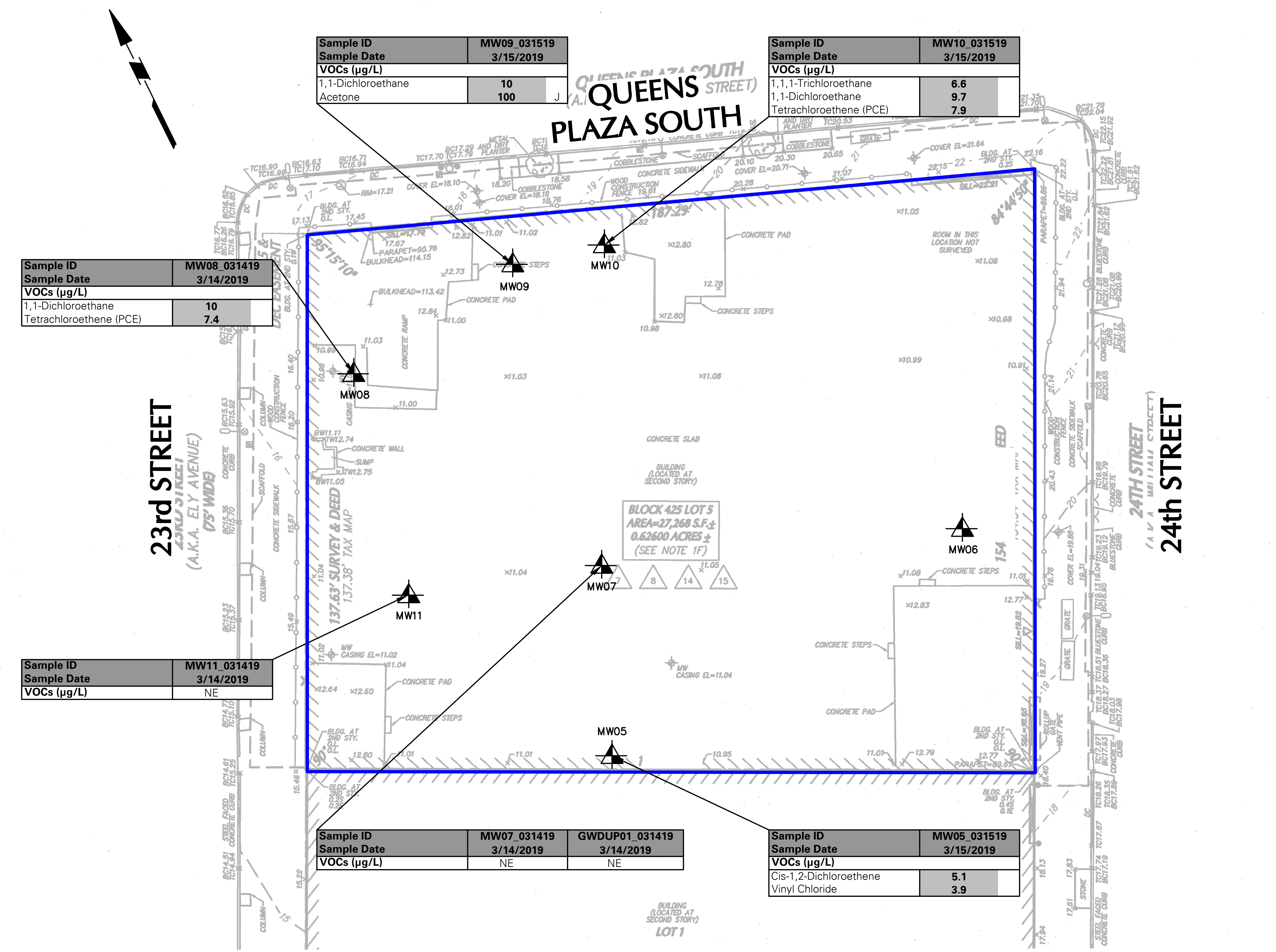
Project
23-10 QUEENS PLAZA SOUTH
BLOCK NO. 425, LOT NO. 5
QUEENS
LONG ISLAND CITY NEW YORK

Figure Title
ENDPOINT DOCUMENTATION SAMPLE LOCATIONS AND ANALYTICAL RESULTS AND EXCAVATION EXTENTS MAP

Project No. 170244603
Date 12/12/2018
Scale 1" = 30'
Drawn By RB
Submission Date –
Figure No. 5
Sheet 5 of 8

Filename: \\langan.com\data\NY\data6\170244601\Cadd Data - 170244601\2D-DesignFiles\Environmental\23-10 QPS SMP\Figure 4 - Endpoint Documentation Sample Locations and Results Map.dwg Date: 7/29/2019 Time: 17:21 User: vdepaula Style Table: Langan.stb Layout: ANSIB-BL



Sample ID	MW09_031519	
Sample Date	3/15/2019	
VOCs (µg/L)		
1,1-Dichloroethane	**10**	
Acetone	**100**	J

Sample ID	MW10_031519
Sample Date	3/15/2019
VOCs (µg/L)	
1,1,1-Trichloroethane	**6.6**
1,1-Dichloroethane	**9.7**
Tetrachloroethene (PCE)	**7.9**

Sample ID	MW08_031419
Sample Date	3/14/2019
VOCs (µg/L)	
1,1-Dichloroethane	**10**
Tetrachloroethene (PCE)	**7.4**

Sample ID	MW11_031419
Sample Date	3/14/2019
VOCs (µg/L)	NE

Sample ID	MW07_031419	GWDUP01_031419
Sample Date	3/14/2019	3/14/2019
VOCs (µg/L)	NE	NE

Sample ID	MW05_031519
Sample Date	3/15/2019
VOCs (µg/L)	
Cis-1,2-Dichloroethene	**5.1**
Vinyl Chloride	**3.9**

LEGEND:

SITE BOUNDARY

APPROXIMATE MONITORING WELL LOCATION (MW05)

Analyte	NYSDEC SGVs
VOCs (µg/L)	
1,1,1-Trichloroethane	5
1,1-Dichloroethane	5
Acetone	50
Cis-1,2-Dichloroethene	5
Tetrachloroethene (PCE)	5
Vinyl Chloride	2

NOTES:

1. BASE MAP REFERENCED FROM TOPOGRAPHIC AND BOUNDARY SURVEY BY LANGAN DATED 31 AUGUST 2018, AND REVISED 25 JULY 2019 (ELEVATIONS SHOW TOP OF SLAB).
2. ELEVATIONS ARE IN FEET AND REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
3. CONCENTRATIONS SHOWN ARE FORM THE SIXTH QUARTERLY MONITORING EVENT, CONDUCTED BETWEEN 14 AND 15 MARCH 2019. MONITORING WELL MW06 WAS NOT SAMPLED DURING THIS EVENT.
4. GROUNDWATER SAMPLE ANALYTICAL RESULTS ARE COMPARED TO THE NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONVERSION (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 (NYSDEC SGVs).
5. ONLY ANALYTES WITH CONCENTRATIONS ABOVE RELEVANT NYSDEC SGVs ARE SHOWN.
6. ANALYTES DETECTED WITH CONCENTRATIONS ABOVE NYSDEC SGVs ARE BOLDED AND SHADED.
7. VOC = VOLATILE ORGANIC COMPOUND
8. µg/L = MICROGRAMS PER LITER
9. NE = ANALYTE DOES NOT EXCEEDED RELEVANT SCOs
10. J = THE ANALYTE WAS POSITIVELY IDENTIFIED AND THE ASSOCIATED NUMERICAL VALUES IS THE APPROXIMATE CONCENTRATION OF THE ANALYTE IN THE SAMPLE.

WARNING: IT IS A VIOLATION OF THE NYS EDUCATION LAW ARTICLE 145 FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER THIS ITEM IN ANY WAY.

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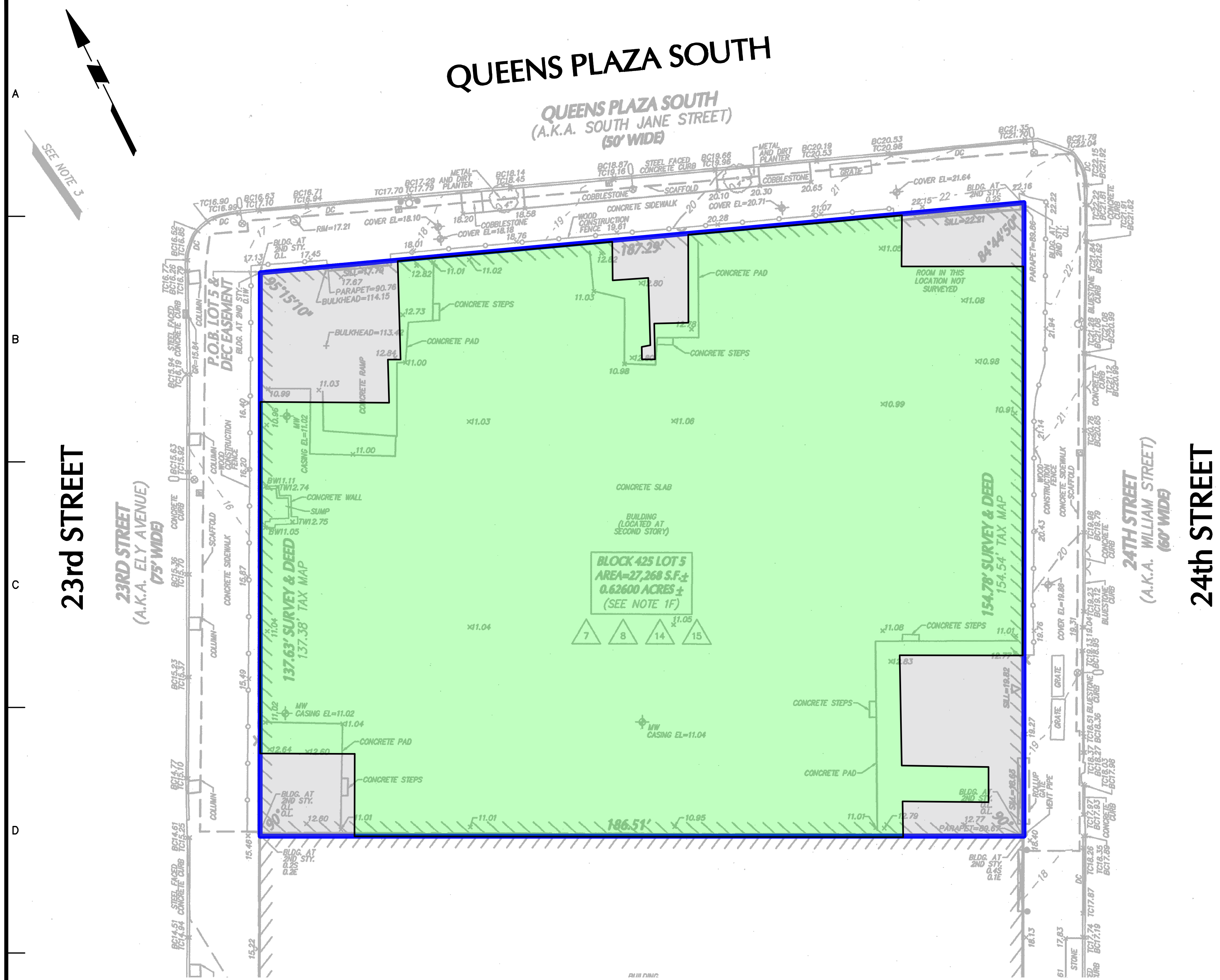
Project
23-10 QUEENS PLAZA SOUTH
BLOCK NO. 425, LOT NO. 5
QUEENS
LONG ISLAND CITY NEW YORK

Figure Title
GROUNDWATER MONITORING SAMPLE LOCATIONS AND RESULTS MAPS

Project No. 170244603	Figure No. 6
Date 7/29/2019	
Scale 1" = 30'	
Drawn By VDP	
Submission Date	Sheet 6 of 8

Filename: \\langan.com\data\NY\data6\170244601\Cadd Data - 170244601\2D-DesignFiles\Environmental\23-10 QPS SMP\Figure 5 - Groundwater Monitoring Sample Locations and Results Map.dwg Date: 7/29/2019 Time: 17:23 User: vdepaula Style Table: Langan.stb Layout: ANSIB-BL



LEGEND:

SITE BOUNDARY

MINIMUM FOUR-INCH-THICK NEW CONCRETE CELLAR SLAB

EXISTING COMPONENTS OF COMPOSITE COVER SYSTEM

NOTES:

1. BASE MAP REFERENCED FROM TOPOGRAPHIC AND BOUNDARY SURVEY BY LANGAN, DATED 31 AUGUST 2018, AND REVISED 25 JULY 2019 (ELEVATIONS SHOW TO OF SLAB).
2. ELEVATIONS ARE IN FEET AND REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).

30 0 15 30
SCALE IN FEET

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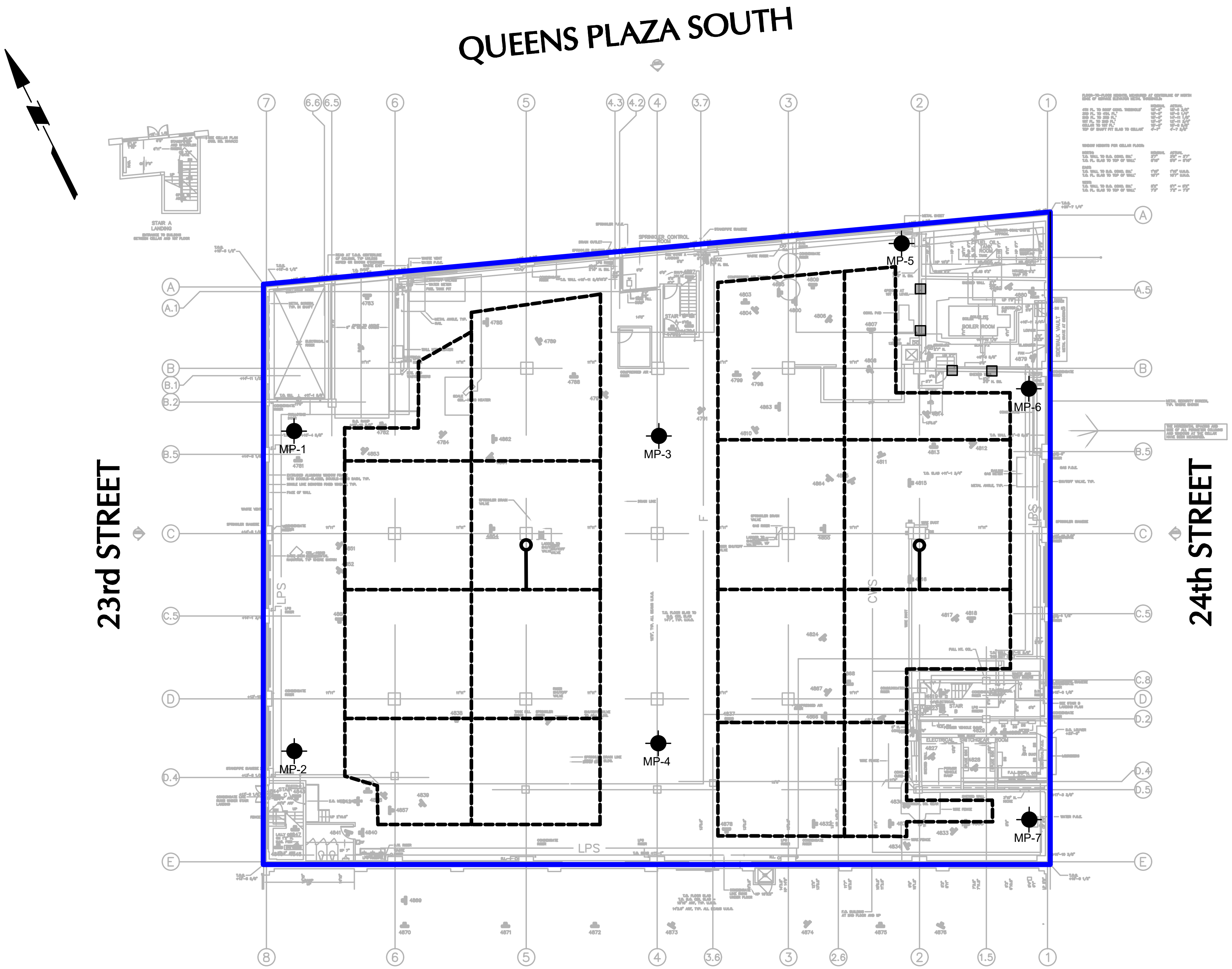
Project	Figure Title	Project No. 170244603	Figure No.
23-10 QUEENS PLAZA SOUTH BLOCK NO. 425, LOT NO. 5 QUEENS LONG ISLAND CITY NEW YORK	COMPOSITE COVER SYSTEM LAYOUT	Date 7/8/2019 Scale 1" = 30' Drawn By VDP Submission Date	7 Sheet 7 of 8

Filename: \\langan.com\data\NY\data6\170244601\Cadd Data - 170244601\2D-DesignFiles\Environmental\23-10 QPS SMP\Figure 7 - Composite Cover System.dwg Date: 7/29/2019 Time: 17:34 User: vdepaula Style Table: Langan.stb Layout: ANSIB-BL



LEGEND:

- SITE BOUNDARY
- APPROXIMATE PERFORATED PIPE LOCATION
- APPROXIMATE SOLID PIPE LOCATION
- APPROXIMATE RISER PIPE LOCATION
- APPROXIMATE COMMUNICATION HOLE LOCATION
- MP-1 APPROXIMATE PROPSOED MONITORING POINT LOCATION

NOTES:

1. BASE MAP REFERENCED FROM DRAWING TITLED "CELLAR EXISTING PLAN" BY JOHN BAIN ASSOCIATES DATED 25 SEPTEMBER 2013.

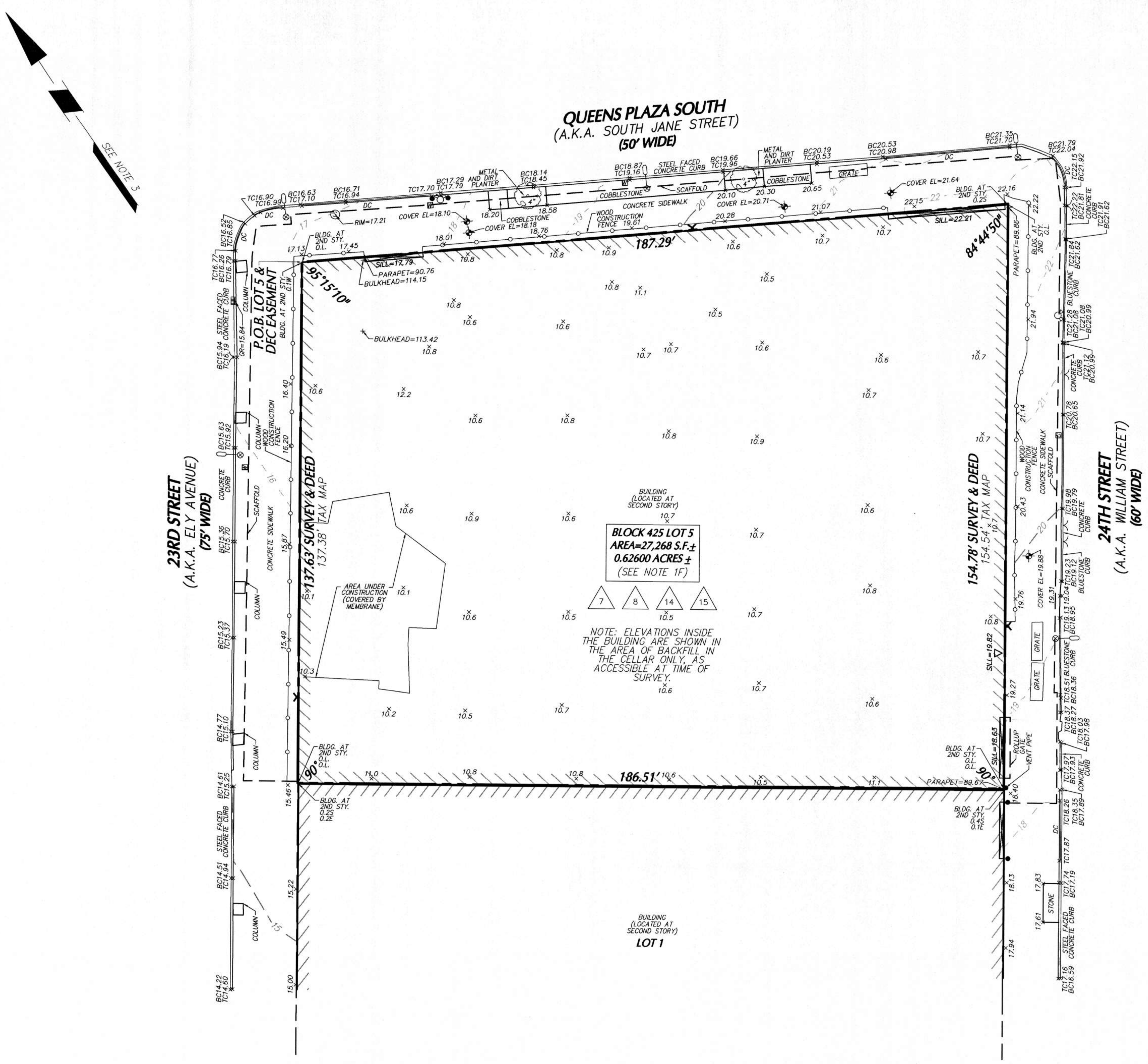
30 0 15 30
SCALE IN FEET

WARNING: IT IS A VIOLATION OF THE NYS EDUCATION LAW ARTICLE 145 FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER THIS ITEM IN ANY WAY.

LANGAN	Project	Figure Title	Project No. 170244603	Figure No.
21 Penn Plaza, 360 West 31st Street, 8th Floor New York, NY 10001 T: 212.479.5400 F: 212.479.5444 www.langan.com Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C. Langan Engineering and Environmental Services, Inc. Langan International LLC Collectively known as Langan	23-10 QUEENS PLAZA SOUTH BLOCK NO. 425, LOT NO. 5 QUEENS LONG ISLAND CITY NEW YORK	SUB-SLAB DEPRESSURIZATION SYSTEM LAYOUT	Date 12/28/2018 Scale 1" = 30' Drawn By RB Submission Date	8 Sheet 8 of 8

Filename: \\langan.com\data\NY\data6\170244601\Cadd Data - 170244601\2D-DesignFiles\Environmental\23-10 QPS SMP\Figure 8 - Sub-Slab Depressurization System Layout.dwg Date: 7/29/2019 Time: 17:28 User: vdepaula Style Table: Langan.stb Layout: ANSIB-BL

APPENDIX A
ENVIRONMENTAL EASEMENT SURVEY



NOTES

1. THIS SURVEY IS BASED UPON EXISTING PHYSICAL CONDITIONS FOUND AT THE SUBJECT SITE, AND THE FOLLOWING REFERENCES:

   A. BOROUGH OF QUEENS, LONG ISLAND CITY ATLAS MAP NO. 15.
   B. CURRENT NYC TAX MAP.
   C. SURVEY OF BLOCK 425, LOTS 1 AND 5, BY EARL B. LOVELL–S.P. BELCHER, INC., PROJECT NO. 311429, LAST REVISED 05/09/13.
   D. SURVEY OF 23–10 42ND ROAD, BLOCK 425, LOT 1, BY EARL B. LOVELL–S.P. BELCHER, INC., PROJECT NO. 315457, SURVEYED 12/15/14.
   E. TITLE NO.: 18–7406–52217–Q, BY FIDELITY NATIONAL TITLE INSURANCE COMPANY, EFFECTIVE 9:00AM ON 05/29/18.
   F. CRFN: 2013000012248, RECORDED/FILED: 01/10/13 11:38 [DEED– INCLUDES LOTS 1 AND 5] (LOT 5 (AKA "PARCEL 1")– PLOTTED)
   G. "TOPOGRAPHIC AND BOUNDARY SURVEY, 23–10 QUEENS PLAZA SOUTH", BY LANGAN, PROJECT NO. 170244603, DRAWING NO. VT101, LAST REVISED 10/23/18.

2. THE SURVEYED PROPERTY IS SUBJECT BUT NOT LIMITED TO THE FOLLOWING FACTS AS REVEALED BY THE HEREON REFERENCED INFORMATION. THE INFORMATION SHOWN HEREON DOES NOT CONSTITUTE A TITLE SEARCH BY THE SURVEYOR. ALL INFORMATION THAT MAY AFFECT THE QUALITY OF TITLE TO BOTH THE SUBJECT AND ADJOINING PARCELS SHOULD BE VERIFIED BY AN ACCURATE AND CURRENT TITLE REPORT.

   EXCEPTIONS AS NOTED FROM TITLE NO.: 18–7406–52217–Q, BY FIDELITY NATIONAL TITLE INSURANCE COMPANY (SEE NOTE 1E):

   7 CRFN: 2014000093715, RECORDED/FILED: 03/18/14 15:17 [PARKING RESTRICTIVE DECLARATION– INCLUDES LOT 5] (CANNOT PLOT)

   8 CRFN: 2014000205030, RECORDED/FILED: 06/16/14 11:47 [PARKING RESTRICTIVE DECLARATION– INCLUDES LOT 5] (CANNOT PLOT)

   9 CRFN: 2015000302414, RECORDED/FILED: 08/31/18 13:31 [ENVIRONMENTAL EASEMENT GRANTED PURSUANT TO ARTICLE 71, TITLE 36 OF THE NEW YORK STATE ENVIRONMENTAL LAW] (NOT PLOTTED– OFFSITE)

   14 CRFN: 2017000136970, RECORDED/FILED: 04/07/17 16:13 [ASSIGNMENT OF LEASES AND RENTS– INCLUDES LOT 5] (CANNOT PLOT)

   15 CRFN: 2017000136435, RECORDED/FILED: 04/07/17 13:12 [UCC FINANCING STATEMENT– INCLUDES LOT 5] (CANNOT PLOT)

3. THE MERIDIAN OF THIS SURVEY IS REFERENCED TO THE NEW YORK STATE PLANE COORDINATE SYSTEM NYLI NAD 83 AS ESTABLISHED BY GPS METHODS.

4. ELEVATIONS SHOWN ARE REFERENCED TO NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88) ESTABLISHED BY GPS METHODS.

5. STREET NAMES AS PER MAPS REFERENCED IN NOTES 1A AND 1B. R.O.W. WIDTHS AS PER MAP REFERENCED IN NOTE 1A. BLOCK AND LOT NUMBERS AS PER MAPS REFERENCED IN NOTE 1B.

6. PLANIMETRIC INFORMATION SHOWN HEREON HAS BEEN OBTAINED FROM GROUND SURVEYS BY LANGAN ENGINEERING, ENVIRONMENTAL, SURVEYING, LANDSCAPE ARCHITECTURE AND GEOLOGY, D.P.C. DURING AUGUST, SEPTEMBER, AND OCTOBER OF 2018.

7. FEMA INFORMATION:

   CURRENT:
   AS PER THE NATIONAL FLOOD INSURANCE PROGRAM FIRM MAP TITLED "CITY OF NEW YORK, NEW YORK, BRONX, RICHMOND, NEW YORK, QUEENS, AND KINGS COUNTIES, PANEL 089 OF 457, MAP NUMBER 3604970089F, REVISED 09/05/07", THE ENTIRE SUBJECT PROPERTY LIES WITHIN ZONE X (NOT SHADED), AN AREA DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN.

   PRELIMINARY:
   AS PER THE NATIONAL FLOOD INSURANCE PROGRAM FIRM MAP TITLED "CITY OF NEW YORK, NEW YORK, BRONX, RICHMOND, NEW YORK, QUEENS, AND KINGS COUNTIES, PANEL 089 OF 457, MAP NUMBER 3604970089G, PRELIMINARY DATED 12/05/13", THE ENTIRE SUBJECT PROPERTY LIES WITHIN ZONE X (NOT SHADED), AN AREA DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN.

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

9. WETLANDS, ENVIRONMENTAL AND/OR HAZARDOUS MATERIALS LOCATION, IF ANY, NOT COVERED UNDER THIS CONTRACT.

10. UNLESS SPECIFICALLY NOTED HEREON, STORM AND SANITARY SEWER INFORMATION (INCLUDING PIPE INVERT, PIPE MATERIAL, AND PIPE SIZE) WAS OBSERVED AND MEASURED AT FIELD LOCATED STRUCTURES (MANHOLES/CATCH BASINS, ETC). CONDITIONS CAN VARY FROM THOSE ENCOUNTERED AT THE TIMES WHEN AND THE LOCATIONS WHERE DATA WAS OBTAINED. DESPITE MEETING THE REQUIRED STANDARD OF CARE THE SURVEYOR CANNOT AND DOES NOT WARRANT THAT PIPE MATERIAL AND/OR PIPE SIZE THROUGHOUT THE PIPE RUN ARE THE SAME AS THOSE OBSERVED AT EACH STRUCTURE, OR THAT THE PIPE RUN IS STRAIGHT BETWEEN THE LOCATED STRUCTURES.

    ADDITIONAL UTILITY (WATER, GAS, ELECTRIC ETC...) DATA MAY BE SHOWN FROM FIELD LOCATED SURFACE MARKINGS (BY OTHERS), EXISTING STRUCTURES, AND/OR FROM EXISTING DRAWINGS.

    UNLESS SPECIFICALLY NOTED HEREON THE SURVEYOR HAS NOT EXCAVATED TO PHYSICALLY LOCATE THE UNDERGROUND UTILITIES. THE SURVEYOR MAKES NO GUARANTEES THAT THE SHOWN UNDERGROUND UTILITIES ARE EITHER IN SERVICE, ABANDONED OR SUITABLE FOR USE, NOR ARE IN THE EXACT LOCATION OR CONFIGURATION INDICATED HEREON.

    PRIOR TO ANY DESIGN OR CONSTRUCTION THE PROPER UTILITY AGENCIES MUST BE CONTACTED FOR VERIFICATION OF UTILITY TYPE AND FOR FIELD LOCATIONS.

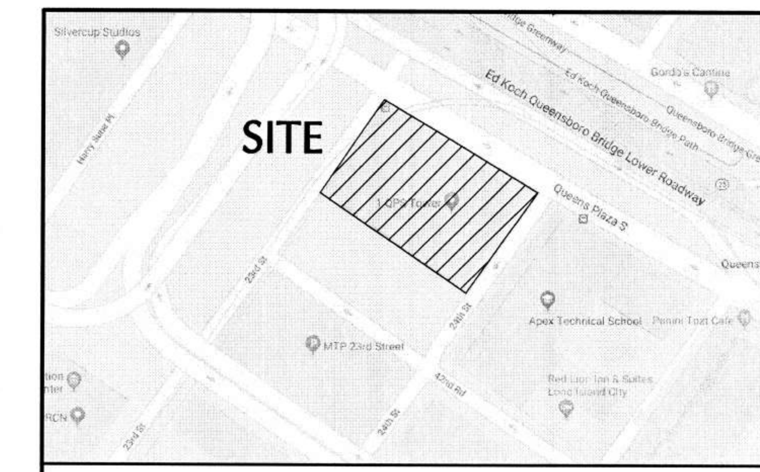
    UNLESS NOTED BELOW SUPPLEMENTAL DOCUMENTS WERE NOT USED TO COMPILE THE SUBSURFACE UTILITY INFORMATION SHOWN HEREON.

11. THIS IS TO CERTIFY THAT THERE ARE NO STREAMS NOR NATURAL WATERCOURSES ON THE PROPERTY AS SHOWN ON THIS SURVEY.

12. THERE WAS LIMITED ACCESS TO THE BUILDING CORNERS AT THE GROUND LEVEL FOR THE BUILDINGS ON THE SUBJECT AND ADJOINING PROPERTIES DUE TO CONSTRUCTION FENCING AND CAPPING COVERING THEM AT THE TIME OF THE SURVEY.

13. UNAUTHORIZED ALTERATION OR ADDITION TO A SURVEY MAP BEARING A LICENSED LAND SURVEYOR'S SEAL IS A VIOLATION OF SECTION 7209, SUB–DIVISION 2, OF THE NEW YORK STATE EDUCATION LAW.

14. THIS PLAN NOT VALID UNLESS EMBOSSED OR BLUE INK STAMPED WITH THE SEAL OF THE PROFESSIONAL.



PROJECT LOCATION MAP

SCALE: N.T.S.

SOURCE: GOOGLE

SURVEY DESCRIPTION

ALL THAT CERTAIN PLOT, PIECE, OR PARCEL OF LAND, SITUATE, LYING, AND BEING IN THE BOROUGH OF QUEENS, QUEENS COUNTY, CITY AND STATE OF NEW YORK, BOUNDED AND DESCRIBED AS FOLLOWS:

BEGINNING AT THE INTERSECTION OF THE SOUTHERLY SIDE OF QUEENS PLAZA SOUTH (A.K.A. SOUTH JANE STREET) (50 FEET WIDE) WITH THE EASTERLY SIDE OF 23RD STREET (A.K.A. ELY AVENUE) (75 FEET WIDE); AND RUNNING THENCE

EASTERLY, ALONG SAID SOUTHERLY SIDE OF QUEENS PLAZA SOUTH, A DISTANCE OF 187.29 FEET TO A POINT, SAID POINT BEING THE INTERSECTION OF SAID SOUTHERLY SIDE OF QUEENS PLAZA SOUTH WITH THE WESTERLY SIDE OF 24TH STREET (A.K.A. WILLIAM STREET) (60 FEET WIDE); THENCE

SOUTHERLY, ALONG SAID WESTERLY SIDE OF 24TH STREET, FORMING AN INTERIOR ANGLE OF 84°44'50" WITH THE PREVIOUS COURSE, A DISTANCE OF 154.78 FEET TO A POINT; THENCE

WESTERLY, FORMING AN INTERIOR ANGLE OF 90°00'00" WITH THE PREVIOUS COURSE, A DISTANCE OF 186.51 FEET TO A POINT, SAID POINT BEING ON SAID EASTERLY SIDE OF 23RD STREET; THENCE

NORTHERLY, ALONG SAID EASTERLY SIDE OF 23RD STREET, A DISTANCE OF 137.63 FEET TO THE POINT OR PLACE OF BEGINNING.

ENCOMPASSING AN AREA OF 27,268 SQUARE FEET OR 0.62600 ACRES, MORE OR LESS.

DEED DESCRIPTION (SEE NOTE 1F- "PARCEL 1" ONLY)

ALL THAT CERTAIN PLOT, PIECE OR PARCEL OF LAND, WITH THE BUILDINGS AND IMPROVEMENTS THEREON ERECTED, SITUATE, LYING AND BEING IN THE FIRST WARD OF THE BOROUGH OF QUEENS, CITY OF NEW YORK, COUNTY OF QUEENS AND STATE OF NEW YORK, BOUNDED AND DESCRIBED AS FOLLOWS:

BEGINNING AT THE CORNER FORMED BY THE INTERSECTION OF THE SOUTHEASTERLY SIDE OF ELY AVENUE (NOW TWENTY–THIRD STREET) WITH THE SOUTHWESTERLY SIDE OF SOUTH JANE STREET, AS SAID STREETS ARE NOW LAID OUT AND OPENED AND;

RUNNING THENCE SOUTHWESTERLY ALONG THE SOUTHEASTERLY SIDE OF ELY AVENUE (NOW TWENTY–THIRD STREET) 137.63 FEET AND;

THENCE SOUTHEASTERLY AT RIGHT ANGLES TO ELY AVENUE (NOW TWENTY–THIRD STREET) 186.51 FEET TO THE NORTHWESTERLY SIDE OF WILLIAM STREET (NOW TWENTY–FOURTH STREET) AND;

THENCE NORTHEASTERLY ALONG THE NORTHWESTERLY SIDE OF WILLIAM STREET (NOW TWENTY–FOURTH STREET) 154.78 FEET TO THE SOUTHWESTERLY SIDE OF SOUTH JANE STREET;

THENCE NORTHWESTERLY ALONG THE SOUTHWESTERLY SIDE OF SOUTH JANE STREET, 187.29 FEET TO THE POINT OR PLACE OF BEGINNING.

LEGEND (NOT SHOWN TO SCALE)

HYDRANT
STAND PIPE
ROOF DRAIN
FLAG POLE
PEDESTAL LIGHT
STREET LIGHT
AREA LIGHT
SIGNAL POLE
POWER POLE
GUY WIRE
ANCHOR POLE
MANHOLE (TYPE AS LABELED)
WATER VALVE
GAS VALVE
UNKNOWN VALVE
CATCH BASIN
x322.35 — SPOT ELEVATION
CO — CLEAN OUT
TREE

SIGN
BOLLARD
E — ELECTRIC BOX
EM — ELECTRIC METER
GM — GAS METER
WM — WATER METER
T — TELEPHONE BOX
TRAFFIC SIGNAL POLE
MONITOR WELL
BENCH
DOOR
DOUBLE DOOR
ROLL UP DOOR
YARD DRAIN
M — MAILBOX
BW — BOTTOM OF WALL
TW — TOP OF WALL
BC — BOTTOM OF CURB
TC — TOP OF CURB
DC — DROP CURB
P.O.B. — POINT OF BEGINNING

BLDG. — BUILDING
O.L. — ON LINE
N — NORTH
S — SOUTH
W — WEST
E — EAST
STY. — STORY
GR — GRATE
EL — ELEVATION
FF=322.35 — FINISHED FLOOR
OVERHEAD WIRE
GUIDE RAIL WOOD
GUIDE RAIL METAL
TREE LINE
CHAINLINK FENCE
STOCKADE FENCE
IRON FENCE
EASEMENT LINE
PROPERTY LINE
RIGHT–OF–WAY LINE

322 — CONTOUR LINE
G — GAS MARK OUT LINE
W — WATER MARK OUT LINE
E — ELECTRIC MARK OUT LINE
T — COMMUNICATION MARK OUT LINE
S — SANITARY MARK OUT LINE
D — DRAINAGE MARK OUT LINE
UNK — UNKNOWN UTILITY MARK OUT LINE
*R — REFERENCE UTILITY LINE (TYPE AS NOTED) – PLOTTED FROM EXISTING MAPPING
7 — EXCEPTION AS NOTED FROM TITLE REPORT (TYPICAL) (SEE NOTE 1E)

NOTE: AT THE TIME OF THE LAST FIELD VISIT DURING OCTOBER OF 2018, THE SITE WAS STILL IN THE PROCESS OF BEING REMEDIATED.

4.82 0 1.20 2.41 4.82 SCALE IN METERS

20 0 5 10 20 SCALE IN FEET

THIS PROPERTY IS SUBJECT TO AN ENVIRONMENTAL EASEMENT HELD BY THE NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION PURSUANT TO TITLE 36 OF ARTICLE 71 OF THE NEW YORK ENVIRONMENTAL CONSERVATION LAW. THE ENGINEERING AND INSTITUTIONAL CONTROLS FOR THIS EASEMENT ARE SET FORTH IN MORE DETAIL IN THE SITE MANAGEMENT PLAN (SMP). A COPY OF THE SMP MUST BE OBTAINED BY ANY PARTY WITH AN INTEREST IN THE PROPERTY. THE SMP CAN BE OBTAINED FROM NYS DEPARTMENT OF ENVIRONMENTAL CONSERVATION, DIVISION OF ENVIRONMENTAL REMEDIATION, SITE CONTROL SECTION, 625 BROADWAY, ALBANY, NY 12233 OR AT derweb@dec.ny.gov.

Date	Description	No.
06/18/19	Deed Description Only	1

REVISIONS

"I hereby state that this plan is based on a field survey made by me or under my immediate supervision in accordance with NYSPLS Code of Practice for Land Surveys, and to the best of my professional knowledge, information, and belief, and in my professional opinion, correctly represents the conditions found on the date of the field survey at the subject property".

SIGNATURE 6-18-2019 DATE SIGNED

PAUL FISHER
PROFESSIONAL LAND SURVEYOR
NY Lic. No. 050784-1

LANGAN
Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.
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Project
23-10 QUEENS PLAZA SOUTH
BLOCK No. 425, LOT No. 5
BOROUGH OF QUEENS
CITY OF NEW YORK
QUEENS COUNTY NEW YORK

Drawing Title
DEC EASEMENT SURVEY

Project No. 170244603
Date 04/17/19
Scale 1"=20'
Drawn By LB
Checked By PDF

Drawing No.
DEC101

Sheet 001 of 001

LANGAN

PROJECT NO. 170244603

Filename: \\langan.com\data\NYC\data6\170244603\Survey Data - 170244603\Carlson\Existing\170244603-V-EX0101-DEC ESMT.dwg Date: 6/18/2019 Time: 16:12 User: lberliner Style Table: Langan.stb Layout: ARCHD-BL

APPENDIX B
LIST OF SITE CONTACTS

APPENDIX B - LIST OF SITE CONTACTS

Key contacts for this project are as follows:

Site Owner and Remedial Party:	QPS 23-10 Development LLC Mr. Randy Marble Telephone: (212) 610-2854 E-mail: rmarble@properymg.com
Remedial Party's Consultant:	Langan Engineering Program Manager Mr. Michael D. Burke, PG, CHMM Telephone: (212) 479-5413 E-mail: mburke@langan.com
	Langan Engineering Project Manager Mr. Paul McMahon, P.E. Telephone: (212) 479-5451 E-mail: pmcmahon@langan.com
	Langan Engineering Health & Safety Officer Mr. William Bohrer Telephone: (212) 479-5533 E-mail: wbohrer@langan.com
	Langan Engineering Field Safety Officer Mr. Vinicius De Paula, EIT Telephone: (212) 479-5499 x5774 E-mail: vdepaula@langan.com
NYSDEC:	NYSDEC Project Manager Ms. Ronnie E. Lee, P.E. Telephone: (518) 402-9767 E-mail: ronnie.lee@dec.ny.gov
	NYSDEC Region 2 HW Engineer Ms. Jane O'Connell Telephone: (718) 482-4599 E-mail: jane.oconnell@dec.ny.gov
	NYSDEC Site Control Kelly A. Lewandowski Telephone: (518) 402-9569 E-mail: kelly.lewandowski@dec.ny.gov

NYSDOH:	NYSDOH Project Manager Ms. Wendy S. Kuehner Telephone: (518) 402-7860 Email: wendy.kuehner@health.ny.gov
Remedial Party's Attorney:	Sive, Paget & Riesel P.C. Ms. David Yudelson, Esq. Telephone: (646) 378-7219 E-mail: dyudelson@sprlaw.com

APPENDIX C
EXCAVATION WORK PLAN

APPENDIX C – EXCAVATION WORK PLAN

C-1 NOTIFICATION

At least 15 days prior to the start of an activity that is anticipated to encounter remaining contamination, the Site owner or their representative will notify the New York State Department of Environmental Conservation (NYSDEC). Table 1 includes contact information for the above notification. The information on this table will be updated as necessary to provide accurate contact information.

Table 1: Notifications*

NYSDEC Project Manager:	Ronnie E. Lee, P.E. (518) 402-9767
NYSDEC Region 2 HW Engineer	Jane O'Connell (718) 482-4599
NYSDEC Site Control	Kelly A. Lewandowski (518) 402-9569
Owner Representative:	Randy Marble (212) 610-2854
Program Manager:	Michael D. Burke, PG, CHMM (212) 479-5413
Project Manager:	Paul McMahon, P.E. (212) 479-5451
Health & Safety Officer (HSO):	William Bohrer (212) 479-5333
Field Safety Officer (FSO):	Vinicius De Paula, EIT (212) 479-5499 x5774

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

This notification will include:

- A detailed description of the work to be performed, including the location and extent of excavation activity, plans/drawings for Site re-grading, intrusive elements or utilities to be installed, estimated volumes of contaminated soil to be excavated and work that may impact an engineering control;
- A summary of environmental conditions anticipated to be encountered in the work areas, including the nature and concentration levels of contaminants of concern, potential presence of grossly contaminated media, and plans for pre-construction sampling;
- A schedule for the work, detailing the start and completion of all ground intrusive work;
- A summary of the applicable components of this Excavation Work Plan (EWP);
- A statement that the work will be performed in compliance with this EWP and 29 Code of Federal Regulations (CFR) 1910.120;
- A copy of the contractor's health and safety plan (HASP), in electronic format, if it differs from the HASP provided in Appendix D of the Site Management Plan (SMP);

- Identification of disposal facilities for potential waste streams; and
- Identification of sources of anticipated backfill, along with all required chemical testing results.

C-2 SOIL SCREENING METHODS

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

Excavated material will be segregated based on previous environmental data and screening results into two classes - material that requires off-site disposal and material that requires testing to determine if the material can be reused on-site (either as backfill or cover soil). Further discussion of off-site disposal of materials and on-site reuse is provided in Sections 6 and 7 of this Appendix.

C-3 SOIL STAGING METHODS

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

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

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

C-4 MATERIALS EXCAVATION AND LOAD OUT

A QEP or field staff under their supervision will oversee all invasive work and the excavation and load-out of all excavated material.

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

The presence of utilities and easements on the Site will be investigated by the owner. It will be determined whether a risk or impediment to the planned work is posed by utilities or easements on the Site.

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

A truck wash/cleaning area will be operated on-site, as appropriate. The QEP or field staff under their supervision will be responsible for documenting that all outbound trucks are washed/cleaned at the truck wash before leaving the Site until the work activities are complete. Locations where vehicles enter or exit the Site will be inspected daily for evidence of off-site sediment tracking. The QEP or field staff under their supervision will be responsible for documenting that egress points for truck and equipment transport from the Site are clean of dirt and other materials derived from the Site during remediation and development. Cleaning of the adjacent streets will be performed as needed to maintain a clean condition with respect to site-derived materials.

C-5 MATERIALS TRANSPORT OFF-SITE

Transport of materials will be performed by licensed haulers in accordance with appropriate local, state and federal regulations, including 6 NYCRR Part 364. Haulers will be appropriately licensed and trucks properly placarded. Trucks will enter and exit the Site using dedicated ingress/egress points. Trucks loaded with site materials will exit the vicinity of the Site using only approved truck routes. Trucks will be prohibited from stopping and idling in the neighborhood outside the Site. To the extent possible, queuing of trucks will be performed on-site to minimize off-site disturbance. Off-site queuing will be minimized.

Truck routes will take into account:

- Limiting transport through residential areas and past sensitive sites;
- Use of city mapped truck routes;
- Prohibiting off-site queuing of trucks entering the facility to the extent possible;
- Limiting total distance to major highways;
- Promoting safety in access to highways;
- Overall safety in transport; and
- Community input (where necessary).

C-6 MATERIALS DISPOSAL OFF-SITE

Soil/fill/solid waste excavated and removed from the Site will be handled, transported and disposed of 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 the NYSDEC's Project Manager. Unregulated off-site management of materials from this Site is prohibited without formal NYSDEC approval.

Material that does not meet Track 1 Unrestricted Use Soil Cleanup Objectives (SCOs), historic fill, hazardous waste, and other contaminated soil is prohibited from being taken to a New York State construction and demolition debris handling and recovery facility (6 NYCRR Part 360.155). Non-hazardous historic fill and contaminated soil will be managed, at a minimum, as a solid waste per 6 NYCRR Parts 360, 361, 363, and 364, and disposed of at a facility licensed to accept the material.

Hazardous wastes derived from the Site (not expected) will be managed, transported and disposed of in full compliance with applicable local, state and federal regulations.

The following documentation will be obtained and reported by the QEP for each off-site disposal location used to fully demonstrate and document that the disposal of material derived from the Site conforms to applicable laws:

1) A letter from the QEP or Brownfield Cleanup Program Volunteer 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 QEP. The letter will include as an attachment a summary of all chemical data for the material being transported (including site characterization data); and

2) A letter from each receiving facility stating it is in receipt of the correspondence (above) and is approved to accept the material. These documents will be included in the Periodic Review Report (PRR).

The PRR will include an account of the destination of all material removed from the Site during the remedy, including excavated soil, contaminated soil, historic fill, solid waste, hazardous waste, non-regulated material, and fluids. Documentation associated with disposal of material must also include records (i.e., manifests and scale tickets) and approvals for receipt of the material by the facilities. This information will also be presented in the PRR.

C-7 MATERIALS REUSE ON-SITE

The reuse of on-site materials must follow the procedures included in this EWP and the SMP so that unacceptable material is not reused on-site. Grossly-contaminated soil, historic fill, or soil with petroleum staining or odor will not be reused on-site. Soil acceptable for reuse (i.e., below demarcation layers or impervious surfaces, as backfill for subsurface utility lines, or as cover soil) must be of natural origin, non-hazardous and meet the lower of the 6 NYCRR Part 375-6.8(b) Restricted Use – Residential SCOs or Protection of Groundwater SCOs.

Demolition debris proposed for reuse on-site will be sampled for asbestos and the results will be reported to the NYSDEC for acceptance, as appropriate. On-site, mechanical processing of historic fill, contaminated soil, and construction and demolition debris is prohibited unless otherwise approved by the NYSDEC. Organic matter (wood, roots, stumps, etc.) or other solid waste derived from clearing and grubbing of the Site will not be reused on-site.

C-8 FLUIDS MANAGEMENT

Liquids to be removed from the Site, including dewatering fluids, will be handled, transported and disposed of in accordance with applicable local, state and federal regulations. Discharges to the New York City sewer system must be approved by the New York City Department of Environmental Protection (NYCDEP).

Dewatering may be conducted via a sump or well-point system. Dewatering fluids will either be containerized for off-site disposal or discharged to a New York City sewer system in accordance with a NYCDEP permit, but will not be recharged back to the land surface or subsurface of the Site without a Non-Jurisdictional Determination or State Pollutant Discharge Elimination System permit.

C-9 COVER SYSTEM RESTORATION

After the completion of activities that penetrate or compromise the composite cover system, the composite cover system, including the 6-mil polyethylene underlying the concrete slab, and sub-slab depressurization (SSD) system will be restored in a manner that complies with the SMP. If the type of cover system changes from that which existed prior to the invasive/excavation activity (i.e., a soil cover is replaced by asphalt), this will constitute a modification of the cover element of the remedy. A figure showing the modified cover system will be included in the subsequent Periodic Review Report and an updated SMP will be prepared and submitted to the NYSDEC.

C-10 BACKFILL FROM OFF-SITE SOURCES

Materials proposed for import to the Site will be approved by the QEP and will be in compliance with provisions in this SMP before they are shipped to the Site. Imported backfill will meet the backfill and cover soil quality standards established in 6 NYCRR 375-6.7(d) or other acceptable fill material such as virgin, native stone from a quarry or RCA. Soils that meet ‘exempt’ fill requirements under 6 NYCRR Part 360, but do not meet backfill or cover soil objectives for this Site, will not be imported onto the Site without prior approval by NYSDEC. 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.

A Request to Import/Reuse Fill or Soil form, which can be found at http://www.dec.ny.gov/regulations/67386.html, will be prepared and submitted to the NYSDEC project manager allowing a minimum of seven days for review.

Composite samples (with the exception of VOCs) of imported soil/fill will be taken at a frequency in accordance with DER-10 Table 5.4(e)10, or at a lesser frequency negotiated with the NYSDEC Project Manager, depending on the proposed source material. The samples would be analyzed for Target Compound List/Target Analyte List (TCL/TAL) VOCs, SVOCs (including 1,4-dioxane), metals, pesticides, polychlorinated biphenyls (PCBs), applicable emerging contaminants (per- and polyfluoroalkyl substances (PFAS)), and metals/inorganics, including all compounds listed in Table 375-6.8 of 6 NYCRR Part 375, by a NYSDOH Environmental Laboratory Approval Program-certified laboratory. Once it is determined that the fill material meets backfill and cover soil quality SCOs, the material will be loaded onto trucks with secure covers for delivery.

RCA can be imported from facilities permitted or registered by the NYSDEC provided the NYSDEC Project Manager issues a case-specific beneficial use determination (BUD), if necessary. Facilities will be identified in the PRR. A PE/QEP will certify that the facilities have 6 NYCRR Part 360 registration and permitting for the period of acquisition of RCA. RCA imported from compliant facilities and virgin gravel, rock or stone from mines, quarries or facilities permitted or registered by the NYSDEC or the applicable state of origin and have no more than 10% by weight passing through a No. 10 sieve will not require additional testing unless required by NYSDEC under its terms for operation of the facility. Additional exemptions from testing requirements may be approved by the NYSDEC Project Manager based on their review of requests by the QEP. RCA imported to the Site must be derived from recognizable and uncontaminated concrete. RCA material is not acceptable for, and will not be used as cover material.

Trucks entering the Site with imported soil will be securely covered with tight fitting covers.

C-11 STORMWATER POLLUTION PREVENTION

Silt fencing or hay bales will be installed around the perimeter of the construction area, as required. Barriers and hay bale checks will be installed and inspected once a week and after every storm event; necessary repairs will be made immediately. Results of inspections will be recorded in a logbook maintained at the Site and available for inspection by the NYSDEC. Accumulated sediments will be removed as required to keep the barrier and hay bale check functional. Undercutting or erosion of the silt fence toe anchor will be repaired immediately with appropriate backfill materials. Manufacturer's recommendations will be followed for replacing silt fence damaged due to weathering. Accessible discharge locations or points will be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters.

C-12 EXCAVATION CONTINGENCY PLAN

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

Sampling will be performed on product, sediment and surrounding soils, etc. as necessary to determine the nature of the material and proper disposal method. Chemical analysis will be performed and include TCL/TAL VOCs, SVOCs, pesticides, PCBs, and inorganics/metals unless the Site history and previous sampling results provide a sufficient justification to limit the list of analytes. In this case, a reduced list of analytes will be proposed to the NYSDEC for approval prior to sampling.

Identification of unknown or unexpected contaminated media identified by screening during invasive site work will be promptly communicated by phone to NYSDEC’s Project Manager. Petroleum spills or releases will also be reported to the NYSDEC Spills Hotline, as required.

Relevant findings will be also included in the PRR.

C-13 COMMUNITY AIR MONITORING PLAN

A CAMP has been prepared and is included as Appendix D of the SMP.

The locations of air sampling stations will be based on the prevailing wind direction will be adjusted on a daily or more frequent basis based on actual wind directions to provide an upwind and at least one downwind monitoring station. If a sensitive receptor, such as a school, day care or residential area is adjacent to the Site, a fixed monitoring station will be located at that site perimeter, as necessary.

Exceedances of action levels listed in the CAMP will be reported to NYSDEC and New York State Department of Health (NYSDOH) Project Managers.

C-14 ODOR CONTROL PLAN

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

If nuisance odors are identified at the Ssite boundary, or if odor complaints are received, work will be halted and the source of odors will be identified and corrected. Work will not resume until relevant nuisance odors are abated. NYSDEC and NYSDOH will be notified of odor events and other complaints about the project. Implementation of odor controls, including the halt of work, will be the responsibility of the QEP. Application of odor controls is the responsibility of the contractor. Odor control measures that are implemented will be summarized in the PRR.

All necessary means will be employed to prevent on-site nuisances and off-site nuisances that originate from site conditions. 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 foams to cover exposed odorous soils, where other methods prove ineffective. 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 develop during remedial work and cannot be corrected, or where the release of nuisance odors cannot otherwise be avoided because of 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.

C-15 DUST CONTROL PLAN

Dust suppression will include, at a minimum, the controls listed below:

- Dust suppression will be achieved through the use of a dedicated water distribution system, on-site water trucks, or an alternate source with suitable supply and pressure for use in dust control.
- Virgin crushed stone or RCA will be used on roadways to provide a clean and dust-free road surface.
- The area of on-site roads will be limited to minimize the area requiring dust suppression.

C-16 OTHER NUISANCES

A plan for rodent control will be developed and followed by the contractor before and during site clearing and grubbing, and during remedial work.

A plan for noise control will be developed and followed by the contractor for remedial work and will conform, at a minimum, to NYCDEP noise control standards.

APPENDIX D
HEALTH AND SAFETY PLAN

HEALTH AND SAFETY PLAN

FOR

23-10 QUEENS PLAZA SOUTH
NYC TAX BLOCK 425, LOT 5
NEW YORK, NY 11101

Prepared For

QPS 23-10 Developer LLC
Property Markets Group
111 Fifth Avenue, 6th Floor
New York, NY 10003

Prepared By:

Langan Engineering, Environmental, Surveying
Landscape Architecture, and Geology, D.P.C.
21 Penn Plaza
360 West 31st Street, 8th Floor
New York, New York 10001

September 2019
Langan Project No. 170244603

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

1.0 INTRODUCTION

1.1 General

This HEALTH AND SAFETY PLAN (HASP) was developed to address disturbance of known and reasonably anticipated subsurface contaminants and comply with Occupational Safety and Health Administration (OSHA) Standard 29 CFR 1910.120(b)(4), *Hazardous Waste Operations and Emergency Response* during anticipated site work at 23-10 Queens Plaza South, Long Island City, New York (Tax Map Block 425, Lot 5) ("the Site"). This HASP provides the minimum requirements for implementing site operations during future remedial measure activities. All contractors performing work on this site shall implement their own HASP that, at a minimum, adheres to this HASP. The contractor is responsible for their own health and safety and that of their subcontractors. Langan personnel will implement this HASP while onsite.

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

1.2 Site Location and Background

The project site (Block 425, Lot 5) is located at 23-10 Queens Plaza South in the County of Queens, Long Island City, New York and consists of a rectangular lot. In a survey prepared by Earl B. Lovell – S.P. Belchar Inc. dated February 26, 2013, the site area was reported to be 27,269 square feet. A site location map is included as Figure 1. The site is on the city block bordered by Queens Plaza South to the north, 24th Street to the east, 42nd Road to the south, and 23rd Street to the west. The site is improved with a four-story building with a basement and partial sub-basement that prior to development was partially vacant and used as a field office for the construction on the southern adjacent Lot 1.

The redevelopment of the site included the renovation of the existing structure and conversion into a commercial parking lot and office space. The cellar will be used for commercial space, the first and second floors will be used for parking and an office lobby, and the third and fourth floors will be office space. The site is in an area primarily characterized by mixed commercial and industrial use with light residential use.

1.3 Summary of Work Tasks

1.3.1 Excavation and Soil Screening

Langan personnel will screen excavated material for visual, olfactory, and instrumental indicators suggestive of a potential chemical or petroleum release. Instrument screening for the presence of volatile organic compounds (VOCs) may be performed with a calibrated photoionization detector (PID) equipped with a 10.6 electron volt (eV) bulb (or equivalent). Contractors will excavate for utilities, foundation components and potential grading using heavy equipment and hand tools. Contractors will notify Langan personnel if they identify indications suggestive of a potential chemical or petroleum release. Contaminated material shall be handled and property disposed in accordance with federal, state and city regulations, criteria and guidelines.

1.3.2 Soil Screening

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

1.3.3 Soil Sampling

Soil samples for excavation endpoint or delineation sampling (along with Quality Assurance/Quality Control [QA/QC] samples) may be collected into laboratory-supplied batch-certified clean glassware and submitted to a NYSDOH ELAP.

1.3.4 Stockpiling

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

1.3.5 Characterization of Excavated Material

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

1.3.6 Excavation Backfill

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

1.3.7 Removal of Underground Storage Tank

If encountered, the contractor shall furnish all labor and materials, equipment and incidentals required for the proper decontamination, removal and closure of any UST in accordance with federal, state and local regulations. Langan personnel will monitor VOCs with a calibrated PID downwind from the UST excavation and record the PID readings.

1.3.8 Construction Dewatering

If dewatering is required, the dewatering contractor shall be responsible for handling contaminated dewatering fluids in accordance with federal, state and local regulations. Dewatering fluids are to be discharged to the local sanitary sewer system after treatment and under approved regulatory permit. Alternatively, the contractor may provide containerized storage to allow for testing of groundwater prior to, and after, treatment and before disposal. If required, Langan field personnel may sample dewatering treatment system liquids from either a discharge standpipe or a storage tank. Dewatering samples will be submitted to a NYSDOH ELAP-certified laboratory for analysis.

1.3.9 Construction Activity Inspections and Observations

Langan may observe construction activities including the installation of piles, caissons and rock anchors. In addition, Langan may observe and record data from a lateral load test. These activities are to be done in accordance with the work plan and when required, under the direction of a PE. The installation and assembly activities performed by the contractor in accordance with the construction documents, remedial plan, and special inspection requirements administered by the New York City Department of Buildings. Materials used for construction will be inspected by Langan for conformance to the design documents.

1.3.10 Management of Investigative-Derived Waste

The investigative-derived waste (IDW) generated during this investigation will be contained in

DOT-approved 55-gallon drums. The drums will be temporarily stored on the site or as directed by the client representative. All drums will be filled between to two-thirds full to allow easy maneuvering during drum pickup and disposal. Drum labels are to be provided by Langan (Environmental Closet). All drums will be labeled as “IDW Pending Analysis” until sample data are reported from the laboratory. Drum labels will include date filled and locations where waste was generated along with the standard information required by the labels in accordance with the Langan SOP09, Drum Labeling..

Closed top drums are to be used to store liquids. Debris, including plastic sheeting, polyethylene tubing, personal protection equipment (PPE), decontamination debris, etc. will be segregated from and disposed in large heavy duty garbage bags and disposed of at the site. Excess unused glassware should be returned to the lab along with the last day of collection samples.

1.3.11 Drum Sampling

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

1.3.12 Monitoring Well Installation and Sampling

Langan will retain a drilling contractor to advance soil borings to a depth below grade surface (bgs) for completion as monitoring wells as specified in the work plan. Borings will be installed at the approximate locations indicated in Langan’s work plan, and may be moved in the field based on utility clearance and accessibility. The drilling contractor will contact the appropriate utility mark-out authority and make available to their drilling staff the verification number and effective dates.

Langan personnel will screen soil for visual, olfactory, and instrumental indicators suggestive of a potential petroleum release. Instrument screening for the presence of VOCs may be performed with a calibrated photoionization detector (PID) equipped with a 10.6 electron volt (eV) bulb (or equivalent). Langan personnel may collect soil samples from the proposed soil boring locations following the sampling plan outlined in the work plan.

Soil samples May be submitted to a NYSDOH ELAP-certified laboratory and analyzed in accordance with work plan specifications.

Groundwater samples will be collected from one or more of the new and if available, pre-existing monitoring wells in accordance with the Langan Low Flow Groundwater Sampling SOP (SOP #12). Groundwater samples will be submitted to an NYSDOH ELAP-certified laboratory and analyzed for constituents as specified in the work plan. The monitoring wells may be backfilled and abandoned in accordance with State and Local regulations at a later unspecified date.

1.3.13 Injection Well Installation and Sampling

Langan will retain a drilling contractor to advance soil borings to a depth bgs specified in the work plan. Borings will be installed at the approximate locations indicated in Langan's work plan, and may be moved in the field based on utility clearance and accessibility. The drilling contractor will contact the appropriate utility mark-out authority and make available to their drilling staff the verification number and effective dates.

Langan personnel will screen soil for visual, olfactory, and instrumental indicators suggestive of a potential petroleum release. Instrument screening for the presence of VOCs may be performed with a calibrated PID. Langan personnel may collect soil samples from the proposed soil boring locations following the sampling plan outlined in the work plan.

Selected soil borings will be converted into injection. Injection wells will be completed in accordance with the work plan based and following the completion program outlined in the in-situ groundwater treatment plan.

1.3.14 In-Situ Groundwater Treatment

Langan may oversee an in-situ treatment of impacted groundwater and soil using the injection wells. A contractor may be retained to injecting oxygen release compounds or other product into new or existing wells located in on the site. Langan will oversee the treatability/feasibility study and based on the data derived, design and document the installation and start-up of the in-situ groundwater treatment system.

1.3.15 Installation of Sub-Membrane Depressurization System (SMDS)

A properly licensed contractor will install the sub-membrane depressurization system in accordance with specifications outlined in the work plan. Langan personnel well observe the installation of the SSDS and record the information specified in the work plan. These activities are to be done in accordance with the work plan and when required, under the direction of a PE.

1.3.16 Site – wide Inspection

Site-wide inspections will be performed annually. Modification to the frequency or duration of the inspections will require approval from the NYSDEC. Site-wide inspections will also be performed after all severe weather conditions that may affect ECs or monitoring devices. During these inspections, an inspection form will be completed. The inspections will determine and document the following:

- Whether ECs continue to perform as designed;
- If these controls continue to be protective of human health and the environment;
- Compliance with requirements of this SMP and the Environmental Easement;
- Achievement of remedial performance criteria; and
- If site records are complete and up to date.

1.3.17 Sub-slab Depressurization (SSD) System Monitoring

Inspection will be conducted on a quarterly basis during the first year of implementation to establish that it is operational and performing within the design specifications. Thereafter, the frequency will be determined by NYSDEC and NYSDOH but is assumed to be annually. A visual inspection of the above-ground system components will be conducted during the monitoring event. During these inspections, a site inspection form will be completed. SSD system components to be monitored include, but are not limited to the following:

- Vacuum blower; and,
- General system piping.

1.3.18 Cover System Monitoring

A composite cover system, comprised of the first-floor concrete building slabs serves as a protective barrier mitigating the risk of exposure to the remaining contamination. Inspection of the composite cover system by a professional engineer, or a qualified environmental professional under the direction of a professional engineer, is required on a regular schedule at a minimum of once per year and following any severe weather or other conditions that could affect the cover. During these inspections, a site inspection form will be completed. The inspection requires sufficient information to certify the integrity of all elements of the cover system described above and should document any cover system disturbances. Any damage to the composite cover system identified during the inspection will be repaired in kind and in compliance with this SMP.

2.0 IDENTIFICATION OF KEY PERSONNEL/HEALTH AND SAFETY PERSONNEL

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

2.1 Langan Project Manager

The Langan Environmental Project Managers (PM) is Paul McMahon. His responsibilities include:

- Ensuring that this HASP is developed, current, and approved prior to on-site activities.
- Ensuring that all the tasks in the project are performed in a manner consistent with Langan's comprehensive *Health and Safety Program for Hazardous Waste Operations* and this HASP.

2.2 Langan Corporate Health and Safety Manager

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

- Updating the *Construction Health and Safety Program for Hazardous Waste Operations*.
- Assisting the site Health and Safety Officer (HSO) with development of the HASP, updating HASP as dictated by changing conditions, jobsite inspection results, etc. and approving changes to this HASP.
- Assisting the HSO in the implementation of this HASP and conducting Jobsite Safety Inspections and assisting with communication of results and correction of shortcomings found.
- Maintaining records on personnel (medical evaluation results, training and certifications, accident investigation results, etc.).

2.3 Langan Site Health & Safety Officer

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

- Participating in the development and implementation of this HASP.
- When on-site, assisting the Langan Field Team Leader in conducting Tailgate Safety Meetings and Jobsite Safety Inspections and correcting any shortcomings in a timely manner.
- Ensuring that proper PPE is available, worn by employees, and properly stored and maintained.
- Controlling entry into and exit from the site contaminated areas or zones.
- Monitoring employees for signs of stress, such as heat stress, fatigue, and cold exposure.
- Monitoring site hazards and conditions.
- Knowing (and ensuring that all site personnel also know) emergency procedures,

evacuation routes, and the telephone numbers of the ambulance, local hospital, poison control center, fire department, and police department.
- Resolving conflicts that may arise concerning safety requirements and working conditions.
- Reporting all incidents, injuries and near misses to the Langan Incident/Injury Hotline immediately and the client representative.

2.4 Langan Field Team Leader Responsibilities

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

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

2.5 Contractor Responsibilities

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

- Ensure their employees are trained in the use of all appropriate PPE for the tasks involved;
- Notify Langan of any hazardous material brought onto the job site or site related area, the hazards associated with the material, and must provide a material safety data sheet (MSDS) or safety data sheet (SDS) for the material;
- Have knowledge of, understand, and abide by all current federal, state, and local health and safety regulations pertinent to the work;
- Ensure their employees handling hazardous materials, if identified at the Site, have

received current training in the appropriate levels of 29 CFR 1910.120, *Hazardous Waste Operations and Emergency Response* (HAZWOPER) if hazardous waste is identified at the Site;

- Ensure their employees handling hazardous materials, if identified at the Site, have been fit-tested within the year on the type respirator they will wear; and
- Ensure all air monitoring is in place pertaining to the health and safety of their employees as required by OSHA 1910.120; and
- All contractors must adherer to all federal, state, and local regulatory requirements.

3.0 TASK/OPERATION SAFETY AND HEALTH RISK ANALYSES

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

3.1 Specific Task Safety Analysis

3.1.1 Installation and Operation of Injection Well Network

Specifically trained contractors are to install and operate the injection network. This includes operating heavy equipment, assembling required parts and the operation of the system during injection activities. Langan personnel are there only to observe and record the data required in the work plan. Assemblage of injection well parts, operation of drilling and injection equipment as well as system operations are to be done exclusively by the contractor following their own health and safety specifications outlined in their HASPs.

3.1.2 In-Situ Groundwater Treatment – Design and Implementation

The Contractor is responsible for the procurement, management, handling, and applications of all in-situ products. Langan personnel will observe and record pertinent information as the contractor applies groundwater treatment as required by the work plan or directed by the PE. Langan must don appropriate chemical resistant clothing including at a minimum gloves when working in close proximity with the oxidizing chemicals. In addition, Langan must insure that contractor takes the necessary precautionary actions to prevent and uncontrolled in-situ product releases, and in the unlikely event of a release, insure that contractor takes the necessary health and safety measures including to mitigate the release and report the event in accordance to applicable Federal, State and local regulations.

Langan personnel are not to operate machinery. These tasks are to be completed by the contractor.

3.2.3 Installation of SMDS

Specifically trained contractors are to install the SMDS. Langan personnel are there only to observe and record the data required in the work plan or directed by the PE. Installation and assemblage of the SMDS is to be done exclusively by the contractor following their own health and safety specifications outlined in their HASPs.

3.1.4 Construction Activity Inspection

The contractor will operate equipment used to install the composite cover. Langan personnel will inspect in accordance with specification in the work plan and record the data the work plan requires or directed by the PE. The installation of the composite cover is to be done exclusively by the contractor following their own health and safety specifications outlined in their HASPs. Other activities assigned to Langan as part of construction activities are limited to inspection and observations as specified in the work pan. Langan personnel are not to operate or assist in the operation of equipment used in construction activities unless defined as part of an inspection or observation in the work plan and they have received proper training to do so.

3.1.5 Indoor Drilling and Excavation

The work scope may require indoor drilling or drilling in locations where there may not be adequate ventilation sufficient to safely operate any rig or excavation equipment powered by an internal combustion engine. Where possible, all such work should be done by equipment powered by electricity. If such equipment is used and must be directly wired to the buildings electrical system or to an independent system, this work must be completed by a licensed electrician in accordance with all electrical codes applicable to the work.

Indoor work which is to be completed with equipment powered by an internal combustion engine must incorporate air monitoring of carbon monoxide (CO) using calibrated air monitoring equipment (MultiRAE or equivalent). In addition, the work plan should incorporate mitigation for venting engine exhaust fumes directly to the outdoors and for circulating fresh air into the work area.

The OSHA Time Weighted Average (TWA) Permissible Exposure Limit (PEL) for CO from 50 to 35 parts per million (ppm). Langan will monitor CO with a suitable monitoring device. If CO levels exceed 5 ppm, Langan will instruct contractors to begin mitigation measures. These measures are at a minimum:

- Increase air circulation using industrial size fans to bring additional fresh air into the building or vent exhaust to the outside;

- Modify the passive exhaust method being used to increase venting circulation by using wider diameter tubing or sealing tubing connections; or
- Modify the work schedule where the rig is turned off to allow time for CO levels to fall back to background

All work must cease if CO levels reach 35 ppm. The Langan engineer is to report to the PM and H&S officer when an action level is reached.

3.1.6 Groundwater Sampling

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

1.1.7 Soil Screening and Sampling

Sampling the soil requires the donning of chemical resistant gloves in addition to the standard PPE. Langan personnel are not to operate drilling or excavation equipment nor open sampling devices (acetate liners, sonic sample bags, etc.). These tasks are to be completed by the driller or excavation contractor.

3.1.8 Stockpile Sampling

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

3.1.9 Groundwater Sampling

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

3.1.10 Stockpile Sampling

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

3.1.11 Hot Spot Delineation

If hot spot delineation is undertaken, sampling requires additional precautions to mitigate exposure. Langan will monitor dust using air-dust monitoring equipment (DustTrak™ 2 or equivalent). The dust monitoring equipment should be equipped with an alarm. The HSO will provide alarm limits when the data triggering hot spot delineation is available. Work cannot commence until the action limits are set by the HSAO. The primary alarm should be set for a 0.15 milligrams per cubic meter (mg/m^3) above the 15 minute average background based on analytical data and the time weighted average exposure limits for the constituent of concern (COC). The secondary alarm may be set for a value based on the PEL for the specific COC.

If the primary alarm activates during work, the PM notified, and dust control measures should be implemented and all workers should don half face respirator with HEPA dust filters to continue to work. Dust control measures include applying a fine water spray wet all surfaces in the work area to dampen dust and activating ventilation. Workers can remove half respirators when air borne dust concentrations return to background. If dust mitigation does not lower dust concentrations and dust levels continue to climb, all work should cease when dust concentrations exceed secondary alarm level and the PM should be notified.

3.1.12 Removal of Underground Storage Tank

If UST excavation and removal activity is initiated, Langan personnel will conduct air monitoring for lower explosion limit (LEL) conditions within the UST excavation itself. This task is to be performed using calibrated air monitoring equipment designed to sound an audio alarm when atmospheric concentrations of VOC are within 10% of the LEL. In normal atmospheric oxygen concentrations, the LEL monitoring may be done with a Wheatstone bridge/catalytic bead type sensor (i.e. MultiRAE). However in oxygen depleted atmospheres (confined space), only an LEL designed to work in low oxygen environments may be used. Best practices require that the LEL monitoring unit be equipped with a long sniffer tube to allow the LEL unit to remain outside the UST excavation. Langan personnel are not to enter the UST excavation nor enter an excavated UST.

In addition to monitoring LEL, Langan personnel will monitor atmospheric VOC concentrations directly downwind of the UST excavation in accordance with standard CAMP procedures using calibrated air monitoring equipment.

3.1.13 Construction Dewatering

Langan may sample dewatering treatment system liquids from either the direct discharge standpipe or from a sample port or valve built into the storage tank, Langan will don the necessary

PPE including nitrile gloves and if necessary, facial splash guard. Sample ports and valves may only be sampled if they are accessible at ground level. Sampling from heights over 6 feet is prohibited unless Langan field personnel are fully accredited in fall protection and is wearing approved fall protection safety apparatus. The discharge samples will be submitted to an ELAP-certified laboratory for analysis in accordance with the work plan.

3.1.14 Backfilling of Excavated Areas to Development Grade

The backfilling contractor will provide their employees with equivalent PPE to protect them from the specific hazards likely to be encountered on-site. Selection of the appropriate PPE must take into consideration: (1) identification of the hazards or suspected hazards; (2) potential exposure routes; and, (3) the performance of the PPE construction (materials and seams) in providing a barrier to these hazards. Langan personnel may survey backfilling material with a calibrated PID; however, as they are not permitted to climb the material delivery truck, the contractor must provide samples from each truck as required.

3.1.15 Installation of Composite Cover

The composite cover contractor will provide their employees with equivalent PPE to protect them from the specific hazards likely to be encountered on-site in accordance with their own CHASP. 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. Langan personnel are not to assist in the physical installation of the composite cover system.

3.1.16 Drum Sampling

Drilling fluid, rinse water, grossly-contaminated soil samples and cuttings will be containerized in 55-gallon drums for disposed off-site. Each drum must be labeled in accordance with the Langan Drum Labeling Standard Operating Procedure (SOP-#9). Sampling drums requires the donning of work gloves when opening the drums and chemical resistant gloves when sampling in addition to standard PPE.

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

3.2 Radiation Hazards

No radiation hazards are known or expected at the site.

3.3 Physical Hazards

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

3.3.1 Explosion

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

3.3.2 Heat Stress

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

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

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

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

To monitor the worker, measure:

- **Heart rate:** Count the radial pulse during a 30-second period as early as possible in the rest period. If the heart rate exceeds 100 beats per minute at the beginning of the rest period, shorten the next work cycle by one-third and keep the rest period the same. If the heart rate still exceeds 100 beats per minute at the next rest period, shorten the following work cycle by one-third. A worker cannot return to work after a rest period until their heart rate is below 100 beats per minute.
- **Oral temperature:** Use a clinical thermometer (3 minutes under the tongue) or similar device to measure the oral temperature at the end of the work period (before drinking).

If oral temperature exceeds 99.6^{O}F (37.6^{O}C), shorten the next work cycle by one-third without changing the rest period. A worker cannot return to work after a rest period until their oral temperature is below 99.6^{O}F. If oral temperature still exceeds 99.6^{O}F (37.6^{O}C) at the beginning of the next rest period, shorten the following cycle by one-third. Do not permit a worker to wear a semi-permeable or impermeable garment when oral temperature exceeds 100.6^{O}F (38.1^{O}C).

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

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

3.3.3 Cold-Related Illness

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

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

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

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

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

3.3.4 Noise

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

3.3.5 Hand and Power Tools

The use of hand and power tools can present a variety of hazards, including physical harm from being struck by flying objects, being cut or struck by the tool, fire, and electrocution. All hand and power tools should be inspected for health and safety hazards prior to use. If deemed unserviceable/un-operable, notify supervisor and tag equipment out of service. Ground Fault Circuit Interrupters (GFCIs) are required for all power tools requiring direct electrical service.

3.3.6 Slips, Trips and Fall Hazards

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

3.3.7 Utilities (Electrocution and Fire Hazards)

3.3.7.1 Utility Clearance

The possibility of encountering underground utilities poses fire, explosion, and electrocution hazards. All excavation work will be preceded by review of available utility drawings and by notification of the subsurface work to the N.Y. One –Call--Center.

3.3.7.2 Lockout-Tagout

The potential adverse effects of electrical hazards include burns and electrocution, which could result in death. Therefore, there is a procedure that establishes the requirements for the lockout/tagout (LOTO) of energy isolating devices in accordance with the OSHA electrical lockout and tagging requirements as specified in 29 CFR 1926.417. This procedure will be used to ensure that all machines and equipment are isolated from potentially hazardous energy. If possible, equipment that could cause injury due to unexpected energizing, start-up, or release of stored energy will be locked/tagged, before field personnel perform work activities.

Depending upon the specific work task involved, Langan's SSC or FTL will serve as the authorized lockout/tagout coordinator, implement the lockout/tagout procedure and will be responsible to locate, lock and tag valves, switches, etc.

SPECIAL NOTE: Project personnel will assume that all electrical equipment at surface, subsurface and overhead locations is energized, until equipment has been designated and confirmed as de-energized by a utility company representative. Langan will notify the designated utility representative prior to working adjacent to this equipment and will verify that the equipment is energized or de-energized in the vicinity of the work location.

No project work shall be performed by Langan personnel or subcontractors on or near energized electrical lines or equipment unless hazard assessments are completed in writing, reviewed by Langan's SSHO, and clearly communicated to the field personnel.

The FTL shall conduct a survey to locate and identify all energy isolating devices. They shall be certain which switches, valves or other isolating devices apply to the equipment. The lockout/tagout procedure involves, but is not limited to, electricity, motors, steam, natural gas, compressed air, hydraulic systems, digesters, sewers, etc.

3.3.8 Physical Hazard Considerations for Material Handling

There are moderate to severe risks associated with moving heavy objects at the Site. The following physical hazards should be considered when handling materials at the Site:

- Heavy objects will be lifted and moved by mechanical devices rather than manual effort whenever possible.
- The mechanical devices will be appropriate for the lifting of 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.
- Lifting devices 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 wheels of any trucks being loaded or unloaded will be chocked to prevent movement. Outriggers will be fully extended on a flat, firm surface during operation.
- 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, currently (monthly) inspected, will be available in all mechanical lifting devices.
- Verify all loads/materials are secure before transportation.

Material handling tasks that are unusual or require specific guidance will need a written addendum to this HASP. The addendum must identify the lifting protocols before the tasks are performed. Upon approval, the plan must be reviewed with all affected employees and documented. Any deviation from a written plan will require approval by the Langan HSM.

3.3.9 Hearing Conservation

Under the construction industry standard, the maximum permissible occupational noise exposure is 90 dbA (8-hour TWA), and noise levels in excess of 90 dbA must be reduced through feasible administrative and engineering controls. (20 CFR 1926.52). Hearing protection is required when working within 15 feet of vacuum extraction equipment and drill rigs.

3.3.9 Open Water

Employees working over or near water, where the danger of drowning exists, shall be provided with U.S. Coast Guard-approved life jackets or buoyant work vests. Prior to and after each use, the buoyant work vests or life preservers shall be inspected for defects which would alter their strength or buoyancy. Defective units shall not be used.

And should a worker fall into the water, OSHA requires (29 CFR 1926.106(c)) that ring buoys with at least 90 feet of line shall be provided and readily available for emergency rescue operations. The distance between ring buoys shall not exceed 200 feet. Another remedial action required by OSHA (29 CFR 1926.106(d)) is the use of lifesaving skiffs.

OSHA requires that at least one lifesaving skiff shall be immediately available at locations where employees are working over or adjacent to water and must include the following provisions.

- The skiff must be in the water or capable of being quickly launched by one person.
- At least one person must be present and specifically designated to respond to water emergencies and operate the skiff at all times when there are employees above water.
- When the operator is on break another operator must be designated to provide requisite coverage when there are employees above water.
- The designated operator must either have the skiff staffed at all times or have someone remain in the immediate area such that the operator can quickly reach the skiff and perform rescue services.
- The skiff operator maybe assigned other tasks provided the tasks do not interfere with the operator’s ability to quickly reach the skiff.
- A communication system, such as a walkie-talkie, must be used to inform the skiff operator of an emergency and to inform the skiff operator where the skiff is needed.
- The skiff must be equipped with both a motor and oars.

With regard to the number of skiffs required and the appropriate maximum response time, the following factors must be evaluated:

- The number of work locations where there is a danger of falling into water;
- The distance to each of those locations;
- Water temperature and currents;
- Other hazards such as, but not limited to, rapids, dams, and water intakes;

Other regulations that present S&H practices and PPE for work on or near water include: 29 CFR 1910, Subpart T (401 – 440)

3.4 Biological Hazards

3.4.1 Animals

There is a possibility of encountering wildlife including reptiles, rodents and other small and medium size mammals. The Langan personnel is to avoid interacting with any wildlife.

3.4.2 Insects

Ticks and other biting or stinging insects may to be encountered during site operations. Langan personnel should take necessary precautions including donning long sleeve shirts and insecticide to prevent bites and stings. After field work, Langan personnel should perform a complete visual inspection of their clothing to insure they are not inadvertently harboring ticks. If they do observe a tick bite, they are to contact the HSM or HSO and report the event.

3.4.3 Plants

Poisonous plants may to be encountered during site operations. Langan personnel should take necessary precautions including donning long sleeve shirts and applying preventative poison Ivy/Sumac lotion to prevent or limit effects of exposure. If after field work, Langan employees do observe a reaction to poisonous plant exposure, they are to contact the HSM or HSO and report the event.

3.5 Additional Safety Analysis

3.5.1 Presence of Non-Aqueous Phase Liquids (NAPL)

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

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

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

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

3.6 Job Safety Analysis

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

4.0 PERSONNEL TRAINING

4.1 Basic Training

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

4.2 Initial Site-Specific Training

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

4.3 Tailgate Safety Briefings

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

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

5.0 MEDICAL SURVEILLANCE

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

Additionally, personnel who may be required to perform work while wearing a respirator must receive medical clearance as required under CFR 1910.134(e), *Respiratory Protection*. Medical evaluations will be performed by, or under the direction of, a physician board-certified in occupational medicine. Results of medical evaluations are maintained by the HSM.

6.0 PERSONAL PROTECTIVE EQUIPMENT

6.1 Levels of Protection

Langan will provide PPE to Langan employees to protect them from the specific hazards they are likely to encounter on-site. Direct hired contractors will provide their employees with equivalent PPE to protect them from the specific hazards likely to be encountered on-site. Selection of the appropriate PPE must take into consideration: (1) identification of the hazards or suspected hazards; (2) potential exposure routes; and, (3) the performance of the PPE construction (materials and seams) in providing a barrier to these hazards.

Based on anticipated site conditions and the proposed work activities to be performed at the site, Level D protection will be used. The upgrading/downgrading of the level of protection will be based on continuous air monitoring results as described in Section 6.0 (when applicable). The decision to modify standard PPE will be made by the site HSO or FTL after conferring with the PM. The levels of protection are described below.

Level D Protection (as needed)

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

Level D Protection (Modified, as needed)

- Safety glasses with sideshields or chemical splash goggles
- Safety boots/shoes (toe-protected)
- Disposable chemical-resistant boot covers
- Coveralls (polycoated Tyvek or equivalent to be worn when contact with wet contaminated soil, groundwater, or non-aqueous phase liquids is anticipated)
- Hard hat
- Long sleeve work shirt and work pants
- Nitrile gloves
- Hearing protection (as needed)
- Personal floatation device (for work within 5 ft of the water)
- Reflective traffic vest

Level C Protection (as needed)

- Full or Half face, air-purifying respirator, with NIOSH approved HEPA filter
- Inner (latex) and outer (nitrile) chemical-resistant gloves
- Safety glasses with side shields or chemical splash goggles
- Chemical-resistant safety boots/shoes
- Hard hat
- Long sleeve work shirt and work pants
- Coveralls (Tyvek® or equivalent)

- Hearing protection (as needed)
- Reflective safety vest

The action levels used in determining the necessary levels of respiratory protection and upgrading to Level C are summarized in Table 4. The written Respiratory Protection Program is maintained by the HSM and is available if needed. The monitoring procedures and equipment are outlined in Section 6.0 (when applicable).

6.2 Respirator Fit-Test

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

6.3 Respirator Cartridge Change-Out Schedule

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

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

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

7.0 AIR QUALITY MONITORING AND ACTIONS LEVELS

7.1 Monitoring During Site Operations

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

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

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

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

7.1.1 Volatile Organic Compounds

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

7.1.2 Metals

Based upon the site historical fill, there is a potential for the soils to contain PAHs and metals. During invasive procedures which have the potential for creating airborne dust, such as excavation of dry soils, a real time airborne dust monitor such as a Mini-Ram may be used to monitor for air particulates. The HSO will monitor the employee breathing zone at least every 30 minutes, or whenever there is any indication that concentrations may have changed (appearance of visible dust) since the last measurement. If dust levels are observed to be greater than 0.100 mg/m^3 or visible dust is observed for longer than 15 minutes or if the site PPE is upgraded to Level C, the HSO will begin monitoring the site perimeter at a location downwind of the AOC every 30 minutes in addition to the employee breathing zone. Instrument action levels for dust monitoring are provided in Table 4.

7.2 Monitoring Equipment Calibration and Maintenance

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

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

7.3 Determination of Background Levels

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

Table 4 lists the instrument action levels.

8.0 COMMUNITY AIR MONITORING PROGRAM

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

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

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

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

- If total VOC levels at the downwind perimeter of the hot zone persist at levels in excess of 5 ppm above background but less than 25 ppm, work activities will be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps work activities will resume provided that the total organic vapor level 200 feet downwind of the hot zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less – but in no case less than 20 feet, is below 5 ppm above background for the 15-minute average.
- If the total VOC level is above 25 ppm at the perimeter of the hot zone, activities will be shut down.

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

- If the downwind particulate level is 100 micrograms per cubic meter (µg/m³) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression must be employed. Work may continue with dust suppression techniques provided that downwind PM10 levels do not exceed 150 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 upwind level and in preventing visible dust migration.

8.1 Vapor Emission Response Plan

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

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

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

8.2 Major Vapor Emission

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

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

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

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

8.3 Major Vapor Emission Response Plan

Upon activation, the following activities will be undertaken:

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

8.4 Dust Suppression Techniques

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

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

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

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

9.0 WORK ZONES AND DECONTAMINATION

9.1 Site Control

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

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

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

9.2 Contamination Zone

9.2.1 Personnel Decontamination Station

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

9.2.2 Minimization of Contact with Contaminants

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

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

9.2.3 Personnel Decontamination Sequence

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

9.2.4 Emergency Decontamination

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

9.2.5 Hand-Held Equipment Decontamination

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

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

9.2.6 Heavy Equipment Decontamination

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

9.3 Support Zone

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

9.4 Communications

The following communications equipment will be utilized as appropriate.

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

Hand Signal	Meaning
Hand gripping throat	Out of air; cannot breathe
Grip partners wrists or place both hands around waist	Leave immediately without debate
Hands on top of head	Need assistance

Hand Signal	Meaning
Thumbs up	OK; I'm alright; I understand
Thumbs down	No; negative
Simulated "stick" break with fists	Take a break; stop work

9.5 The Buddy System

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

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

10.0 NEAREST MEDICAL ASSISTANCE

The address and telephone number of the nearest hospital:

New York Presbyterian/Weill Cornell Medical Center
525 East 68th Street
New York, New York
212-746-5454

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

11.0 STANDING ORDERS/SAFE WORK PRACTICES

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

12.0 SITE SECURITY

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

13.0 UNDERGROUND UTILITIES

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

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

14.0 SITE SAFETY INSPECTION

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

15.0 HAND AND POWER TOOLS

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

16.0 EMERGENCY RESPONSE

16.1 General

This section establishes procedures and provides information for use during a project emergency. Emergencies happen unexpectedly and quickly, and require an immediate response; therefore, contingency planning and advanced training of staff is essential. Specific elements of emergency support procedures that are addressed in the following subsections include communications, local emergency support units, and 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, call *Incident Intervention®* at 1-888-479-7787 to report their injuries. For all other communications, contact the Langan Incident Hotline at **(800) 9-LANGAN** (800-952-6426) extension 4699 as soon as possible.

Should outside assistance be needed for accidents, fire, or release of hazardous substances, the emergency numbers will be available and posted at the site (Table 5) where a readily accessible telephone is made available for emergency use.

Also, in the event of an incident where a team member becomes exposed or suffers from an acute symptom from contact with site materials and has to be taken to a hospital, a short medical data sheet (Attachment T) for that individual will be made available to the attending physician. The medical data sheet will include the following:

- Name, address, home phone
- Age, height, weight
- Name of person to be notified in case of an accident
- Allergies
- Particular sensitivities
- Does he/she wear contact lenses
- Short checklist of previous illness
- Name of personal physician and phone
- Name of company physician and phone
- Prescription and non-prescription medications currently used.

A sample medical data sheet is included in Attachment T.

16.2 Responsibilities

16.2.1 Health and Safety Officer (HSO)

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

16.2.2 Emergency Coordinator

The HSO or their designated alternate will serve as the Emergency Coordinator. The Emergency Coordinator is responsible for ensuring that all personnel are evacuated safely and that machinery and processes are shut down or stabilized in the event of a stop work order or evacuation. They are also responsible for ensuring the HSM are notified of all incidents, all injuries, near misses, fires, spills, releases or equipment damage. The Emergency Coordinator is required to immediately notify the HSM of any fatalities or catastrophes (three or more workers injured and hospitalized.

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

The Emergency Coordinator is responsible for implementing the Emergency Response Plan.

16.2.3 Site Personnel

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

16.3 Communications

Once an emergency situation has been stabilized, or as soon as practically, the injured Langan personnel should contact *Incident Intervention®* at 1-888-479-7787 to report their injuries. For all other communications, contact the Langan Incident Hotline at **(800) 9-LANGAN** (800-952-6426) extension 4699 as soon as possible.

16.4 Local Emergency Support Units

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

Figure 2 shows the hospital route map. Outside emergency number 911 and local ambulance should be relied on for response to medical emergencies and transport to emergency rooms. Always contact first responders when there are serious or life threatening emergencies on the site. Project personnel are instructed not to drive injured personnel to the Hospital. In the event of an injury, provide first aid and keep the injured party calm and protected from the elements and treat for shock when necessary.

16.5 Pre-Emergency Planning

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

16.6 Emergency Medical Treatment

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

- First Aid Kit: Contractor Vehicles
- Emergency Eye Wash: Contractor Vehicles

During the site safety briefing, project personnel will be informed of the location of the first aid station(s) that has been set up. Some injuries, such as severe cuts and lacerations or burns, may require immediate treatment. Any first aid instructions that can be obtained from doctors or paramedics, before an emergency-response squad arrives at the site or before the injured person can be transported to the hospital, will be followed closely.

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

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

16.8 Emergency Site Evacuation Routes and Procedures

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

In the event that an emergency situation arises, the FTL will implement an immediate evacuation of all project personnel due to immediate or impending danger. The FTL will also immediately communicate with the contractor to coordinate any needed evacuation of the property.

The FTL or Site Supervisor will give necessary instructions until the Designated Incident Commander (IC) assumes control. After the emergency has been resolved, the FTL or Site

Supervisor will coordinate with the IC and indicate when staff should resume their normal duties. If dangers are present for those at the designated assembly point, another designated location of assembly will be established.

It will be the responsibility of the FTL or Site Supervisor to report a fire or emergency, assess the seriousness of the situation, and initiate emergency measures until the arrival of the local fire fighters or other first responders, should they be necessary. The FTL, working with emergency responders, may also order the closure of the Site for an indefinite period as long as it is deemed necessary.

Under no circumstances will incoming visitors be allowed to proceed to the area of concern, once an emergency evacuation has been implemented. Visitors or other persons present in the area of the emergency shall be instructed to evacuate the area. The FTL will ensure that access roads are not obstructed and will remain on-site to provide stand-by assistance upon arrival of emergency personnel.

If it is necessary to temporarily control traffic in the event of an emergency, those persons controlling traffic will wear proper reflection warning vests until the arrival of police or fire personnel.

16.8.1 Designated Assembly Locations

All personnel will evacuate the site and assemble at a designated assembly location. The assembly location will be designated by Langan personnel and discussed during each shift's pre-job safety briefing.

16.8.2 Accounting for Personnel

All contractor and subcontractor supervisors are responsible for the accounting of all personnel assembled at the designed assembly area. The Designated Incident Commander shall be notified if personnel are not found.

16.9 Fire Prevention and Protection

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

16.9.1 Fire Prevention

Fires will be prevented by adhering to the following precautions:

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

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

16.10 Significant Vapor Release

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

- Move all personnel to an upwind location. All non-essential personnel shall evacuate.
- Upgrade to Level C Respiratory Protection.
- Downwind perimeter locations shall be monitored for volatile organics.
- If the release poses a potential threat to human health or the environment in the community, the Emergency Coordinator shall notify the Langan Project Manager.
- Local emergency response coordinators will be notified.

16.11 Overt Chemical Exposure

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

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

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

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

16.12 Decontamination during Medical Emergencies

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

16.13 Adverse Weather Conditions

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

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

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

16.14 Spill Control and Response

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

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

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

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

In addition to the spill control and response procedures described in this 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.

16.15 Emergency Equipment

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

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

16.16 Restoration and Salvage

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

- Refilling fire extinguishers.
- Refilling medical supplies.
- Recharging eyewashes and/or showers.
- Replenishing spill control supplies.

16.17 Documentation

Immediately following an incident or near miss, unless emergency medical treatment is required, either the employee or a coworker must contact the Langan Incident/Injury Hotline at 1-(800)-9-LANGAN (ext. #4699) and the client representative to report the incident or near miss. For emergencies involving personnel injury and/or exposure, the HSO and affected employee will complete and submit an Employee Exposure/Injury Incident Report (Attachment C) to the Langan Corporate Health and Safety Manager as soon as possible following the incident.

17.0 SPECIAL CONDITIONS

This guideline contains information and requirements for special conditions that may not be routinely encountered.

17.1 Scope

The guideline applies to the specific projects identified within this document. Additional provisions will be addressed in each Site-Specific HEALTH AND SAFETY PLAn (HASP), as needed.

17.2 Responsibilities

Site Personnel - All site personnel must be alert to safety hazards on work sites and take action to minimize such hazards. Personnel must utilize the buddy system, watch for inappropriate behavior, and be alert to changes in site conditions.

Health and Safety Officer (HSO) - The HSO is responsible for considering these procedures in the development of site specific HASPs. The HSO shall schedule frequent "tail gate" safety briefings to enhance safety awareness and discuss potential problems.

17.3 Procedures

The procedures outlined below shall be followed when such conditions are encountered.

17.3.1 Ladders

Langan safety procedures shall be used to ensure employee safety when using ladders in the office or work sites. All ladders shall be coated or repaired to prevent injury to the employee from punctures or lacerations and to prevent snagging or clothing. Any wood ladders used must have an opaque covering except for identification or warning labels, which may be placed on one face only of a side rail.

17.3.1.1 Ladder Use

Employees shall only use ladders for the purposes, which they were designed and shall not be used as scaffolding. Ladders will be maintained and inspected prior to use for slip hazards including oil and grease. Employees shall use ladders only on stable and level surfaces unless the ladder is secured to prevent possible displacement. Ladders should not be used on slippery surfaces unless secured or provided with slip resistant feet to prevent accidental displacement. Ladders should not be used in locations where they could be displaced by workplace activities or traffic. Ladder rungs, cleats and steps shall be parallel, level and uniformly spaced when the ladder is in the use position.

Employees should not be carrying anything including equipment that could cause injury if there was a fall while utilizing the ladder. The top and bottom of the ladder area must remain clear while in use. When ascending and descending the ladder, employees must face the ladder.

Ladders shall not be loaded beyond the maximum intended load for which they were built or the manufacturer's rated capacity.

17.3.1.2 Portable Ladders

Rungs, cleats and steps for portable ladders and fixed ladders shall be spaced not less than 10 inches apart, nor more than 14 inches apart, as measured between center lines of the rungs, cleats and steps. When used to access an upper landing surface, the ladder side rails must extend at least three feet above the upper landing surface to which the ladder is used to gain access. If this is not possible, due to the ladders length, then the top of the ladder shall be secured at its top to a rigid support.

17.3.1.3 Step Stools

Rungs, cleats and steps of step stools shall not be less than 8 inches apart, nor more than 12 inches apart, as measured between center lines of the rungs, cleats and steps.

17.3.1.4 Extension Ladders

Rungs, cleats and steps of the base section of extension trestle ladders shall be spaced not less than 8 inches apart, nor more than 18 inches apart, as measured between center lines of the rungs, cleats and steps. The rung spacing on the extension section of the extension trestle ladder shall not be less than 6 inches nor more than 12 inches, as measured between center lines of the rungs, cleats and steps. Ladders shall be used at an angle such that the horizontal distance from the top support to the foot of the ladder is approximately one-quarter of the working length of the ladder (the distance along the ladder between the foot and the top support).

17.3.1.5 Inspection

Ladders will be inspected for visible detects periodically, prior to utilization or after any occurrence that could have negatively affected the ladder. Portable ladders with defects including broken or missing rungs, cleats, or steps, broken or split rails, corroded components or other faulty or defective components shall not be used. The ladder will be immediately marked as defective, tagged as "Do Not Use" or blocked from being used and removed from service until repaired.

17.3.2 First Aid/Cardiopulmonary Resuscitation (CPR)

Langan field and office personnel will be encouraged to be trained in First Aid and Cardiopulmonary Resuscitation (CPR). Training will be provided free of charge by Langan to all employees. Employees will receive a training certificate that will be kept on file with the Health & Safety Coordinator (HSC). Training and certification will be provided by a credited provider such as American Red Cross or equivalent.

17.3.2.1 Emergency Procedures

Prior to work at sites the Langan employees certified in first aid and CPR will be identified in the site specific HASP. Langan will endear to have at least one employee at a job site trained and able to render first aid and CPR. The site specific HASP will contain first aid information on both potential chemical and physical hazards. Emergency procedures to be followed are in case of injury or illnesses are provided in the HASP. The HASP will include emergency contact information including local police and fire departments, hospital emergency rooms, ambulance services, on-site medical personnel and physicians. The HASP will also include directions and contact information to the nearest emergency facility in case immediate medical attention is required. The emergency contact information will be conspicuously posted at the worksite. Employees that are injured and require immediate medical attention shall call either 911 or the local posted emergency contacts. Employees should use ambulatory services to transport injured workers to the nearest facility for emergency medical care. In areas where 911 is not available, the telephone numbers of the physicians, hospitals, or ambulances shall be conspicuously posted.

17.3.2.2 First Aid Supplies

First aid supplies are readily available to all Langan employees when required. First aid kits are located in each Langan office. Portable first aid kits are available for employees to use at work sites. First aid kits should consist of items needed to treat employees for potential chemical and physical injuries. At a minimum, first aid kits should contain items to allow basic first aid to be rendered. Where the eyes or body of an employee may be exposed to corrosive materials, suitable facilities for quick drenching or flushing of the eyes and body shall be provided within the work area for immediate emergency use including eye wash.

First aid kits will be weatherproof with individual sealed packages of each item. All portable first aid kits shall be inspected by Langan employees before and after use to ensure all used items are replaced. When out in the field, employees shall check first aid kits weekly to ensure used items are replaced.

17.3.3 Hydrogen Sulfide

Langan employees with the potential to be exposed to hydrogen sulfide while at work sites shall have training in hydrogen sulfide awareness. The training will include identification of areas where employees could be exposed to hydrogen sulfide, health effects, permissible exposure limits, first aid procedures and personnel protective equipment. Langan employees could be exposed to hydrogen sulfide while at job sites including petroleum refineries, hazardous waste treatment, storage and disposal facilities, uncontrolled hazardous waste sites and remediation projects.

17.3.3.1 Characteristics

Hydrogen sulfide is a colorless gas with a strong odor of rotten eggs that is soluble in water. Hydrogen sulfide is used to test and make other chemicals. It is also found as a by-product of chemical reactions, such as in sewer treatment. It is a highly flammable gas and a dangerous fire hazard. Poisonous gases are produced in fires including sulfur oxides. Hydrogen sulfide is not listed as a carcinogen.

17.3.3.2 Health Effects

Hydrogen Sulfide can affect employees if inhaled or through contact with skin or eyes. Acute (or short term) health effects of hydrogen sulfide exposure include irritation of the nose and throat, dizziness, confusion, headache and trouble sleeping. Inhalation of hydrogen sulfide can irritate the lungs causing coughing and/or shortness of breath. Higher levels of exposure can cause build-up of fluid in the lungs (pulmonary edema), a medical emergency, with severe shortness of breath.

Chronic (or long term) health effects of low levels of exposure to hydrogen sulfide can cause pain and redness of the eyes with blurred vision. Repeated exposure may cause bronchitis with cough, phlegm and shortness of breath.

17.3.3.3 Protective Clothing and Equipment

Respirators are required for those operations in which employees will be exposed to hydrogen sulfide above OSHA permissible exposure level. The maximum OSHA permissible exposure limit (PEL) for hydrogen sulfide is 20 parts of hydrogen sulfide vapor per million parts of air (20 ppm) for an 8-hour workday and the maximum short-term exposure limit (STEL) is 10 ppm for any 10-minute period.

Where employees are exposed to levels up to 100 parts of hydrogen sulfide vapor per million parts of air (100 ppm), the following types of respiratory protection are allowed:

- Any powered, air purifying respirator with cartridge(s);
- Any air purifying, full-facepiece respirator (gas mask) with a chin style, front- or back-mounted canister;
- Any supplied air system with escape self-contained breathing apparatus, if applicable; and,
- Any self-contained breathing apparatus with a full facepiece.

Respirators used by employees must have joint Mine Safety and Health Administration and the National Institute for Occupational Safety and Health (NIOSH) seal of approval. Cartridges or canisters must be replaced before the end of their service life, or the end of the shift, whichever occurs first. Langan employees that have the potential to be exposed to hydrogen sulfide will be trained in the proper use of respirators. Respirator training is discussed under– Langan’s Respiratory Protection Program.

Employees with potential exposure to hydrogen sulfide, or when required by the client, will wear a portable hydrogen sulfide gas detector. The detector should have an audible, visual and vibrating alarm. The detector may also provide detection for carbon monoxide, sulfur dioxide and oxygen deficient atmospheres. The hydrogen sulfide monitor will, at a minimum, be calibrated to detect hydrogen sulfide at a level of 20 parts of hydrogen sulfide vapor per million parts of air (20 ppm). Many portable gas detectors will have factory defaults with a low level alarm at 10 ppm and a high level alarm at 15 ppm. Langan employees shall consult clients to determine if any site specific threshold levels exist.

If the hydrogen sulfide gas detector sounds and employees are not wearing appropriate respiratory protection, employees must immediately vacate the area and meet at the assigned emergency location. Langan employees may not re- enter the site without proper respiratory protection and approval from the client or property owner, if needed.

Employees shall wear PPE to prevent eye and skin contact with hydrogen sulfide. Employees must wear appropriate protective clothing including boots, gloves, sleeves and aprons, over any parts of their body that could be exposed to hydrogen sulfide. Non-vented, impact resistant goggles should be worn when working with or exposed to hydrogen sulfide.

17.3.3.4 Emergency and First Aid Procedures

Eye and Face Exposure

If hydrogen sulfide comes in contact with eyes, it should be washed out immediately with large amounts of water for 30 minutes, occasionally lifting the lower and upper eye lids. Seek medical attention immediately.

Skin Exposure

If hydrogen sulfide contaminates clothing or skin, remove the contaminated clothing immediately and wash the exposed skin with large amounts of water and soap. Seek medical attention immediately. Contaminated clothing should either be disposed of or washed before wearing again.

Breathing

If a Langan employee or other personnel breathe in hydrogen sulfide, immediately get the exposed person to fresh air. If breathing has stopped, artificial respiration should be started. Call for medical assistance or a doctor as soon as possible.

Safety Precautions

Hydrogen sulfide is a highly flammable gas and a dangerous fire hazard. Containers of hydrogen sulfide may explode in a fire situation. Poisonous gases are produced during fires.

Langan employees should contact property owners and operators prior to conducting work onsite to be aware of any site specific contingency plans, identify where hydrogen sulfide is used at the facility and be informed about additional safety rules or procedures.

19.3.4 Fire Protection/Extinguishers

Langan field personnel that have been provided with portable fire extinguishers for use at worksites will be trained to familiarize employees with general principles of fire extinguisher use and hazards associated with the incipient stage of firefighting. Training will be provided prior to initial assignment for field work and annually thereafter.

Portable fire extinguishers shall be visually inspected monthly and subjected to an annual maintenance check. Langan shall retain records of the annual maintenance date.

17.3.5 Overhead lines

When field work is performed near overhead lines, the lines shall be deenergized and grounded, or other protective measures shall be provided before the work shall commence. If overhead lines are to be deenergized, arrangements shall be made with the client, property owner or organization that operates or controls the electric circuits involved to deenergize and ground them. If protective measures, such as guarding, isolating, or insulating, are provided, these precautions shall prevent employees from contacting such lines directly with any part of their body or indirectly through conductive materials, tools, or equipment.

When unqualified Langan personnel are working in an elevated position near overhead lines, the location shall be such that the person and the longest conductive object they may contact cannot come closer to any unguarded, energized overhead line than the following distances:

1. For voltages to ground 50kV or below - 10 feet; and
2. For voltages to ground over 50kV - 10 feet, plus 4 inches for every 10kV over 50kV.

As previously indicated, Langan does not retain qualified employees to perform work on energized equipment.

17.3.5.1 Vehicle and Equipment Clearance

Any vehicle or mechanical equipment capable of having parts of its structure elevated near energized overhead lines shall be operated so that a clearance of 10 feet is maintained. If the voltage of the overhead lines is higher than 50kV, the clearance shall be increased 4 inches for every 10kV over that voltage.

If any of the following discussed conditions occur, the clearance may be reduced.

- If the vehicle is in transit with its structure lowered, the clearance may be reduced to 4 ft. If the voltage is higher than 50kV, the clearance shall be increased 4 in. for every 10 kV over that voltage.
- If insulating barriers are installed to prevent contact with the lines, and if the barriers are rated for the voltage of the line being guarded and are not a part of or an attachment to the vehicle or its raised structure, the clearance may be reduced to a distance within the designed working dimensions of the insulating barrier.

Employees standing on the ground may not contact the vehicle or mechanical equipment or any of its attachments, unless the employee is using protective equipment rated for the voltage; or the equipment is located so that no uninsulated part of its structure (that portion of the structure that provides a conductive path to employees on the ground) can come closer to the overhead line than permitted.

If any vehicle or mechanical equipment capable of having parts of its structure elevated near energized overhead lines is intentionally grounded, employees working on the ground near the point of grounding may not stand at the grounding location whenever there is a possibility of overhead line contact. Additional precautions, such as the use of barricades or insulation, shall be taken to protect employees from hazardous ground potentials, depending on earth resistivity and fault currents, which can develop within the first few feet or more outward from the grounding point.

17.3.6 Trade Secret

Langan employees could potentially be provided trade secret information by the client or property owner when site specific information is provided about highly hazardous chemicals. Trade secret means any confidential formula, pattern, process, device, information or compilation of information that is used in an employer's business, and that gives the employer an opportunity to obtain an advantage over competitors who do not know or use it. Langan employees understand that this information should be kept confident and if required, may enter into a confidentially agreement with the client.

17.3.7 Bloodborne Pathogens

Langan employees that can reasonably anticipate exposure to blood or other potentially infectious material while at work sites shall have training in bloodborne pathogens. Applicable employees would include those trained in first aid and serving a designated role as an emergency medical care provider. Bloodborne pathogens are pathogenic microorganisms that are present in human blood and can cause disease in humans. These pathogens include, but are not limited to, hepatitis B virus and human immunodeficiency virus.

17.3.7.1 Training

Langan employees with potential occupational exposure to blood or other potentially infectious material must participate in a training program. Training must be conducted prior to initial assignment where there would be potential for exposure and annually thereafter within one year of previous training. The training program will be provided to Langan employees at no cost to them and during working hours.

Langan will ensure the training program shall consist of the following:

- An accessible copy of the regulatory text of 29 CFR 1910.1030 and an explanation of its contents;
- A general explanation of the epidemiology and symptoms of bloodborne diseases;
- An explanation of the modes of transmission of bloodborne pathogens;
- An explanation of Langan's exposure control plan and the means by which the employee can obtain a copy of the written plan;
- An explanation of the appropriate methods for recognizing tasks and other activities that may involve exposure to blood and other potentially infectious materials;
- An explanation of the use and limitations of personal protective
  - equipment (PPE) to prevent and reduce exposure;
  - Information on the types, proper use, location, removal, handling and disposal of PPE;
  - An explanation of the basis for selection of PPE;
  - Information on the hepatitis B vaccine, including information on its efficacy, safety, method of administration, the benefits of being vaccinated, and that the vaccine and vaccination will be offered free of charge;
  - Information on the appropriate actions to take and persons to contact in an emergency involving blood or other potentially infectious materials;
  - An explanation of the procedure to follow if an exposure incident occurs, including the method of reporting the incident and the medical follow-up that will be made available;
  - Information on the post-exposure evaluation and follow-up that the
  - employer is required to provide for the employee following an exposure incident;
  - An explanation of the signs and labels and/or color coding required by paragraph 29 CFR 1910.1030(g)(1); and
  - An opportunity for interactive questions and answers with the person conducting the training session.

Langan will develop and implement a written Exposure Control Plan, which will be designed to eliminate or minimize employee exposure to bloodborne pathogens. The Exposure Control Plan will contain the following elements:

- An exposure determination for employees;
- The schedule and method of implementation for Methods of Compliance (29 CFR 191.1030(d)), Hepatitis B Vaccination and Post-Exposure Evaluation and Follow-up (29 CFR 1910.1030(f)), Communication of Hazards to Employees (29 CFR 1910.1030(g)) and (h) Recordkeeping (29 CFR 1910.1030(h));
- The procedure for the evaluation of circumstances surrounding exposure incidents;
- Ensure a copy of the Exposure Control Plan will be accessible to employees; and,
- The Exposure Control Plan shall be reviewed and updated at least annually.

Langan employees with occupational exposure to bloodborne pathogens include any employees trained in first aid that would be expected to provide emergency medical care. This determination is made without regards to the use of PPE, which could eliminate or minimize exposure.

Universal precautions shall be observed to prevent contact with blood or other potentially infectious materials. According to the concept of Universal Precautions, all human blood and certain human body fluids are treated as if known to be infectious for bloodborne pathogens. Under circumstances in which differentiation between body fluid types is difficult or impossible, all body fluids shall be considered potentially infectious materials.

Work practice controls shall be used to eliminate or minimize employee exposure, if applicable. Since Langan employees will have occupational exposure only during rendering of first aid, personnel protective equipment will be utilized to reduce or minimize exposure. PPE that could be available to Langan personnel when administering first aid includes safety glasses, gloves, and Tyvek suits or sleeves. PPE and first aid kits will be provided to employees at no cost to them.

Langan employees that render first aid in office areas will have access to hand washing facilities or restrooms. For first aid rendered at field locations, first aid kits will contain an appropriate antiseptic hand cleanser and clean cloth/paper towels or antiseptic towelettes. After using antiseptic hand cleansers or towelettes, employees shall wash their hands with soap and running water as soon as feasible.

After administering first aid, potentially infectious materials, including towels, personnel protective equipment, clothes and bandages, shall be placed in a container, which prevents leakage during collection, handling, processing, storage, transport, or shipping. All PPE will be dispose of after use. Any equipment or working surfaces which was been exposed to blood or potentially infectious materials due to an injury, will be decontaminated prior to reuse.

Langan will make available the hepatitis B vaccine and vaccination series to all employees who have occupational exposure, and post-exposure evaluation and follow-up to all employees who have had an exposure incident. These services will be available to the employee at no cost to them through a medical provider.

17.3.7.2 Recordkeeping

Langan will maintain training and medical records for each employee with occupational exposure to blood or potentially infectious materials. Medical and training records will be maintained by Langan's H&S Department.

Training records will include the following:

- Dates of the training sessions;
- Contents or a summary of the training sessions;
- Names and qualifications of persons conducting the training; and
- Names and job titles of all persons attending the training sessions.

Training records shall be maintained for 3 years from the date on which the training occurred. Medical records will be will be preserved and maintained for the duration of employment plus 30 years.

All records will be made available upon request to employees, the Assistant Secretary of Labor for Occupational Safety and Health, and Director of National Institute for Occupational Safety and Health Director of OSHA for examination and copying. Medical records must have written consent from employee before releasing.

If Langan ceases to do business, all records shall be transferred to the successor employer. The successor employer shall receive and maintain these records.

If there will not be a successor, Langan will notify current employees of their rights to access records at least three months prior to the cessation of business.

18.0 RECORDKEEPING

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

18.1 Field Change Authorization Request

Any changes to the work to be performed that is not included in the HASP will require an addendum that is approved by the Langan project manager and Langan HSM to be prepared. Approved changes will be reviewed with all field personnel at a safety briefing.

18.2 Medical and Training Records

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

18.3 Onsite Log

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

18.4 Daily Safety Meetings ("Tailgate Talks")

Completed safety briefing forms will be maintained by the HSO.

18.5 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.

18.6 Hazard Communication Program/MSDS-SDS

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

18.7 Documentation

Immediately following an incident or near miss, unless emergency medical treatment is required, either the employee or a coworker must contact the Langan incident/injury hotline at 1-800-952-6426, extension 4699 and the Project Manager to report the incident or near miss. The Project Manager will contact the client or client representative. A written report must be completed and submitted HSM within 24 hours of the incident. For emergencies involving personnel injury and/or exposure, employee will complete and submit the Langan incident/injury report to the Langan corporate health and safety manager as soon as possible following the incident. Accidents will be investigated in-depth to identify all causes and to recommend hazard control measures.

18.7.1 Accident and Injury Report Forms

18.7.1.1 Accident/Incident Report

All injuries, no matter how slight, shall be reported to the FTL and the PM immediately. The accident/incident report forms, attached in Attachment U and Attachment V will be filled out on all accidents by the applicable contractor supervision personnel, the FTL, or the HSO. Copies of all accident/incident reports shall be kept on-site and available for review. Project personnel will be instructed on the location of the first aid station, hospital, and doctor and ambulance service near the job. The emergency telephone numbers will be conspicuously posted in site vehicles near the work zone. First aid supplies will be centrally located and conspicuously posted between restricted and non-restricted areas to be readily accessible to all on the site.

18.7.1.2 First Aid Treatment Record

The forms in will be used for recording all non-lost time injuries treated by the project first-aid attendant, the local physician or hospital will be entered in detail on this record. "Minor" treatment of scratches, cuts, etc. will receive the same recording attention as treatment of more severe injuries.

18.7.1.3 OSHA Form 300

An OSHA Form 300 will be kept at the Langan Corporate Office in Parsippany, New Jersey. All recordable injuries or illnesses will be recorded on this form. Subcontractor employers must also meet the requirements of maintaining an OSHA 300 form. The Incident Report form used to capture the details of work-related injuries/illnesses meets the requirements of the OSHA Form 301 (supplemental record) and must be maintained with the OSHA Form 300 for all recordable injuries or illnesses. Forms for recording OSHA work-related injuries and illnesses are included in Attachment U and Attachment V.

19.0 CONFINED SPACE ENTRY

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

20.0 HASP ACKNOWLEDGEMENT FORM

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

Printed Name	Signature	Company	Date

TABLES

TABLE 1
TASK HAZARD ANALYSES

Task	Hazard	Description	Control Measures	First Aid
1.3.1 – 1.3.18	Contaminated Soil or Groundwater-Dermal Contact	Contaminated water spills on skin, splashes in eyes; contact with contaminated soil/fill during construction activities or sampling.	Wear proper PPE; follow safe practices, maintain safe distance from construction activities	See Table 2, seek medical attention as required
1.3.1 – 1.3.18	Lacerations, abrasions, punctures	Cutting bailer twine, pump tubing, acetate liners, etc. with knife; cuts from sharp site objects or previously cut piles, tanks, etc.; Using tools in tight spaces	Wear proper PPE; follow safe practices	Clean wound, apply pressure and/or bandages; seek medical attention as required.
1.3.1 – 1.3.18	Contaminated Media Inhalation	Opening drums, tanks, wells; vapors for non-aqueous phase liquids or other contaminated site media; dust inhalation during excavation; vapor accumulation in excavation	Follow air monitoring plan; have quick access to respirator, do not move or open unlabeled drums found at the site, maintain safe distance from construction activities	See Table 2, seek medical attention as required
1.3.1 – 1.3.18	Lifting	Improper lifting/carrying of equipment and materials causing strains	Follow safe lifting techniques; Langan employees are not to carry contractor equipment or materials	Rest, ice, compression, elevation; seek medical attention as required
1.3.1 – 1.3.18	Slips, trips, and falls	Slips, trips and falls due to uneven surfaces, cords, steep slopes, debris and equipment in work areas	Good housekeeping at site; constant awareness and focus on the task; avoid climbing on stockpiles; maintain safe distance from construction activities and excavations; avoid elevated areas over six feet unless fully accredited in fall protection and wearing an approved fall protection safety apparatus	Rest, ice, compression, elevation; seek medical attention as required
1.3.1 – 1.3.18	Noise	Excavation equipment, hand tools, drilling equipment.	Wear hearing protection; maintain safe distance from construction activities	Seek medical attention as required
1.3.1 – 1.3.18	Falling objects	Soil material, tools, etc. dropping from drill rigs, front-end loaders, etc.	Hard hats to be worn at all times while in work zones; maintain safe distance from construction activities and excavations	Seek medical attention as required
1.3.1 – 1.3.18	Underground/ overhead utilities	Excavation equipment, drill rig auger makes contact with underground object; boom touches overhead utility	"One Call" before dig; follow safe practices; confirm utility locations with contractor; wear proper PPE; maintain safe distance from construction activities and excavations	Seek medical attention as required
1.3.1 – 1.3.18	Insects (bees, wasps, hornet, mosquitoes, and spider)	Sings, bites	Insect Repellent; wear proper protective clothing (work boots, socks and light colored pants);field personnel who may have insect allergies (e.g., bee sting) should provide this information to the HSO or FSO prior to commencing work, and will have allergy medication on site.	Seek medical attention as required
1.3.1 – 1.3.18	Vehicle traffic / Heavy Equipment Operation	Vehicles unable to see workers on site, operation of heavy equipment in tight spaces, equipment failure, malfunctioning alarms	Wear proper PPE, especially visibility vest; use a buddy system to look for traffic; rope off area of work with cones and caution tape or devices at points of hazard, maintain safe distance from construction activities and equipment	Seek medical attention as required

TABLE 2
CONTAMINANT HAZARDS OF CONCERN

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.18	1,1′-Biphenyl 1,1-Biphenyl Biphenyl Phenyl benzene Diphenyl	92-52-4	None	1 mg/m^3 100 mg/m^3	Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, throat; headache, nausea, lassitude (weakness, exhaustion), numb limbs; liver damage	Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	1,1-Dichloroethane Asymmetrical dichloroethane Ethylidene chloride 1,1-Ethylidene dichloride 1,1-DCA	75-34-3	PID	100 ppm 3000 ppm	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the skin; central nervous system depression; liver, kidney, lung damage	Eye: Irrigate immediately Skin: Soap flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	1,2,3-Trichlorobenzene vic-Trichlorobenzene 1,2,6-Trichlorobenzene	87-61-6	PID	None None	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat, respiratory system; bronchitis; hypochromic anemia; headache, drowsiness, lassitude (weakness, exhaustion), dizziness, nausea, incoordination; vomiting, confusion; chemical pneumonitis (aspiration liquid)	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.18	1,2,3-Trichloropropane Allyl trichloride Glycerol trichlorohydrin Glyceryl trichlorohydrin Trichlorohydrin	96-18-4	PID	50 ppm 100 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation eyes, nose, throat; central nervous system depression; In Animals: liver, kidney injury; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	1,2,4,5-Tetrachlorobenzene Benzene Tetrachloride	95-94-3	PID	None None	Soil	Inhalation, skin, eyes, ingestion	Cough	Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	1,2,4,5-Tetramethylbenzene	95-93-2	NA	None None	Groundwater Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat, respiratory system; bronchitis; hypochromic anemia; headache, drowsiness, lassitude (weakness, exhaustion), dizziness, nausea, incoordination; vomiting, confusion; chemical pneumonitis (aspiration liquid)	Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	1,2,4-Trichlorobenzene Unsym-Trichlorobenzene 1,2,4-Trichlorobenzol	120-82-1	NA	None None	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation eyes, skin, mucous membrane; In Animals: liver, kidney damage; possible teratogenic effects	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.18	1,2,4-Trimethylbenzene	95-63-6	PID	None None	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat, respiratory system; bronchitis; hypochromic anemia; headache, drowsiness, lassitude (weakness, exhaustion), dizziness, nausea, incoordination; vomiting, confusion; chemical pneumonitis (aspiration liquid)	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	1,2-Dichlorobenzene	95-50-1	PID	50 ppm 200 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eye, swelling periorbital (situated around the eye); profuse rhinitis; headache, anorexia, nausea, vomiting; weight loss, jaundice, cirrhosis; in animals: liver, kidney injury; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	1,2-Dichloroethane Ethylene dichloride 1,2-DCA DCE[1] Ethane dichloride Dutch liquid, Dutch oil Freon 150	107-06-2	PID	50 ppm 50 ppm	Groundwater Soil Vapor	inhalation, ingestion, skin absorption, skin and/or eye contact	irritation to the eyes, skin, mucous membrane	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.18	1,2-Dichloroethene 1,2-Dichloroethylene 1,2-DCE Total 1,2-Dichloroethene cis-1,2-Dichloroethylene mixture of cis and trans Acetylene dichloride cis-Acetylene dichloride sym-Dichloroethylene cis- 1,2-Dichloroethene cDCE 1,1-dimethyl-;dimethyl1,1-cyclohexane	156-59-2 540-59-0	PID	200 ppm 4000 ppm	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	Irritant to eyes, skin, mucous membranes and respiratory system. May be harmful by ingestion, skin absorption and inhalation	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	Trans-1,2-Dichloroethene trans-1,2-Dichloroethylene tDCE trans-Acetylene dichloride	156-60-5	PID	200 ppm 4000 ppm	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	Irritant to eyes, skin, mucous membranes and respiratory system. May be harmful by ingestion, skin absorption and inhalation	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	1,3,5-Trimethylbenzene Mesitylene sym-Trimethylbenzene	108-67-8	PID	None None	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat, respiratory system; bronchitis; hypochromic anemia; headache, drowsiness, lassitude (weakness, exhaustion), dizziness, nausea, incoordination; vomiting, confusion; chemical pneumonitis (aspiration liquid)	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.18	1,3-Dichlorobenzene m-Dichlorobenzol; m-Phenylene dichloride m-dichlorobenzene	541-73-1	PID	None None	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, swelling periorbital (situated around the eye); profuse rhinitis; headache, anorexia, nausea, vomiting; weight loss, jaundice, cirrhosis; in animals: liver, kidney injury; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	1,4-Dioxane 1,4-Dioxacyclohexane [1,4]Dioxane p-Dioxane [6]-crown-2 Diethylene dioxide Diethylene ether Dioxan	123-91-1	PID	100 ppm 500 ppm	Groundwater Soil Vapor	Inhalation, ingestion, skin and/or eye contact	Irritant to eyes, skin, mucous membranes and respiratory system. May be harmful by ingestion, skin absorption and inhalation	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	1H,1H,2H,2H.Perfluorooctanesulfonic Acid (6:2FTS) Sodium 1H,1H, 2H, 2H-Perfluorooctane Sulfonate (6:2)(6:2FTS) 6:2 Fluorinated Telomer Sulfonates (6:2FTS) Sodium 1H,1H,2H,2H-Perfluorooctane Sulfonate (6:2)	27619-97-2	NA	NA NA	Groundwater	inhalation, skin or eye contact, ingestion	irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	2,4-Dimethylphenol 2,4-Xylenol m-Xylenol 1-Hydroxy-2,4-dimethylbenzene 2,4-Dimethylphenol 4-Hydroxy-1,3-dimethylbenzene 4,6-Dimethylphenol 1,3-Dimethyl-4-hydroxybenze	105-67-9	None	NA NA	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, mucous membrane; headache, narcosis, coma; dermatitis; in animals: liver, kidney damage	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.18	2-Butanone Ethyl methyl ketone MEK Methyl acetone Methyl ethyl ketone	78-93-3	PID	200 ppm 3000 ppm	Soil Groundwater Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose; headache; dizziness; vomiting; dermatitis	Eye: Irrigate immediately Skin: Water wash immediately Breathing: Fresh air Swallow: Medical attention immediately
1.3.1 – 1.3.18	2-Hexanone Butyl methyl ketone MBK Methyl butyl ketone Methyl n-butyl ketone	591-78-6	PID	100 ppm 1600 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, nose; peripheral neuropathy: lassitude (weakness, exhaustion), paresthesia; dermatitis; headache, drowsiness	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	2-Methylnaphthalene β-methylnaphthalene	91-57-6	PID	NA NA	Groundwater Soil Vapor	inhalation, ingestion or skin absorption, eye contact	irritation to the skin, eyes, mucous membranes and upper respiratory tract. It may also cause headaches, nausea, vomiting, diarrhea, anemia, jaundice, euphoria, dermatitis, visual disturbances, convulsions and comatose	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.18	4-Isopropyltoulene 1-Methyl-4-(1-methylethyl)benzene 4-Isopropyltoluene; 4-Methylcumene; 1-Methyl-4-isopropylbenzene Dolcymene Camphogen Paracymene Cymene p-Cymene p-Isopropyltoluene	99-87-6	PID	NA NA	Soil Groundwater Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, mucous membrane; dermatitis; headache, narcosis, coma	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	4-Methyl-2-pentanone Hexone Isobutyl methyl ketone Methyl isobutyl ketone MIBK Methyl Isobutyl Ketone	108-10-1	PID	100 ppm 500 ppm	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, mucous membrane; headache, narcosis, coma; dermatitis; in animals: liver, kidney damage	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	Acenaphthene 1,2-Dihydroacenaphthylene 1,8-Ethylenenaphthalene peri-Ethylenenaphthalene Naphthyleneethylene Tricyclododecapentaene	83-32-9	PID	NA NA	Soil	inhalation, ingestion, skin and/or eye contact,	irritation to the skin, eyes, mucous membranes and upper respiratory tract; If ingested, it can cause vomiting	Eye: Irrigate immediately Skin: Soap wash immediately, if redness or irritation develop, seek medical attention immediately Breathing: Move to fresh air Swallow: do not induce vomiting, seek medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.18	Acenaphthylene Cycopental(de)naphthalene, Acenaphthalene	208-96-8	PID	NA NA	Soil	inhalation, ingestion, skin and/or eye contact	irritation to the skin, eyes, mucous membranes and upper respiratory tract	Eye: Irrigate immediately, seek medical attention immediately, Skin: Soap wash immediately, if redness or irritation develop, seek medical attention immediately Breathing: Move to fresh air Swallow: do not induce vomiting, seek medical attention immediately
1.3.1 – 1.3.18	Acetone Dimethyl ketone Ketone propane 2-Propanone	67-64-1	PID	1000 ppm 2500 ppm	Groundwater Soil	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, nose, throat; headache, dizziness, central nervous system depression; dermatitis	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.18	Acetophenone 1-phenylethanone Methyl phenyl ketone Phenylethanone	98-86-2	None	NA NA	Groundwater Soil	inhalation, ingestion, skin and/or eye contact	irritation to the skin, eyes, mucous membranes and upper respiratory tract	Eye: Irrigate immediately, seek medical attention immediately, Skin: Soap wash immediately, if redness or irritation develop, seek medical attention immediately Breathing: Move to fresh air Swallow: do not induce vomiting, seek medical attention immediately
1.3.1 – 1.3.18	Aluminum	7429-90-5	None	0.5 mg/m3 50 mg/m3	Soil	inhalation, skin and/or eye contact	irritation to the eyes, skin, respiratory system	Eye: Irrigate immediately Breathing: Fresh air
1.3.1 – 1.3.18	Anthracene	120-12-7	PID	0.2 mg/m^3 80 mg/m^3 (Coal Pitch Tar)	Soil	inhalation, skin or eye contact, ingestion	irritation to the skin, eyes, mucous membranes and upper respiratory tract, abdominal pain if ingested.	Eye: Irrigate immediately, seek medical attention immediately, Skin: Soap wash immediately, Breathing: Move to fresh air, refer to medical attention; Swallow: refer to medical attention

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.18	Antimony	7440-36-0	None	0.5 mg/m^3 50 mg/m^3	Groundwater Soil	inhalation, ingestion, skin and/or eye contact	irritation skin, possible dermatitis; resp distress; diarrhea; muscle tremor, convulsions; possible gastrointestinal tract	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	Aroclor 1254	11097-69-1	None	0.5 mg/m^3 5 mg/m^3	Groundwater Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, chloracne	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	Aroclor 1260	11096-82-5	None	0.5 mg/m^3 5 mg/m^3	Groundwater Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, chloracne	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	Arsenic	NA	None	0.5 mg/m^3 NA	Groundwater Soil	inhalation, ingestion, skin and/or eye contact	irritation skin, possible dermatitis; resp distress; diarrhea; muscle tremor, convulsions; possible gastrointestinal tract	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.18	Barium	10022-31-8	None	0.5 mg/m³ 50 mg/m³	Groundwater Soil	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, upper respiratory system; skin burns; gastroenteritis; muscle spasm; slow pulse	Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	Benzaldehyde Benzoic aldehyde Benzenecarbonal Benzenecarboxaldehyde Phenylmethanal	100-52-7	PIF	NA NA	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, respiratory system	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	Benzene Benzol Phenyl hydride	71-43-2	PID	3.19 mg/m³ 1,595 mg/mg³	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; lassitude (weakness, exhaustion) [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	Benzo(a)anthracene Benzanthracene Benzanthrene 1,2-Benzanthracene Benzo[b]phenanthrene Tetraphene	56-55-3	PID	0.2 mg/m³ 80 mg/m³ (Coal Pitch Tar)	Groundwater Soil	inhalation, skin or eye contact, ingestion	dermatitis, bronchitis, [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.18	Benzo(a)pyrene	50-32-8	PID	0.2 mg/m^3 80 mg/m^3 (Coal Pitch Tar)	Soil	inhalation, skin or eye contact, ingestion	dermatitis, bronchitis, [potential occupational carcinogen]	Eye: Irrigate immediately, seek medical attention Skin: Soap wash immediately; Breathing: move to fresh air; Swallow: Induce vomiting if conscious, seek medical attention immediately
1.3.1 – 1.3.18	Benzo(b)fluoranthene	205-99-2	PID	0.2 mg/m^3 80 mg/m^3 (Coal Pitch Tar)	Soil	inhalation, skin or eye contact, ingestion	irritation to eyes and skin, respiratory irritation(dizziness, weakness, fatigue, nausea, headache)	Eye: Irrigate immediately, refer to medical attention Skin: Soap wash immediately Breathing: move to fresh air Swallow: Medical attention immediately
1.3.1 – 1.3.18	Benzo(g,h,i)perylene Benzo(ghi)perylene	191-24-2	PID	0.2 mg/m^3 80 mg/m^3 (Coal Pitch Tar)	Soil	inhalation, skin or eye contact, ingestion	NA	Eye: Irrigate immediately, refer to medical attention Skin: Soap wash immediately Breathing: move to fresh air Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.18	Benzo(k)fluoranthene	207-08-9	PID	0.2 mg/m^3 80 mg/m^3 (Coal Pitch Tar)	Soil	inhalation, skin or eye contact, ingestion	irritation to eyes and skin, respiratory irritation (dizziness, weakness, fatigue, nausea, headache)	Eye: Irrigate immediately, refer to medical attention Skin: Soap wash immediately Breathing: move to fresh air Swallow: Medical attention immediately
1.3.1 – 1.3.18	Benzoic acid Carboxybenzene E210 Dracylic acid Phenylmethanoic acid Benzenecarboxylic acid	65-85-0	None	NA NA	Groundwater Soil Vapor	inhalation, skin or eye contact, ingestion	irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs	Eye: Irrigate immediately, refer to medical attention Skin: Soap wash immediately Breathing: move to fresh air
1.3.1 – 1.3.18	Benzyl Alcohol Benzenemethanol Phenyl carbinol alpha-Hydroxytoluene Benzoyl alcohol Phenyl methanol	100-51-6	PID	NA NA	Groundwater Soil Vapor	inhalation, skin or eye contact, ingestion	irritation to eyes and skin, respiratory irritation (dizziness, weakness, fatigue, nausea, headache	Eye: Irrigate immediately, refer to medical attention Skin: Soap wash immediately Breathing: move to fresh air Swallow: Medical attention immediately
1.3.1 – 1.3.18	Benzyl butyl phthalate Butyl benzyl phthalate Butylbenzylphthalate	86-66-7	None	NA NA	Groundwater Soil Vapor	inhalation, skin or eye contact, ingestion	irritation to eyes and skin, respiratory irritation (dizziness, weakness, fatigue, nausea, headache	Eye: Irrigate immediately, refer to medical attention Skin: Soap wash immediately Breathing: move to fresh air Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.18	Beryllium	7440-41-7	None	0.002 mg/m^3 4 mg/m^3	Soil	inhalation, skin and/or eye contact	berylliosis (chronic exposure): anorexia, weight loss, lassitude (weakness, exhaustion), chest pain, cough, clubbing of fingers, cyanosis, pulmonary insufficiency; irritation to the eyes; dermatitis; [potential occupational carcinogen]	Eye: Irrigate immediately Breathing: Fresh air
1.3.1 – 1.3.18	Bis(2-ethylhexyl)phthalate Bis(2-Ethylhexyl) Phthalate Di-sec octyl phthalate DEHP Di(2-ethylhexyl)phthalate Octyl phthalate	117-81-7	None	5 mg/m^3 5000 mg/m^3	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, mucous membrane; in animals: liver damage; teratogenic effects; [potential occupational carcinogen	Eye: Irrigate immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	Bromodichloromethane dichlorobromomethane	75-27-4	None	NA NA	Groundwater Soil Vapor	inhalation, skin or eye contact, ingestion	irritation of the skin, eyes, mucous membranes and respiratory tract, narcosis, nausea, dizziness and headache	Eye: Irrigate immediately (liquid) Skin: Water flush immediately (liquid) Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.18	Cadmium	7440-43-9	None	0.005 mg/m^3 9 mg/m^3	Soil	inhalation, ingestion	pulmonary edema, dyspnea (breathing difficulty), cough, chest tightness, substernal (occurring beneath the sternum) pain; headache; chills, muscle aches; nausea, vomiting, diarrhea; anosmia (loss of the sense of smell), emphysema, proteinuria, mild anemia; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	Calcium	7440-70-2	None	NA	Groundwater Soil	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, upper resp tract; ulcer, perforation nasal septum; pneumonitis; dermatitis	Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	Carbazole 9-azafluorene Dibenzopyrrole Diphenylenimine diphenyleneimide	86-74-8	None	NA NA	Soil	inhalation, skin absorption (liquid), skin and/or eye contact	irritation to eyes and skin, respiratory irritation	Eye: Irrigate immediately, refer to medical attention Skin: Soap wash immediately Breathing: move to fresh air Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.18	Carbon disulfide	75-15-0	PID	20 ppm 500 ppm	Soil Groundwater Vapor	inhalation, skin or eye contact, ingestion	irritation to the eyes, skin, respiratory system	Eye: Irrigate immediately (liquid) Skin: Water flush immediately (liquid) Breathing: Respiratory support
1.3.1 – 1.3.18	Chlorobenzene benzene chloride monochlorobenzene Phenyl chloride Chlorobenzol MCB	108-90-7	PID	75 ppm 1000 ppm	Groundwater Soil Vapor	inhalation, skin or eye contact, ingestion	irritation to the eyes, skin, nose; drowsiness, incoordination; central nervous system depression; in animals: liver, lung, kidney injury	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	Chloroform Methane trichloride Trichloromethane	67-66-3	None	50 ppm 500 ppm	Groundwater Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin; dizziness, mental dullness, nausea, confusion; headache, lassitude (weakness, exhaustion); anesthesia; enlarged liver; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	Chromium Total Chromium	7440-47-3	None	1.0 mg/m^3 250 mg/m^3	Groundwater Soil	inhalation absorption ingestion	irritation to eye, skin, and respiratory	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.18	Chrysene Benzo[a]phenanthrene 1,2-Benzphenanthrene	218-01-9	PID	0.2 mg/m^3 80 mg/m^3 (Coal Pitch Tar)	Groundwater Soil	inhalation, absorption, ingestion, consumption	irritation to eye, skin, and respiratory, gastrointestinal irritation nausea, vomit, diarrhea [potential occupational carcinogen]	Eyes: Irrigate immediately Skin: Soap wash promptly. Breath: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	cis-1,2-Dichloroethene	156-59-2	PID	200 ppm 1000 ppm	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, respiratory system; central nervous system depression	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	Cobalt	7440-48-4	None	0.1mg/m^3 20 mg/m^3	Soil	inhalation, ingestion, skin and/or eye contact	Cough, dyspnea (breathing difficulty), wheezing, decreased pulmonary function; weight loss; dermatitis; diffuse nodular fibrosis; resp hypersensitivity, asthma	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	Copper	7440-50-8	None	1.0 mg/m^3 100 mg/m^3	Groundwater Soil	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, nose, metallic taste; dermatitis; anemia	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.18	Cumene Cumol Isopropylbenzene 2-Phenyl propane	98-82-8	PID	50 ppm 900 ppm	Groundwater Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, mucous membrane; dermatitis; headache, narcosis, coma	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	Cyanide	57-12-5	None	5 mg/m^3 25 mg/m^3	Groundwater Soil	inhalation, ingestion, skin and/or eye contact	Exposure to cyanide can cause weakness, headaches, confusion, dizziness, fatigue, anxiety, sleepiness, nausea and vomiting. Breathing can speed up then become slow and gasping. Coma and convulsions also occur. If large amounts of cyanide have been absorbed by the body, the person usually collapses and death can occur very quickly. Long-term exposure to lower levels of cyanide can cause skin and nose irritation, itching, rashes and thyroid changes.	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.18	Cyclohexane Benzene hexahydride Hexahydrobenzene Hexamethylene Hexanaphthene	110-82-7	PID	300 ppm 1300 ppm	Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, respiratory system; drowsiness; dermatitis; narcosis, coma	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	Delta BHC Delta-BHC Delta-hexachlorocyclohexane Delta Hexachlorocyclohexane	319-86-8	None	0.5 mg/m^3 50 mg/m^3	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat; headache; nausea; clonic convulsions; resp difficulty; cyanosis; aplastic anemia; muscle spasm; in animals: liver, kidney damage	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	Dibenz(a,h)anthracene Dibenzo(a,h)anthracene	53-70-3	PID	0.2 mg/m^3 80 mg/m^3 (Coal Pitch Tar)	Groundwater Soil	inhalation, absorption, ingestion, consumption	irritation to eyes, skin, respiratory, and digestion [potential occupational carcinogen]	Eyes: Irrigate immediately Skin: Soap wash promptly. Breath: Respiratory support PID Swallow: Medical attention immediately
1.3.1 – 1.3.18	Dibenzofuran	132-64-9	None	NA NA	Soil	inhalation, absorption	irritation to eyes, and skin	Eyes: Irrigate immediately Skin: Soap wash promptly.

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.18	Dibutyl phthalate Di-n-butyl phthalate Butyl phthalate n-Butyl phthalate 1,2-Benzenedicarboxylic acid dibutyl ester o-Benzenedicarboxylic acid dibutyl ester DBP Palatinol C, Elaol Dibutyl-1,2-benzene-dicarboxylate Di-n-butyl Phthalate Di-n-butylphthalate	84-74-2	None	5 mg/m^3 4000 mg/m^3	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, upper respiratory system, stomach	Eye: Irrigate immediately Skin: Wash regularly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	Dieldrin HEOD 1,2,3,4,10,10-Hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-1,4-endo exo-5,8-dimethanonaphthalene	60-57-1	PID	0.25 mg/m^3 50 mg/m^3	Groundwater Soil Water	inhalation, skin absorption, ingestion, skin and/or eye contact	headache, dizziness; nausea, vomiting, malaise (vague feeling of discomfort), sweating; myoclonic limb jerks; clonic, tonic convulsions; coma; [potential occupational carcinogen]; in animals: liver, kidney damage	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	Diesel Fuel automotive diesel fuel oil No. 2 distillate diesoline diesel oil diesel oil light diesel oil No. 1-D summer diesel	68334-30-5	PID	NA NA	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat; burning sensation in chest; headache, nausea, lassitude (weakness, exhaustion), restlessness, incoordination, confusion, drowsiness; vomiting, diarrhea; dermatitis; chemical pneumonitis (aspiration liquid)	Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.18	Ethyl benzene Ethylbenzene Ethylbenzol Phenylethane	100-40-4	PID	435 mg/m^3 3,472 mg/m^3	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, mucous membrane; headache; dermatitis; narcosis, coma	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	Ethyl chloride Chloroethane Hydrochloric ether Monochloroethane Muriatic ether Hydrochloric ether	75-00-3	PID	1000 ppm 3800 ppm	Groundwater Soil Vapor	inhalation, skin absorption (liquid), ingestion (liquid), skin and/or eye contact	incoordination, inebriation; abdominal cramps; cardiac arrhythmias, cardiac arrest; liver, kidney damage	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	Fluoranthene Benzo(j, k)fluorene	206-44-0	PID	0.2 mg/m^3 80 mg/m^3 (Coal Pitch Tar)	Groundwater Soil	inhalation, skin or eye contact, ingestion	irritation to eyes and skin, respiratory irritation(dizziness, weakness, fatigue, nausea, headache)	Eye: Irrigate immediately, refer to medical attention Skin: Soap wash immediately Breathing: move to fresh air Swallow: Medical attention immediately
1.3.1 – 1.3.18	Fluorene	86-73-7	PID	0.2 mg/m^3 80 mg/m^3 (Coal Pitch Tar)	Soil	inhalation, skin or eye contact, ingestion	irritation to eyes and skin, respiratory irritation(dizziness, weakness, fatigue, nausea, headache)	Eye: Irrigate immediately, refer to medical attention Skin: Soap wash immediately Breathing: move to fresh air Swallow: Medical attenti

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.18	Fuel Oil No. 2	68476-30-2	PID	NA NA	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat; burning sensation in chest; headache, nausea, lassitude (weakness, exhaustion), restlessness, incoordination, confusion, drowsiness; vomiting, diarrhea; dermatitis; chemical pneumonitis (aspiration liquid)	Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	Gasoline	8006-61-9	PID	NA NA	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, mucous membrane; dermatitis; headache, lassitude (weakness, exhaustion), blurred vision, dizziness, slurred speech, confusion, convulsions; chemical pneumonitis (aspiration liquid)	Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	Helium	7440-59-7	Helium Detector	NA NA	NA	inhalation	dizziness, headache, and nausea	Breathing: Respiratory support
1.3.1 – 1.3.18	Hexavalent Chromium Chromium VI	18540-29-9	None	1.0 mg/m^3 250 mg/m^3	Groundwater Soil	inhalation absorption ingestion	irritation to eye, skin, and respiratory	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.18	Indeno(1,2,3-cd)pyrene Indeno(1,2,3-c,d)Pyrene Indeno(1,2,3-cd)Pyrene	193-39-5	None	0.2 mg/m^3 80 mg/m^3 (Coal Pitch Tar)	Groundwater Soil	inhalation, absorption, ingestion, consumption	irritation to eyes, skin, respiratory, and digestion [potential occupational carcinogen]	Eyes: Irrigate immediately Skin: Soap wash promptly. Breath: Respiratory support Swallow: Medical attention immediately, wash mouth with water
1.3.1 – 1.3.18	Iron	7439-89-6	None	10 mg/m^3 NA	Groundwater Soil	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, mucous membrane; abdominal pain, diarrhea, vomiting	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	Lead	7439-92-1	None	0.050 mg/m^3 100 mg/m^3	Groundwater Soil	inhalation, ingestion, skin and/or eye contact	lassitude (weakness, exhaustion), insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; paralysis wrist, ankles; encephalopathy; kidney disease; irritation to the eyes; hypertension	Eye: Irrigate immediately Skin: Soap flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	Magnesium	7439-95-4	None	15 mg/m^3 NA	Soil	inhalation, skin and/or eye contact	irritation to the eyes, skin, respiratory system; cough	Eye: Irrigate immediately Breathing: Fresh air

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.18	Manganese	7439-96-5	None	5 mg/m^3 500 mg/m^3	Groundwater Soil	inhalation, ingestion	aerosol is irritating to the respiratory tract	Eye: Irrigate immediately Skin: Soap flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	m-Cresol 4 meta-Cresol 3-Cresol m-Cresylic acid 1-Hydroxy-3-methylbenzene 3-Hydroxytoluene 3-Methylphenol	108-39-4	PID	5 ppm 250 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, mucous membrane; central nervous system effects: confusion, depression, resp failure; dyspnea (breathing difficulty), irreg rapid resp, weak pulse; eye, skin burns; dermatitis; lung, liver, kidney, pancreas damage	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	Mercury	7439-97-6	None	0.1 mg/m^3 10 mg/m^3	Groundwater Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin; cough, chest pain, dyspnea (breathing difficulty), bronchitis, pneumonitis; tremor, insomnia, irritability, headache, lassitude (weakness, exhaustion); stomatitis, salivation; gastrointestinal disturbance, anorexia, weight loss; proteinuria	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.18	Methoxychlor p,p'-Dimethoxydiphenyltrichloroethane DMDT Methoxy-DDT 2,2-bis(p-Methoxyphenyl)-1,1,1-trichloroethane 1,1,1-Trichloro-2,2-bis-(p-methoxyphenyl)ethane	72-43-5	None	15 mg/m^3 5000 mg/m^3	Groundwater Soil Vapor	inhalation, ingestion	fasciculation, trembling, convulsions; kidney, liver damage; [potential occupational carcinogen]	Skin: Soap wash Breathing: Fresh air Swallow: Medical attention immediately
1.3.1 – 1.3.18	Methyl Acetate	79-20-9	PID	200 ppm 3100 ppm	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat; headache, drowsiness; optic nerve atrophy; chest tightness; in animals: narcosis	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	Methyl Bromide Bromomethane Monobromomethane	74-83-9	PID	20 ppm 250 ppm	Soil Groundwater Vapor	inhalation, skin absorption (liquid), skin and/or eye contact (liquid)	irritation to the eyes, skin, respiratory system; muscle weak, incoordination, visual disturbance, dizziness; nausea, vomiting, headache; malaise (vague feeling of discomfort); hand tremor; convulsions; dyspnea (breathing difficulty); skin vesiculation; liquid: frostbite; [potential occupational carcinogen]	Eye: Irrigate immediately (liquid) Skin: Water flush immediately (liquid) Breathing: Respiratory support

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.18	Methyl *tert*-butyl ether MTBE Methyl tertiary-butyl ether Methyl t-butyl ether tert-Butyl methyl ether tBME tert-BuOMe	1634-04-4	PID	NA NA	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat; burning sensation in chest; headache, nausea, lassitude (weakness, exhaustion), restlessness, incoordination, confusion, drowsiness; vomiting, diarrhea; dermatitis; chemical pneumonitis (aspiration liquid)	Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	Methylcyclohexane Methyl cyclohexane Hexahydrotoluene Cyclohexylmethane Toluene hexahydride	108-87-2	PID	500 ppm 1200 ppm	Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat; dizziness, drowsiness; in animals: narcosis	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	Methylene Chloride Dichloromethane Methylene dichloride	75-09-2	PID	25 ppm 2300 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin; lassitude (weakness, exhaustion), drowsiness, dizziness; numb, tingle limbs; nausea; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.18	m-Xylenes 1,3-Dimethylbenzene m-Xylol Metaxylene	108-38-3	PID	100 ppm 900 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; corneal vacuolization; nausea, vomiting, abdominal pain; dermatitis	Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	Naphthalene Naphthalin Tar camphor White tar	91-20-3	PID	50 mg/m^3 250 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes; headache, confusion, excitement, malaise (vague feeling of discomfort); nausea, vomiting, abdominal pain; irritation bladder; profuse sweating; hematuria (blood in the urine); dermatitis, optical neuritis	Eye: Irrigate immediately Skin: Molten flush immediately/solid-liquid soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	n-Butylbenzene	104-51-8	PID	NA NA	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin; dry nose, throat; headache; low blood pressure, tachycardia, abnormal cardiovascular system stress; central nervous system, hematopoietic depression; metallic taste; liver, kidney injury	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.18	N-ethyl perfluorooctane sulfonamido acetic acid NEtFOSAA N-Ethylperfluorooctanesulfonamide	4151-50-2	NA	NA NA	Groundwater	inhalation, skin or eye contact, ingestion	irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	Nickel	7440-02-0	None	NA 10 mg/m^3	Groundwater Soil	ion, ingestion, skin and/or eye contact	sensitization dermatitis, allergic asthma, pneumonitis; [potential occupational carcinogen]	Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	Non-Flammable Gas Mixture CALGAS (Equipment Calibration Gas : Oxygen Methane Hydrogen Sulfide Carbon Monoxide Nitrogen	7782-44-7 74-82-8 7783-08-4 830-08-0 7727-37-9	Multi-Gas PID	NA/NA NA/NA 10/100 ppm 50/1200 ppm NA/NA	NA	inhalation	dizziness, headache, and nausea	Breathing: Respiratory support
1.3.1 – 1.3.18	Non-Flammable Gas Mixture CALGAS (Equipment Calibration Gas : Oxygen Isobutylene Nitrogen	7782-44-7 115-11-7 7727-37-9	PID	NA/NA NA/NA NA/NA	NA	inhalation	dizziness, headache, and nausea	Breathing: Respiratory support

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.18	n-Propylbenzene Isocumene Propylbenzene 1-Phenylpropane 1-Propylbenzene Phenylpropane	103-65-1	PID	NA NA	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin; dry nose, throat; headache; low blood pressure, tachycardia, abnormal cardiovascular system stress; central nervous system, hematopoietic depression; metallic taste; liver, kidney injury	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	o-Cresol ortho-Cresol 2-Cresol o-Cresylic acid 1-Hydroxy-2-methylbenzene 2-Hydroxytoluene 2-Methyl phenol 2-Methylphenol 2-Metyhlphenol	95-48-7	PID	5 ppm 250 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, mucous membrane; central nervous system effects: confusion, depression, resp failure; dyspnea (breathing difficulty), irreg rapid resp, weak pulse; eye, skin burns; dermatitis; lung, liver, kidney, pancreas damage	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediatelyethylp hhhhhhhhhh
1.3.1 – 1.3.18	o-Xylenes 1,2-Dimethylbenzene ortho-Xylene o-Xylol	95-47-6	PID	100 ppm 900 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; corneal vacuolization; nausea, vomiting, abdominal pain; dermatitis	Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.18	p-Cresol para-Cresol 4-Cresol p-Cresylic acid 1-Hydroxy-4-methylbenzene 4-Hydroxytoluene 4-Methylphenol	106-44-5	PID	5 ppm 250 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, mucous membrane; central nervous system effects: confusion, depression, resp failure; dyspnea (breathing difficulty), irreg rapid resp, weak pulse; eye, skin burns; dermatitis; lung, liver, kidney, pancreas damage	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	p-Dichlorobenzene p-DCB 1,4-Dichlorobenzene para-Dichlorobenzene Dichlorocide	106-46-7	PID	75 ppm 150 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, swelling periorbital (situated around the eye); profuse rhinitis; headache, anorexia, nausea, vomiting; weight loss, jaundice, cirrhosis; in animals: liver, kidney injury; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	p-Diethylbenzene 1,4-Diethylbenzene 1,4-Diethyl benzene	105-05-5	PID	None None	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, respiratory system; skin burns; in animals: central nervous system depression	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.18	Pentachlorophenol PCP; Penta; 2,3,4,5,6-Pentachlorophenol	87-86-5	PID	0.5 mg/m^3 2.5 mg/m^3	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, nose, throat; sneezing, cough; lassitude (weakness, exhaustion), anorexia, weight loss; sweating; headache, dizziness; nausea, vomiting; dyspnea (breathing difficulty), chest pain; high fever; dermatitis	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	Perfluoroheptanoic acid Perfluoroheptanoic acid Tridecafluoroheptanoic acid PFHpA	375-85-9	NA	None None	Groundwater	inhalation, skin or eye contact, ingestion	irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	Perfluorobutanoic Acid Heptafluorobutyric acid Heptafluorobutanoic acid Perfluorobutyric acid PFBA	375-22-4	NA	None None	Groundwater	inhalation, skin or eye contact, ingestion	irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	Perfluorohexanesulfonic Acid perfluorohexanesulfonate perfluorohexanesulfonic acid PFHxS	355-46-4	NA	None None	Groundwater	inhalation, skin or eye contact, ingestion	irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.18	Perfluorohexanoic Acid PFHxA	307-24-4	NA	None None	Groundwater	inhalation, skin or eye contact, ingestion	irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	Perfluoronoanoic Acid Perfluorononanoic Acid PFNA perfluoro-n-nonanoic acid perfluorononanoate	375-95-1	NA	None None	Groundwater	Groundwater	inhalation, skin or eye contact, ingestion; strong acid	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	Perfluorooctanesulfonamide Erfluoroctylsulfonamide Perfluorooctane sulfonamide Heptadecafluorooctanesulphonamide Perfluorooctanesulfonic acid amide Deethylsulfluramid FC-99 PFOSA	754-91-6	NA	NA NA	Groundwater	inhalation, skin or eye contact, ingestion	irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	Perfluorooctanesulfonic Acid PFOS	1763-23-1	NA	None None	Groundwater	inhalation, skin or eye contact, ingestion	irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.18	Perfluoropentanoic Acid PFPeA	2706-90-3	NA	None None	Groundwater	inhalation, skin or eye contact, ingestion	irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	p-Ethyltoluene 4-Ethyltoluene 1-ethyl-4-methyl-benzene 1-methyl-4-ethylbenzene	622-96-8	NA	NA NA	Soil	ingestion, skin and/or eye contact	irritation to the eyes, skin, mucous membrane; headache; dermatitis; narcosis, coma	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	Phenanthrene	85-01-8	PID	0.2 mg/m^3 80 mg/m^3 (Coal Pitch Tar)	Groundwater Soil	inhalation, skin or eye contact, ingestion	irritation to eyes and skin, respiratory irritation(dizziness, weakness, fatigue, nausea, headache)	Eye: Irrigate immediately, refer to medical attention Skin: Soap wash immediately Breathing: move to fresh air Swallow: Medical attention immediately
1.3.1 – 1.3.18	Phenol Carbolic acid Hydroxybenzene, Monohydroxybenzene Phenyl alcohol Phenyl hydroxide	108-95-2	PID	5 ppm 250 ppm	Groundwater Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, nose, throat; anorexia, weight loss; lassitude (weakness, exhaustion), muscle ache, pain; dark urine, skin burns; dermatitis; tremor, convulsions, twitching	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.18	Potassium	7440-09-7	None	NA NA	Soil	inhalation, skin absorption, ingestion, skin and/or eye contact inhalation, ingestion, skin and/or eye contact	eye: Causes eye burns. Skin: Causes skin burns. Reacts with moisture in the skin to form potassium hydroxide and hydrogen with much heat. ingestion: Causes gastrointestinal tract burns. inhalation: May cause irritation of the respiratory tract with burning pain in the nose and throat, coughing, wheezing, shortness of breath and pulmonary edema. Causes chemical burns to the respiratory tract. inhalation may be fatal as a result of spasm, inflammation, edema of the larynx and bronchi, chemical pneumonitis and pulmonary edema.	Eyes: Get medical aid immediately Skin: Get medical aid immediately. Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Ingestion: If victim is conscious and alert, give 2-4 full cups of milk or water. Get medical aid immediately. inhalation: Get medical aid immediately.
1.3.1 – 1.3.18	p-Xylenes 1,4-Dimethylbenzene para-Xylene p-Xylol	106-42-3	PID	100 ppm 900 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; corneal vacuolization; nausea, vomiting, abdominal pain; dermatitis	Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.18	Pyrene benzo[def]phenanthrene	129-00-0	PID	0.2 mg/m^3 80 mg/m^3 (Coal Pitch Tar)	Groundwater Soil	inhalation, skin or eye contact, ingestion	irritation to eyes and skin, respiratory irritation(dizziness, weakness, fatigue, nausea, headache)	Eye: Irrigate immediately, refer to medical attention Skin: Soap wash immediately Breathing: move to fresh air Swallow: Medical attention immediately
1.3.1 – 1.3.18	sec-Butylbenzene	135-98-8	PID	10 ppm 100 ppm	Groundwater Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, nose, throat; inhalation: nausea or vomiting	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	Selenium	7782-49-2	None	1 mg/m^3 0.2 mg/m^3	Soil	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat; visual disturbance; headache; chills, fever; dyspnea (breathing difficulty), bronchitis; metallic taste, garlic breath, gastrointestinal disturbance; dermatitis; eye, skin burns; in animals: anemia; liver necrosis, cirrhosis; kidney, spleen damage	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.18	Silver	7440-22-4	None	0.01 mg/m^3 10 mg/m^3	Soil	inhalation, ingestion, skin and/or eye contact	blue-gray eyes, nasal septum, throat, skin; irritation, ulceration skin; gastrointestinal disturbance	Eye: Irrigate immediately Skin: Water flush Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	Sodium	7440-23-5	None	NA NA	Groundwater Soil	ion, ingestion, skin and/or eye contact	sensitization dermatitis, allergic asthma, pneumonitis; [potential occupational carcinogen]	Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	Tert-Butyl Alcohol Tertiary Butyl Alcohol Tert-Butanol Butyl alcohol 2-Methyl-2-propanol Trimethyl carbinol TBA	75-65-0	PID	100 ppm 1600 ppm	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat; drowsiness, narcosis	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	tert-Butylbenzene *t*-Butylbenzene 2-Methyl-2-phenylpropane Pseudobutylbenzene	98-06-6	PID	10 ppm NA	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	eye, skin irritation; dry nose, throat; headaches; low blood pressure, tachycardia; abnormal cardiovascular system; central nervous system depression; hematopoietic depression	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.18	Tetrachloroethylene Perchlorethylene Perchloroethylene PCE Perk Tetrachlorethylene Tetrachloroethene	127-18-4	PID	100 ppm 150 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat, respiratory system; nausea; flush face, neck; dizziness, incoordination; headache, drowsiness; skin erythema (skin redness); liver damage; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	Thallium	7440-28-0	None	0.1 mg/m^3 15 mg/m^3	Groundwater Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	nausea, diarrhea, abdominal pain, vomiting; ptosis, strabismus; peri neuritis, tremor; retrosternal (occurring behind the sternum) tightness, chest pain, pulmonary edema; convulsions, chorea, psychosis; liver, kidney damage; alopecia; paresthesia legs	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	Toluene Methyl benzene Methyl benzol Phenyl methane Toluol	108-88-3	PID	200 ppm 500 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, nose; lassitude (weakness, exhaustion), confusion, euphoria, dizziness, headache; dilated pupils, lacrimation (discharge of tears); anxiety, muscle fatigue, paresthesia; dermatitis	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.18	Total PCBs Chlorodiphenyl (42% chlorine) Aroclor® 1242 PCB Polychlorinated biphenyl	53469-21-9	None	0.5 mg/m^3 5 mg/m^3	Groundwater Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, chloracne	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	Total Xylenes Dimethylbenzene Xylol	1330-20-7	PID	100 ppm 900 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; corneal vacuolization; nausea, vomiting, abdominal pain; dermatitis	Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	Trichloroethylene Ethylene trichloride TCE Trichloroethene Trilene	79-01-6	PID	100 ppm 1000 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin; headache, visual disturbance, lassitude (weakness, exhaustion), dizziness, tremor, drowsiness, nausea, vomiting; dermatitis; cardiac arrhythmias, paresthesia; liver injury; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.18	Vanadium	7440-62-2	None	0.1 mg/m3 15 mg/m3	Groundwater Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	nausea, diarrhea, abdominal pain, vomiting; ptosis, strabismus; peri neuritis, tremor; retrosternal (occurring behind the sternum) tightness, chest pain, pulmonary edema; convulsions, chorea, psychosis; liver, kidney damage; alopecia; paresthesia legs	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.18	Vinyl Chloride Chloroethene Chloroethylen Ethylene monochloride Monochloroethene Monochloroethylene VC Vinyl chloride monomer (VCM)	75-01-4	PID	1 ppm NA	Groundwater Soil Vapor	inhalation, skin and/or eye contact (liquid)	lassitude (weakness, exhaustion); abdominal pain, gastrointestinal bleeding; enlarged liver; pallor or cyanosis of extremities; liquid: frostbite; [potential occupational carcinogen]	Eye: Frostbite Skin: Frostbite Breathing: Respiratory support
1.3.1 – 1.3.18	Vinylidene chloride 1,1-DCE 1,1-Dichloroethene 1,1-Dichloroethylene VDC Vinylidene chloride monomer Vinylidene dichloride	75-35-4	PID	NA NA	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, throat; dizziness, headache, nausea, dyspnea (breathing difficulty); liver, kidney disturbance; pneumonitis; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.18	Zinc	7440-62-2	None	15 mg/m^3 500 mg/m^3	Groundwater Soil	inhalation	chills, muscle ache, nausea, fever, dry throat, cough; lassitude (weakness, exhaustion); metallic taste; headache; blurred vision; low back pain; vomiting; malaise (vague feeling of discomfort); chest tightness; dyspnea (breathing difficulty), rales, decreased pulmonary function	Breathing: Respiratory support`

EXPLANATION OF ABBREVIATIONS

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

TABLE 3
Summary of Monitoring Equipment

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

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

TABLE 4
INSTRUMENTATION ACTION LEVELS

Photoionization Detector Action Levels	Action Required
Background to 5 ppm	No respirator; no further action required
> 1 ppm but < 5 ppm for > 5 minutes	1. Temporarily discontinue all activities and evaluate potential causes of the excessive readings. If these levels persist and cannot be mitigated (i.e., by slowing drilling or excavation activities), contact HSO to review conditions and determine source and appropriate response action. 2. If PID readings remain above 1 ppm, temporarily discontinue work and upgrade to Level C protection. 3. If sustained PID readings fall below 1 ppm, downgrading to Level D protection may be permitted.
> 5 ppm but < 150 ppm for > 5 minutes	1. Discontinue all work; all workers shall move to an area upwind of the jobsite. 2. Evaluate potential causes of the excessive readings and allow work area to vent until VOC concentrations fall below 5 ppm. 3. Level C protection will continue to be used until PID readings fall below 1 ppm.
> 150 ppm	Evacuate the work area

Notes:

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

TABLE 5
EMERGENCY NOTIFICATION LIST

ORGANIZATION	CONTACT	TELEPHONE
Local Police Department	NYPD	911
Local Fire Department	NYFD	911
Ambulance/Rescue Squad	NYFD	911
Hospital	New York Presbyterian/Weil Cornell Medical Center	911 or 212-746-5454
Langan Incident Hotline		800-952-6426 ex 4699
Medical Treatment Hotline	Incident Intervention	888-449-7787
Langan Project Manager	Paul McMahon	914-433-1157 (cell)
Langan Health and Safety Manager (HSM)	Tony Moffa	215-756-2523 (cell)
Langan Health & Safety Officer (HSO)	William Bohrer	410-984-3068 (cell)
Langan Field Team Leader (FTL)	To Be Determined	
Client's Representative	Paul Lipof	212-610-2827
National Response Center (NRC)		800-424-8802
Chemical Transportation Emergency Center (Chemtrec)		800-424-9300
Center for Disease Control (CDC)		404-639-3534
EPA (RCRA Superfund Hotline)		800-424-9346
TSCA Hotline		202-554-1404
Poison Control Center		800-222-1222

Immediately following an injury, unless immediate emergency medical treatment is required, the injured employee must contact Incident Intervention® at 888-449-7787.

For all other incidents or near misses, unless emergency response is required, either the employee or a coworker must contact the Langan Incident Hotline at 1-(800)-9-LANGAN (ext. #4699).

TABLE 6

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

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

a For work levels of 250 kilocalories/hour.

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

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

TABLE 7

HEAT INDEX

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

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

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

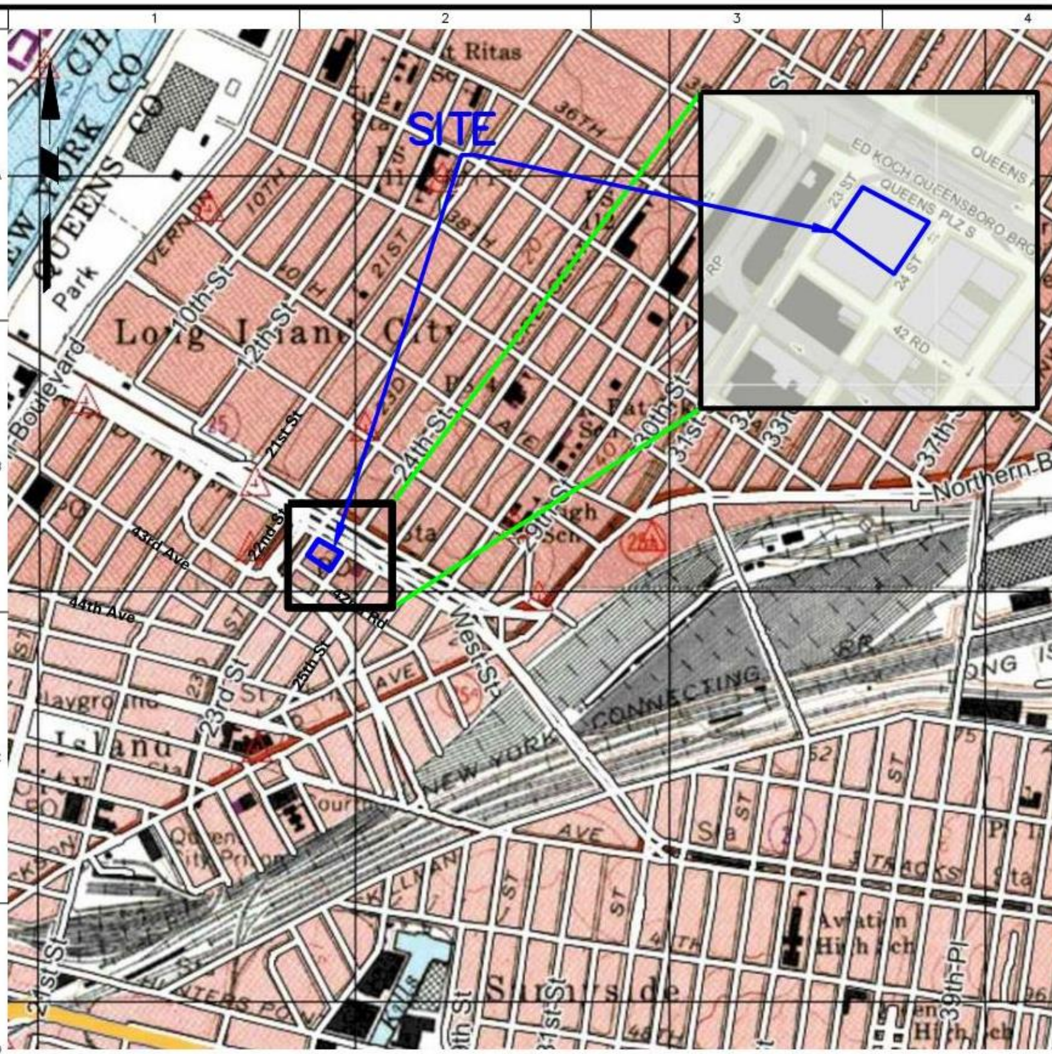
Note: Exposure to full sunshine can increase Heat Index values by up to 15 degrees F.

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

FIGURES

FIGURE 1

Site Location Map



LEGEND:

SITE BOUNDARY

NOTES:

1. BASE MAP TAKEN FROM UNITED STATES GEOLOGICAL SURVEY (USGS) 1927 NORTH AMERICAN DATUM, REVISED IN 1979.
2. INSET BASE MAP TAKEN FROM http://maps.nyc.gov/doitt/nycitymap/

LANGAN 21 Penn Plaza, 360 West 31st Street, 8th Floor New York, NY 10001 T: 212.479.5400 F: 212.479.5444 www.langan.com Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C. Langan Engineering and Environmental Services, Inc. Langan International LLC Collectively known as Langan	Project **23-10 QUEENS PLAZA SOUTH** BLOCK No. 425, LOT No. 5 LONG ISLAND CITY QUEENS NEW YORK	Figure Title **SITE LOCATION MAP**	Project No. 170244603 Date 6/15/2015 Scale NTS Drawn By PMM Submission Date –	Figure No. **1** Sheet 1 of 10

Filename: \\langan.com\data\NY\data6\170244601\Cadd Data - 170244601\2D-DesignFiles\Environmental\RAWP\23-10 QPS\Figure 1 - Site Location Map.dwg Date: 6/24/2015 Time: 09:07 User: pfarnham Style Table: Langan.stb Layout: ANSIA-BP

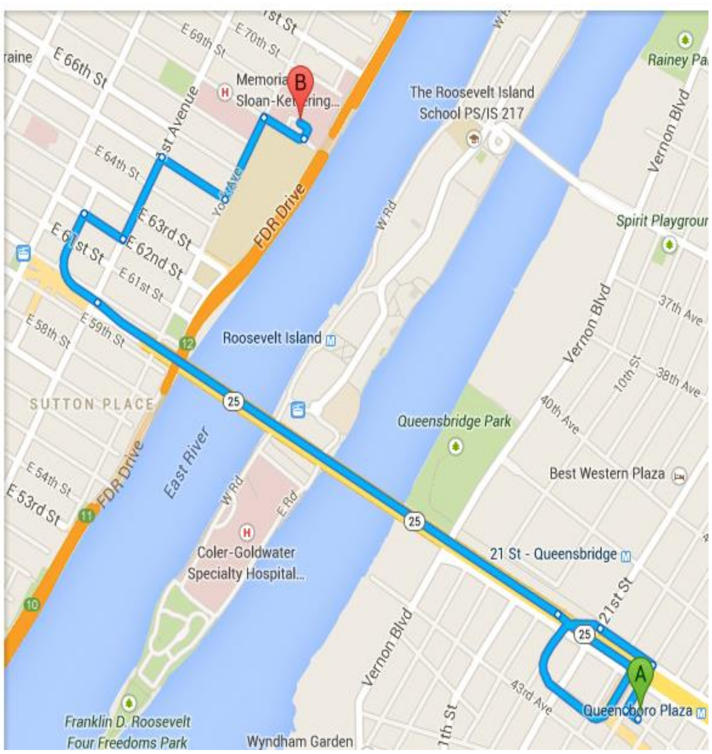
FIGURE 2
HOSPITAL ROUTE PLAN

Hospital Location: **New York Presbyterian/Weil Cornell Medical Center**
525 East 68th Street
New York, New York
212-746-5454

START: 23-10 Queens Plaza South, Long Island City, New York

1. Turn right onto 234st Street
2. Turn left onto Queens Plaza North
3. Take ramp to Queensboro Bridge Upper Roadway
4. Merge onto Ed Koch Queensboro Bridge
5. Take the ramp to 2nd Avenue S/West Side/ 1st Avenue-N/FDR Drive
6. Turn right onto East 62nd Street
7. Take the 1st left onto 1st Avenue
8. Turn right at the 3rd cross street onto East 65th Street
9. Turn left onto York Avenue
10. Take the 1st right onto East 68th Street
11. Turn left to stay on East 68th Street, destination will be on the right.

END: New York Presbyterian/ Weil Cornell Medical Center, 525 East 68th Street, New York, NY



ATTACHMENT A

STANDING ORDERS

STANDING ORDERS

GENERAL

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

TOOLS AND HEAVY EQUIPMENT

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

ATTACHMENT B

DECONTAMINATION PROCEDURES

PERSONNEL DECONTAMINATION

LEVEL C DECONTAMINATION

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

LEVEL D DECONTAMINATION

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

EQUIPMENT DECONTAMINATION

GENERAL:

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

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

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

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

MONITORING EQUIPMENT:

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

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

RESPIRATORS:

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

ATTACHMENT C

EMPLOYEE EXPOSURE/ INJURY INCIDENT REPORT

EMPLOYEE INCIDENT/INJURY REPORT
LANGAN ENGINEERING & ENVIRONMENTAL SERVICES

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

Affected Employee Name: ______________________________ Date: ______________________________

Incident type: ☐ Injury ☐ Report Only/No Injury

☐ Near Miss ☐ Other: __________________________________ _______

EMPLOYEE INFORMATION (Person completing Form)

Employee Name: ______________________________ Employee No: ______________________________

Title: ______________________________ Office Location: ______________________________

Length of time employed or date of hire: ______________________________

Mailing address: ______________________________

____

Sex: M ☐ F ☐ Birth date: ______________

Business phone & extension: ______________ Residence/cell phone: ______________________________

ACCIDENT INFORMATION

Project: ______________________________ Project #: ______________________________

Date & time of incident: ______________ Time work started & ended: ______________________________

Site location: ______________________________

Incident Type: Possible Exposure ☐ Exposure ☐ Physical Injury ☐

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

____

Exact location incident occurred:
____

____

Describe work being done:______________________________

____

____

____

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

____

____

Describe in detail how the incident occurred:

____

____

____

____

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

____

____

____

____

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

____

List the names of other persons affected during this incident:

____

____

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

____

____

____

Weather conditions during incident:

____

MEDICAL CARE INFORMATION

Did affected employee receive medical care? Yes ☐ No ☐

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

____

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

____

______

Length of stay at the facility?

______

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

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

Has the employee returned to work? Yes ☐ No ☐

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

If Yes, please describe:

____

____

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

If Yes, please describe:

____

HEALTH & SAFETY INFORMATION

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

Describe protective equipment and clothing used by the employee:

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

Employee Signature Date

Langan Representative Date

ATTACHMENT D

CALIBRATION LOG

DATE:________________ PROJECT:____________________

CALIBRATION LOG

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

ATTACHMENT E

MATERIAL SAFETY DATA SHEETS

SAFETY DATA SHEETS

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

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

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

ATTACHMENT F

JOBSITE SAFETY INSPECTION CHECKLIST

Jobsite Safety Inspection Checklist

Date: ______________________ **Inspected By:** ______________________

Location: ______________________ **Project #:** ______________________

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

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

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

Unsafe Acts: ______________________________

____

____

____

Notes: ______________________________

____

____

____

ATTACHMENT G

JOB SAFETY ANALYSIS FORM

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

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

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

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

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

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

JSA Title: **Subsurface Investigation**

JSA Number: **JSA030-01**

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

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

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

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

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

<u>**Print Name**</u>	<u>**Sign Name**</u>	<u>**Date**</u>
<u>Prepared by:</u>		
<u>Reviewed by:</u>		

LANGAN	Job Safety Analysis (JSA) Health and Safety

JSA Title: **Field Sampling**

JSA Number: **JSA022-01**

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

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

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

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
5. Unpack/Transport equipment to work area.	6. Back Strains 7. Slip/Trips/Falls 8. Cuts/Abrasions from equipment 9. Contusions from dropped equipment	6. Use proper lifting techniques/Use wheeled transport 7. Minimize distance to work area/Unobstructed path to work area/follow good housekeeping procedures. Mark slip/trip/fall hazards with orange safety cones. 8. Wear proper PPE (leather gloves, long sleeves). 9. Wear proper PPE (Langan approved safety shoes).
6. Initial Site Arrival-Site Assessment	1. Traffic	1. Situational awareness (be alert of your surroundings). Secure area from through traffic.
7. Surface Water Sampling	1. Contaminated media. Skin/eye contact with biological agents and/or chemicals.	1. Wear appropriate PPE (Safety glasses, appropriate gloves). Review (M)SDS for all chemicals being.
8. Sampling from bridges	1. Struck by vehicles	1. Wear appropriate PPE (Safety Vest). Use buddy system and orange safety cones.
9. Icing of Samples/ Transporting coolers/equipment from work area.	11. Back Strains 12. Slips/Trips/Falls 13. Cuts/Abrasions from equipment 14. Pinch/Crushing Hazards.	17. Drain coolers of water. Use proper lifting techniques. Use wheeled transport. 18. Have unobstructed path from work area. Aware of surroundings. 19. Wear proper PPE (Leather gloves, long sleeves) 20. Wear proper PPE (Leather gloves, long sleeves)
10. Site Departure	1. Contaminated PPE/Vehicle	1. Contaminated PPE should be disposed of on-site. Remove boots and soiled clothing for secure storage in trunk. Wash hands promptly.
11. All activities	1. Slips/ Trips/ Falls 2. Hand injuries, cuts or lacerations during manual handling of materials	1. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
	3. Foot injuries 4. Back injuries 15. Traffic 16. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.) 17. High Noise levels 18. Overhead hazards 19. Heat Stress/ Cold Stress 20. Eye Injuries	2. Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery or dirty objects before handling / Wear leather/ cut-resistant gloves 3. Wear Langan approved safety shoes 4. Use proper lifting techniques / Consider load location, task repetition, and load weigh when evaluating what is safe or unsafe to lift / Obtain assistance when possible 21. Wear high visibility clothing & vest / Use cones or signs to designate work area 22. Be aware of surroundings at all times, including the presence of wildlife/ Do not approach stray dogs / Carry/use dog/animal repellant / Use bug spray when needed 23. Wear hearing protection 24. Wear hard hat / Avoid areas were overhead hazards exist. 25. Wear proper attire for weather conditions (sunscreen or protective clothing in sunlight, layers for cold weather) / Drink plenty of fluids to avoid dehydration / Takes breaks as necessary to avoid heat/cold stress 26. Wear safety glasses
Additional items.		
Additional Items identified while in the field. (Delete row if not needed.)		

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

LANGAN	Job Safety Analysis (JSA) Health and Safety

JSA Title: Equipment Transportation and Set-Up

JSA Number: JSA012-01

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

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

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

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
12.Transport equipment to work area	10.Back Strain 11.Slips/ Trips/ Falls 12.Traffic 13.Cuts/abrasions from equipment 14.Contusions from dropped equipment	1. Use proper lifting techniques / Use wheeled transport 2. Minimize distance to work area / Have unobstructed path to work area / Follow good housekeeping procedures 3. Wear proper PPE (high visibility vest or clothing) 4. Wear proper PPE (leather gloves, long sleeves) 5. Wear proper PPE (safety shoes)
13.Moving equipment to its planned location	2. Pinch Hazard 3. Slips/ Trips/ Falls	1. Wear proper PPE (leather gloves) 2. Be aware of potential trip hazards / Practice good housekeeping procedures / Mark significant below-grade hazards (i.e. holes, trenches) with safety cones or spray paint
14.Equipment Set-up	2. Pinch Hazard 3. Cuts/abrasions to knuckles/hands 4. Back Strain	1. Wear proper PPE (leather gloves) 2. Wear proper PPE (leather gloves) 3. Use proper lifting techniques / Use wheeled transport
15. All activities	21. Slips/ Trips/ Falls 22. Hand injuries, cuts or lacerations during manual handling of materials 23. Foot injuries 24. Back injuries 25. Traffic 26. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.) 27. High Noise levels 28. Overhead hazards 29. Heat Stress/ Cold Stress 30. Eye Injuries	27. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards 28. Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery or dirty objects before handling / Wear leather/ cut-resistant gloves 29. Wear Langan approved safety shoes 30. Use proper lifting techniques / Consider load location, task repetition, and load weigh when evaluating what is safe or unsafe to lift / Obtain assistance when possible 31. Wear high visibility clothing & vest / Use cones or signs to designate work area

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
4. All activities (cont'd)		32. Be aware of surroundings at all times, including the presence of wildlife/ Do not approach stray dogs / Carry/use dog/animal repellant / Use bug spray when needed 33. Wear hearing protection 34. Wear hard hat / Avoid areas were overhead hazards exist. 35. Wear proper attire for weather conditions (sunscreen or protective clothing in sunlight, layers for cold weather) / Drink plenty of fluids to avoid dehydration / Takes breaks as necessary to avoid heat/cold stress 36. Wear safety glasses
Additional items.		
Additional Items identified while in the field. (Delete row if not needed.)		

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

LANGAN

Job Safety Analysis (JSA)
Health and Safety

JSA Title: **55-gallon Drum Sampling**

JSA Number: **JSA043-01**

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

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

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

☒ Other: All Drums are required to be labeled. Langan employees do not open or move undocumented drums or unlabeled drums without proper project manager authorization.

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
16.Unpack/Transport equipment to work area.	15.Back Strains 16.Slip/Trips/Falls 17.Cuts/Abrasions from equipment 4. Contusions from dropped equipment	10. Use proper lifting techniques/Use wheeled transport 11. Minimize distance to work area/Unobstructed path to work area/follow good housekeeping procedures. Mark slip/trip/fall hazards with orange safety cones. 12. Wear proper PPE (leather gloves, long sleeves). 4. Wear proper PPE (Langan approved safety shoes).
17.Open Drums	1. Hand Injuries, cuts or lacerations when untightening drum locking bolt, removing drum lid strap, or removing lid. 2. Pressure from drums.	1. Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery or dirty objects before handling / Wear leather/ cut-resistant gloves. Use non-metallic mallet and non-sparking tools/wrenches. 2. Open drum slowly to relieve pressure. Wear proper PPE: face shield and goggles; correct gloves; and over garments.
18.Collecting Soil/Fluid Sample	4. Irritation to eye from vapor, soil dust, or splashing 5. Irritation to exposed skin	2. Wear proper eye protection including safety glasses/ face shield/googles and when necessary, splash guard. If dust or vapor phase is present, wear appropriate safety breathing gear (1/2 mask or full face mask with correct filter) 3. Wear proper skin protection including nitrile gloves.
19.Closing Drums	1. Hand Injuries, cuts or lacerations when untightening drum locking bolt, removing drum lid strap, or removing lid.	2. Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery or dirty objects before handling / Wear leather/ cut-resistant gloves. Use non-metallic mallet and non-sparking tools/wrenches.
20.Moving Drums	2. Hand Injuries, cuts or lacerations when untightening drum locking bolt, removing drum lid strap, or removing lid. 3. Back Strains	2. Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery or dirty objects before handling / Wear leather/ cut-resistant gloves. Use non-metallic mallet and non-sparking tools/wrenches. 3. Use proper lifting techniques/Use wheeled transport

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
21. All activities	31. Slips/ Trips/ Falls 32. Hand injuries, cuts or lacerations during manual handling of materials 33. Foot injuries 34. Back injuries 35. Traffic 36. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.) 37. High Noise levels 38. Overhead hazards 39. Heat Stress/ Cold Stress 40. Eye Injuries	37. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards 38. Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery or dirty objects before handling / Wear leather/ cut-resistant gloves 39. Wear Langan approved safety shoes 40. Use proper lifting techniques / Consider load location, task repetition, and load weigh when evaluating what is safe or unsafe to lift / Obtain assistance when possible 41. Wear high visibility clothing & vest / Use cones or signs to designate work area 42. Be aware of surroundings at all times, including the presence of wildlife/ Do not approach stray dogs / Carry/use dog/animal repellant / Use bug spray when needed 43. Wear hearing protection 44. Wear hard hat / Avoid areas were overhead hazards exist. 45. Wear proper attire for weather conditions (sunscreen or protective clothing in sunlight, layers for cold weather) / Drink plenty of fluids to avoid dehydration / Takes breaks as necessary to avoid heat/cold stress 46. Wear safety glasses
Additional items.		
Additional Items identified while in the field. (Delete row if not needed.)		

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

LANGAN	Job Safety Analysis (JSA) Health and Safety

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

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

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

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
22.Move equipment to work site	18.Back strain when lifting equipment 19.Slips/ Trips/ Falls while moving equipment 20.Traffic (if applicable) 21.Pinched fingers or running over toes during geoprobe set-up 22.Overturn drilling rig while transporting to loading dock on flat-bed tow truck	13. Use proper lifting technique (use legs for bending and lifting and not the back)/ Use wheeled transport for heavy equipment / Get assistance when handling loads greater than 50 lbs. / Minimize distance to vehicle 14. Use proper lifting technique (use legs for bending and lifting and not the back) / Use wheeled transport for heavy equipment / Get assistance when handling loads greater than 50 lbs. / Minimize distance to vehicle / Have unobstructed path to vehicle or collection point / Do not lift/walk with boxes that are heavy/difficult to lift 15. Wear high visibility safety vests or clothing / Exercise caution 16. Wear proper PPE (cut-resistant gloves) / Stay alert, be aware of geoprobe rig at all times 17. Drill rig should be parked in center of flat-bed tow truck / Emergency brake shall be used at all times during transport on the flat-bed truck/ All unnecessary personnel should stay away from the flat-bed truck during moving activities
23.Calibration of monitoring equipment	6. Skin or eye contact with calibration chemicals 7. Pinch fingers in monitoring equipment	4. Wear proper PPE (safety glasses/ goggles) 5. Wear proper PPE (leather gloves)
24.Set-up geoprobe rig	5. Geoprobe rig movement	3. All field personnel should stay clear of the geoprobe rig while moving / Use a spotter when backing up the geoprobe
25.Advance geoprobe rods below ground surface to desired depth	4. Underground utilities 5. High noise levels	4. Clean all subsurface soil borings to a minimum of 5 feet below grade 5. Wear proper PPE (hearing protection)
26. Remove and open acetate liner	41. Pinched fingers while removing macrocore 42. Cuts/lacerations when cutting acetate liner open 43. Exposure to hazardous vapors	1. Wear proper PPE (nitrile gloves, cut-resistant or leather gloves 2. Wear proper PPE (cut-resistant or leather gloves) 3. Do not place face over acetate liner when opening / Monitor hazardous vapors in air with PID / Upgrade PPE as necessary based on levels contained in the Health and Safety Plan

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
5. Remove and open acetate liner (cont'd)	44. Skin contact with contaminated soil	4. Wear proper PPE (nitrile gloves)
27. Sample Collections a) Monitor parameters b) Prepare sample containers and labels	1. Contact with potentially contaminated soil 2. Lacerations from broken sample bottles 3. Back strain while transporting full coolers 4. Internal exposure to contaminants and metals through inhalation of dust 5. Slips/ Trips/ Falls	1. Use monitoring devices / Wear proper PPE (safety glasses, nitrile gloves) 2. Do not over-tighten bottle caps / Handle bottles safely to prevent breakage 6. Use proper lifting techniques / Do not lift heavy loads without assistance 7. Avoid creating dust / If necessary, wear a half mask respirator with applicable dust cartridge / Inspect respirator for damage and cleanliness prior to use / Clean respirator after each use and store in a clean, secure location 8. Be alert / Follow good housekeeping procedures
28. Remove excess soil from acetate liner and place in 55-gallon drum (IF NOT PERFORMED BY LANGAN, REMOVE!)	1. Cuts/lacerations from acetate liner 2. Pinched fingers/hand while opening/closing drum 3. Skin contact with contaminated soil 4. Soil debris in eyes	1. Wear proper PPE (cut-resistant or leather gloves) 2. Wear proper PPE (cut-resistant or leather gloves) 3. Wear proper PPE (nitrile gloves) 4. Wear proper PPE (safety glasses)
8. Transport drums to central staging location (IF NOT PERFORMED BY LANGAN, REMOVE!)	1. Back, arm or shoulder strain from moving drums 2. Pinch fingers/hand in drum cart when moving drums 3. Pinch fingers/hand when operating lift-gate on vehicle 4. Contact with potentially contaminated groundwater when moving improperly sealed drums 5. Slips when moving drums 6. Drop drum on feet/toes	47. Use drum cart for moving drums / Use proper lifting techniques / Do not lift heavy loads without assistance 48. Wear proper PPE (cut-resistant or leather gloves) 49. Wear proper PPE (cut-resistant or leather gloves) 50. Wear proper PPE (nitrile gloves underneath work gloves) 51. Follow good housekeeping procedures / Ensure route to move drum and storage space is free from obstructions 52. Wear proper PPE (safety shoes) / Work in a safe manner to prevent dropped drum
9. All activities	1. Slips/ Trips/ Falls 2. Hand injuries, cuts or lacerations during manual handling of materials 3. Foot injuries 4. Back injuries 5. Traffic 6. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.) 7. High Noise levels 8. Overhead hazards 9. Heat Stress/ Cold Stress	1. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards 2. Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery or dirty objects before handling / Wear leather/ cut-resistant gloves 3. Wear Langan approved safety shoes 4. Use proper lifting techniques / Consider load location, task repetition, and load weigh when evaluating what is safe or unsafe to lift / Obtain assistance when possible 5. Wear high visibility clothing & vest / Use cones or signs to designate work area 6. Be aware of surroundings at all times, including the presence of wildlife/ Do not approach stray dogs / Carry/use dog/animal repellant / Use bug spray when needed 7. Wear hearing protection 8. Wear hard hat / Avoid areas were overhead hazards exist. 9. Wear proper attire for weather conditions (sunscreen or protective clothing in sunlight, layers for cold weather) / Drink plenty of fluids to avoid dehydration / Takes breaks as necessary to avoid heat/cold stress

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

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

LANGAN	Job Safety Analysis (JSA) Health and Safety

JSA Title: **Monitoring Well Development**

JSA Number: **JSA026-01**

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

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

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
29. Transport equipment to work area	23. Back Strains 24. Slips/Trips/Falls 25. Traffic 26. Cuts/Abrasions/Contusions from equipment	18. Use proper lifting techniques/ Use wheeled transport/ use buddy system when lifting equipment. 19. Minimize distance from work area/ unobstructed path to collection points and vehicle/ Follow good housekeeping procedures. 20. Wear high-visibility vest or clothing/Exercise caution/ Use traffic cones or signage if needed. 21. Wear proper PPE (leather gloves, long sleeves, Langan approved safety shoes).
30. Measure depth of water	8. Exposure to hazardous substances 9. Pinched fingers	6. Wear proper PPE (Nitrile gloves, Safety glasses/Face shield). 7. Wear proper PPE (cut-resistant gloves).
31. Install Tremie pipe in the monitoring well and connect to water source.	6. Hand injuries during installation (pinched fingers/hands). 7. Back strain from holding Tremie pipe. 8. High pressure water spray.	4. Wear proper PPE (Nitrile gloves/cut-resistant gloves). 5. Use proper lifting techniques/ Use two personnel when lowering pump greater than 80 feet. 6. Ensure all hose connections are tight and secure/ Use proper PPE (face shield and safety glasses).
32. Install pump in to well a. Connect pump to sample tubing. b. Lower pump to desired depth in well. c. Connect sample tubing to flow cell d. Connect pump to power source (generator)	6. Hand injuries during pump installation and sample tubing cutting. 7. Back strain 8. Electric shock 9. Exhaust gases from generator 10. Burns from hot equipment	9. Wear proper PPE when installing pump and cutting sample tubing (Nitrile and cut-resistant gloves)/ Use tubing cutter. 10. Proper lifting techniques/ Two personnel when installing pump at depths greater than 80 feet/ Use buddy when lifting heavy loads (pump, generator)/Use wheeled transport. 11. Ensure equipment is (LO/TO: locked out/tagged out) prior to preforming any electrical connections/ Inspect wires for frays or cuts/Ensure generator is properly grounded prior to starting. 12. Position generator so that exhaust is flowing away from work area.

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
e. Turn on power source (generator)		13. Do not touch exhaust or any hot part of generator/ Allow equipment time to cool down prior to carrying/ Use proper PPE (long sleeves, leather gloves)
33. Develop monitoring well a. Jet water into well using Tremie pipe b. Turn pump on and adjust to desired flow rate. c. Surge pump up and down well to remove sediment from screen d. Containerize all purge water from well.	45. Hand injuries 46. Face injuries 47. Contaminated spray from water	53. Wear proper PPE (cut-resistant gloves and nitrile gloves). 54. Wear proper PPE (face shield and safety glasses)/do not stand over well opening. 55. Wear proper PPE (Face shield and safety goggles)/Tyvek over garments/ Ensure all connections are secure and tight/ Tubing outlet is contained in an overflow container.
34. Drum staging area.	1. Back, Arm, and shoulder strain. 2. Pinch points 3. Cross contamination 4. Slip/Trips/Falls	1. Use proper lifting techniques/ Use drum carts when moving drums/ use buddy system for moving of drums if needed/Move drums shortest distance needed. 2. Keep fingers and feet away from pinch points/ Use proper PPE (cut-resistant gloves, Langan approved safety shoes) 3. Use proper PPE (Nitrile gloves, Tyvek sleeves) 4. Ensure pathway is clear prior to moving equipment/ Mark all hazards/ Use additional person as a spotter if needed.
35. Equipment pack-up	1. Back Strains 2. Slips/Trips/Falls 3. Traffic 4. Cuts/Abrasions/Contusions from equipment.	1. Use proper lifting techniques/ Use wheeled transport/ use buddy system when lifting equipment. 2. Minimize distance from work area/ Unobstructed path to collection points and vehicle/ Follow good housekeeping procedures. 3. Wear high-visibility vest or clothing/Exercise caution/ Use traffic cones or signage if needed. 56. Wear proper PPE (leather gloves, long sleeves, Langan approved safety shoes).
36. All activities	1. Slips/ Trips/ Falls 2. Hand injuries, cuts or lacerations during manual handling of materials 3. Foot injuries 48. Back injuries 49. Traffic 50. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.) 51. High Noise levels 52. Overhead hazards 53. Heat Stress/ Cold Stress 54. Eye Injuries	1. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards 2. Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery or dirty objects before handling / Wear leather/ cut-resistant gloves 3. Wear Langan approved safety shoes 4. Use proper lifting techniques / Consider load location, task repetition, and load weigh when evaluating what is safe or unsafe to lift / Obtain assistance when possible 5. Wear high visibility clothing & vest / Use cones or signs to designate work area 6. Be aware of surroundings at all times, including the presence of wildlife/ Do not approach stray dogs / Carry/use dog/animal repellant / Use bug spray when needed 7. Wear hearing protection 8. Wear hard hat / Avoid areas were overhead hazards exist.

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
		9. Wear proper attire for weather conditions (sunscreen or protective clothing in sunlight, layers for cold weather) / Drink plenty of fluids to avoid dehydration / Takes breaks as necessary to avoid heat/cold stress 10. Wear safety glasses.
Additional items.		
Additional Items identified while in the field. (Delete row if not needed.)		

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

LANGAN	Job Safety Analysis (JSA) Health and Safety

JSA Title: Groundwater Sampling

JSA Number: JSA008-01

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

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

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
37.Transport equipment to work area	1. Back Strain 2. Slips/ Trips/ Falls 3. Traffic 4. Cuts/abrasions from equipment 5. Contusions from dropped equipment	1. Use proper lifting techniques / Use wheeled transport 2. Minimize distance to work area / Have unobstructed path to work area / Follow good housekeeping procedures 3. Wear proper PPE (high visibility vest or clothing) 4. Wear proper PPE (leather gloves, long sleeves) 5. Wear proper PPE (safety shoes)
38. Remove well cover	10.Scrape knuckles/hand 11.Strain wrist/bruise palm 12.Pinch fingers or hand	3. Wear proper PPE (leather gloves) 4. Using a hammer, tap the end of the wrench to loosen grip of bolts 5. Wear proper PPE (leather gloves)
39. Remove well cap and lock	9. Well can pops from pressure 10. Exposure to hazardous substances through inhalation or dermal exposure 11. Scrape knuckles/hand 12. Strain write/bruise palm	5. Remove cap slowly to relieve pressure / Do not place face over well when opening / Wear proper PPE (safety glasses) 6. Use direct air monitoring/reading instrument (i.e. PID) / Be familiar with and follow actions prescribed in the HASP / Wear proper PPE (nitrile gloves) 7. Wear proper PPE (leather gloves) 8. Using hammer, tap the end of the wrench to loosen grip
40. Measure head-space vapor levels	1. Exposure to hazardous substances through inhalation	1. Do not place face over well when collecting measurement
41. Remove dedicated tubing (if necessary)	1. Exposure to hazardous substances through inhalation or dermal exposure 2. Tubing swings around after removal	1. Wear proper PPE (nitrile gloves, Tyvek sleeves) 2. Wear proper PPE (safety glasses)
42. Set-up plastic sheeting for work site around the well	1. Lacerations when cutting plastic sheeting	1. Use scissors to cut plastic sheeting / Cut motions should always be away from body and body parts
43. Measure depth to water	1. Exposure to hazardous substances through inhalation or dermal exposure 2. Pinch fingers or hand in water level instrument	1. Wear proper PPE (nitrile gloves) 2. Wear proper PPE (leather gloves)

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

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
16. Place used PPE in designated disposal drum	1. Pressure build-up inside drum 2. Pinch hazard	1. Remove cap from bung hole in drum to relieve pressure 2. Wear proper PPE (leather gloves)
17. Decontaminate equipment	1. Splashing water/soap from decontamination 2. Contact with potentially contaminated groundwater through dermal exposure 3. Electrical shock from broken electric cords	1. Wear proper PPE (safety glasses) 2. Wear proper PPE (safety glasses, dermal protection) 3. Properly plug in pump to generator / Do not allow the pump or generator to contact water / Check for breaks in the cord
18. All activities	55. Slips/ Trips/ Falls 56. Hand injuries, cuts or lacerations during manual handling of materials 57. Foot injuries 58. Back injuries 59. Traffic 60. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.) 61. High Noise levels 62. Overhead hazards 63. Heat Stress/ Cold Stress 64. Eye Injuries	57. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards 58. Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery or dirty objects before handling / Wear leather/ cut-resistant gloves 59. Wear Langan approved safety shoes 60. Use proper lifting techniques / Consider load location, task repetition, and load weigh when evaluating what is safe or unsafe to lift / Obtain assistance when possible 61. Wear high visibility clothing & vest / Use cones or signs to designate work area 62. Be aware of surroundings at all times, including the presence of wildlife/ Do not approach stray dogs / Carry/use dog/animal repellant / Use bug spray when needed 63. Wear hearing protection 64. Wear hard hat / Avoid areas were overhead hazards exist. 65. Wear proper attire for weather conditions (sunscreen or protective clothing in sunlight, layers for cold weather) / Drink plenty of fluids to avoid dehydration / Takes breaks as necessary to avoid heat/cold stress 66. Wear safety glasses
Additional items.		
Additional Items identified while in the field. (Delete row if not needed.)		

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

LANGAN	Job Safety Analysis (JSA) Health and Safety

JSA Title: Site Inspection

JSA Number: JSA024-01

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

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

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
46. Jobsite Pre-briefing	27. None	22. Review JSA, SOP's, and discuss hazards that may be present and control measures for present hazards while on-site.
2. Working near railroads	1. Passing Trains. 2. Slip/Trips/Falls.	1. Wear reflective vest/ Stay away from tracks/ Do not cross tracks within 10 ft. of train car or when there is a train within view/listen for train horn. 2. Be aware of tripping hazards/ Follow good housekeeping procedures/ Mark significant hazards with spray paint or cones.
3. Walking around site	11. Uneven terrain 12. Wildlife: Stray animals, mice/rats, vectors (i.e. mosquitoes, bees, etc.) 13. Weather: Heat/cold stress 14. Slip/Trips/Falls 15. Foot injuries 16. Eye injuries	14. Pay attention to surrounding area (puddles, wet, frozen, uneven areas); Mark with cones or spray paint. 15. Use bug spray/ Avoid stray animals/Use repellant when needed. 16. Dress for the correct weather situation/ Use sunscreen or protective clothing in sunlight, layers in cold weather/ Drink plenty of fluids/ Take breaks when needed. 4. Be aware of tripping hazards/ Follow good housekeeping procedures/ Mark significant hazards with spray paint or cones. 5. Wear proper PPE (Langan approved safety shoes)/ Change wet socks during cold weather. 6. Wear proper PPE (safety glasses/goggles).
4. Working near road	1. Passing vehicles 2. Slip/Trips/Falls	1. Wear reflective vest/ Stay away from roadway/ Use buddy system/ Place signage or cones when needed. 2. Be aware of tripping hazards/ Follow good housekeeping procedures/ Mark significant hazards with spray paint or cones.
5. All activities	65. Slips/ Trips/ Falls 66. Hand injuries, cuts or lacerations during manual handling of materials 67. Foot injuries 68. Back injuries 69. Traffic	67. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards 68. Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery or dirty objects before handling / Wear leather/ cut-resistant gloves 69. Wear Langan approved safety shoes

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
	70. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.) 71. High Noise levels 72. Overhead hazards 73. Heat Stress/ Cold Stress 74. Eye Injuries	70. Use proper lifting techniques / Consider load location, task repetition, and load weigh when evaluating what is safe or unsafe to lift / Obtain assistance when possible 71. Wear high visibility clothing & vest / Use cones or signs to designate work area 72. Be aware of surroundings at all times, including the presence of wildlife/ Do not approach stray dogs / Carry/use dog/animal repellant / Use bug spray when needed 73. Wear hearing protection 74. Wear hard hat / Avoid areas were overhead hazards exist. 75. Wear proper attire for weather conditions (sunscreen or protective clothing in sunlight, layers for cold weather) / Drink plenty of fluids to avoid dehydration / Takes breaks as necessary to avoid heat/cold stress 76. Wear safety glasses
Additional items.		
Additional Items identified while in the field. (Delete row if not needed.)		

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

LANGAN	Job Safety Analysis (JSA) Health and Safety

JSA Title: **Building Construction Oversight**

JSA Number: **JSA006-01**

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

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

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
47. Transport equipment to work area	28. Back Strain 29. Slips/ Trips/ Falls 30. Traffic 31. Cuts/abrasions from equipment 32. Contusions from dropped equipment	6. Use proper lifting techniques / Use wheeled transport 7. Minimize distance to work area / Have unobstructed path to work area / Follow good housekeeping procedures 8. Wear proper PPE (high visibility vest or clothing) 9. Wear proper PPE (leather gloves, long sleeves) 10. Wear proper PPE (safety shoes)
48. Drilling/anchor bolt installation	13. Hazards associated with drilling, flying objects, heavy equipment, ground level hazards and dust 14. Slips/ Trips/ Falls 15. Hazards associated with concrete work	6. Maintain a safe distance from drilling operation / Wear proper PPE (hard hat, safety glasses, safety shoes, safety vest) 7. Be aware of potential trip hazards / Follow good housekeeping procedures / Mark significant below-grade hazards (i.e. holes, trenches) with safety cones or spray paint / Wear the proper PPE (safety shoes) 8. Maintain a safe distance from pouring operation
49. Steel building erection	13. Overhead hazards, falling objects 14. Pinching/crushing hazards	9. Wear proper PPE (hard had, safety glasses, safety vest) / Be aware of overhead hazards and maintain a safe distance of at least 10 ft. 10. All personnel should make others aware of moving objects or their inten to move objects / Avoid areas where pinching and crushing hazards are possible
50. All activities	75. Slips/ Trips/ Falls 76. Hand injuries, cuts or lacerations during manual handling of materials 77. Foot injuries 78. Back injuries 79. Traffic 80. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.) 81. High Noise levels 82. Overhead hazards	77. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards 78. Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery or dirty objects before handling / Wear leather/ cut-resistant gloves 79. Wear Langan approved safety shoes 80. Use proper lifting techniques / Consider load location, task repetition, and load weigh when evaluating what is safe or unsafe to lift / Obtain assistance when possible

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
4. All activities (cont'd)	83. Heat Stress/ Cold Stress 84. Eye Injuries	81. Wear high visibility clothing & vest / Use cones or signs to designate work area 82. Be aware of surroundings at all times, including the presence of wildlife/ Do not approach stray dogs / Carry/use dog/animal repellant / Use bug spray when needed 83. Wear hearing protection 84. Wear hard hat / Avoid areas were overhead hazards exist. 85. Wear proper attire for weather conditions (sunscreen or protective clothing in sunlight, layers for cold weather) / Drink plenty of fluids to avoid dehydration / Takes breaks as necessary to avoid heat/cold stress 86. Wear safety glasses
Additional items.		
Additional Items identified while in the field. (Delete row if not needed.)		

Print Name	Sign Name	Date
Prepared by:		
Reviewed by:		

LANGAN	Job Safety Analysis (JSA) Health and Safety

JSA Title: **Geotechnical Drilling**

JSA Number: **JSA014-01**

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

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

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
51. Transport equipment to work area	33. Back Strain 34. Slips/ Trips/ Falls 35. Traffic 36. Cuts/abrasions from equipment 37. Contusions from dropped equipment	11. Use proper lifting techniques / Use wheeled transport 12. Minimize distance to work area / Have unobstructed path to work area / Follow good housekeeping procedures 13. Wear proper PPE (high visibility vest or clothing) 14. Wear proper PPE (leather gloves, long sleeves) 15. Wear proper PPE (safety shoes)
52. Set-up HSA/SPT rig	16. Slips/ Trips/ Falls 17. Pinch Hazards 18. High noise levels 19. Clothing entanglement 20. Electrocution/falling equipment and debris from raising HSA/SPT rig mast 21. Carbon monoxide poisoning 22. HSA/SPT rig roll-over 23. HSA/SPT rig movement	9. Be aware of potential trip hazards / Follow good housekeeping procedures / Mark significant below-grade hazards (i.e. holes, trenches) with safety cones or spray paint 10. Wear proper PPE (leather gloves) 11. Wear proper PPE (hearing protection) 12. Wear proper attire for HSA/SPT rig (no loose clothing, strings, etc.) 13. Wear proper PPE (hard hats) / Be aware of locations at all times / Look up, down and around before raising mast / Check HSA/SPT drill rig mast for loose objects/debris before raising 14. Stand upwind of rig engine 15. Do not move rig with mast raising / Set stabilizers prior to raising mast / Inspect work area / If area appears unstable, the boring locations should be moved. 16. All field personnel should stay clear of rig while moving / Use a spotter when backing up the rig
53. Advance HSA/SPT rods, augers and casing below ground surface	15. Strain wrist/bruise palm 16. Pinched fingers 17. Back strain 18. Clothing entanglement 19. Carbon monoxide poisoning 20. Bruised/Broken toes/feet	11. Wear proper PPE (leather gloves) / Use proper technique for preparing rods / Use second person, if necessary 12. Wear proper PPE (leather gloves) 13. Use proper lifting techniques / Obtain assistance if needed 14. Wear proper attire for HSA/SPT rig (no loose clothing, strings, etc.) 15. Stand upwind of the rig

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
54. Advance HSA/SPT rods, augers and casing below ground surface (cont'd)	21. High noise levels	16. Wear proper PPE (safety shoes) 17. Wear proper PPE (hearing protection)
55. Remove and open split spoon	17. Pinched fingers 18. Cuts/lacerations 19. Skin contact with contaminated soil and groundwater	1. Wear proper PPE (nitrile and leather gloves) 2. Wear proper PPE (leather gloves) 3. Wear proper PPE (nitrile gloves, safety glasses)
56. Repeat steps 3 and 4 until desired depth is reached	1. See steps 3 and 4	1. See steps 3 and 4
57. Remove HSA/SPT rods, augers and casing and place in storage rack	1. Clothing entanglement 2. Back strain 3. Pinched fingers 4. Carbon monoxide poisoning 5. High noise levels	1. Wear proper attire for HSA/SPT rig (no loose clothing, strings, etc.) 2. Use proper lifting techniques / Obtain assistance if needed 3. Wear proper PPE (leather gloves) 4. Stand upwind of rig engine 5. Wear proper PPE (hearing protection)
58. Tremie-grout borehole with a cement-bentonite grout mixture	1. Splash cement/bentonite grout on face/eyes 2. Back strain 3. Pinched fingers	1. Wear proper PPE (safety glasses) 2. Use proper lifting techniques / Obtain assistance if needed 3. Wear proper PPE (nitrile gloves, leather gloves)
59. Decontaminate equipment	1. Contact with potentially impacted material 2. Contact with sharp pieces of equipment	1. Wear proper PPE (safety glasses, nitrile gloves) 2. Wear proper PPE (leather gloves)
60. Patch soil boring location to return to pre-existing conditions (i.e. concrete, asphalt, grass)	1. Cuts/lacerations 2. Splashed concrete on face/eyes 3. Hammer fingers/hands when patching asphalt	1. Wear proper PPE (leather gloves) / Use scissors for cutting 2. Use proper PPE (safety glasses) 3. Be aware of hands/fingers during hammering / Wear proper PPE (leather gloves)
61. All activities	85. Slips/ Trips/ Falls 86. Hand injuries, cuts or lacerations during manual handling of materials 87. Foot injuries 88. Back injuries 89. Traffic 90. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.) 91. High Noise levels 92. Overhead hazards 93. Heat Stress/ Cold Stress 94. Eye Injuries	87. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards 88. Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery or dirty objects before handling / Wear leather/ cut-resistant gloves 89. Wear Langan approved safety shoes 90. Use proper lifting techniques / Consider load location, task repetition, and load weigh when evaluating what is safe or unsafe to lift / Obtain assistance when possible 91. Wear high visibility clothing & vest / Use cones or signs to designate work area 92. Be aware of surroundings at all times, including the presence of wildlife/ Do not approach stray dogs / Carry/use dog/animal repellant / Use bug spray when needed 93. Wear hearing protection 94. Wear hard hat / Avoid areas were overhead hazards exist.

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
		95. Wear proper attire for weather conditions (sunscreen or protective clothing in sunlight, layers for cold weather) / Drink plenty of fluids to avoid dehydration / Takes breaks as necessary to avoid heat/cold stress 96. Wear safety glasses
Additional items.		
Additional Items identified while in the field. (Delete row if not needed.)		

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

ATTACHMENT H

TAILGATE SAFETY BRIEFING FORM

LANGAN TAILGATE SAFETY BRIEFING

Date:______________________________ Time: ____

Leader:___________________________________ Location:____

Work Task:

____

____

SAFETY TOPICS (*provide some detail of discussion points*)

Chemical Exposure Hazards and Control:____

____

Physical Hazards and Control: ____

Air Monitoring: ____

PPE: ____

____

Communications:____

Safe Work Practices: ____

____

Emergency Response: ____

Hospital/Medical Center Location: ____

Phone Nos.: ____

Other: ____

FOR FOLLOW-UP (the issues, responsibilities, due dates, etc.)

____

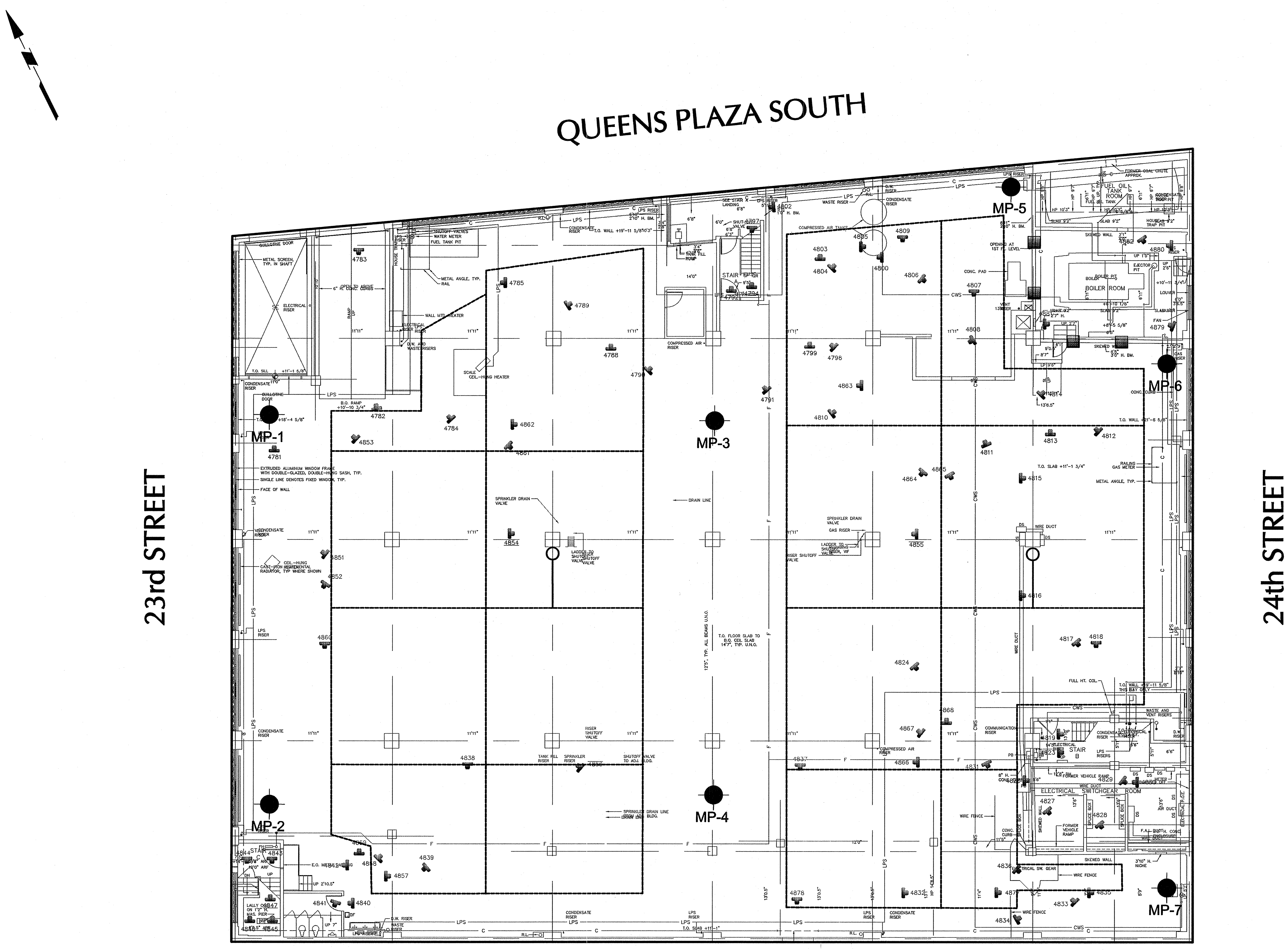
____

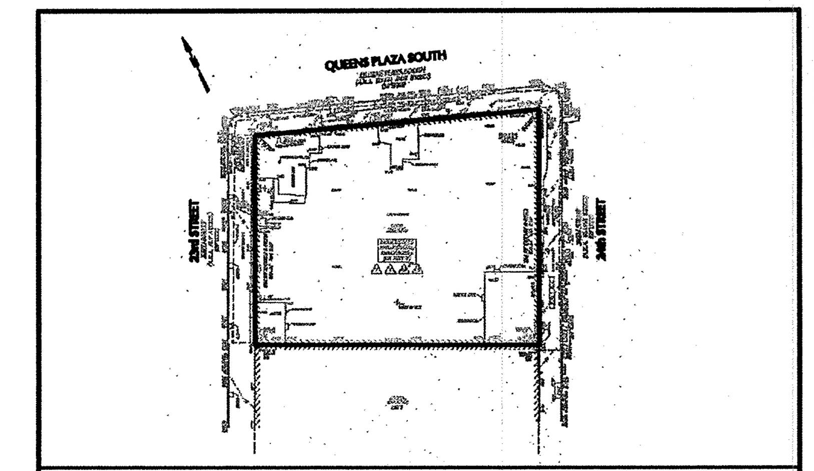
____

ATTENDEES

PRINT NAME	COMPANY	SIGNATURE

APPENDIX E
SSD SYSTEM DESIGN DRAWINGS





PROJECT LOCATION MAP

SCALE: 1" = 100'

SOURCE:
TOPOGRAPHIC AND BOUNDARY SURVEY BY LANGAN (31 AUGUST 2018, AND REVISED 25 JULY 2019).

LEGEND:

- SITE BOUNDARY
- APPROXIMATE PERFORATED PIPE LOCATION
- APPROXIMATE SOLID PIPE LOCATION
- APPROXIMATE RISER PIPE LOCATION
- APPROXIMATE COMMUNICATION POINT LOCATION
- MP-1 APPROXIMATE MONITORING POINT LOCATION

NOTES:

1. BASE MAP REFERENCED FROM DRAWING TITLED "CELLAR EXISTING PLAN" BY JOHN BAIN ASSOCIATES, DATED 25 SEPTEMBER 2013.

Date	Description	No.

REVISIONS

SIGNATURE 9/24/2019 DATE SIGNED

PROFESSIONAL XXXXXXXXXX
STATE LIC. No. XXXXX

LANGAN

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Project

23-10 QUEENS PLAZA SOUTH

BLOCK No. 425, LOT No. 5
LONG ISLAND CITY

QUEENS NEW YORK

Drawing Title

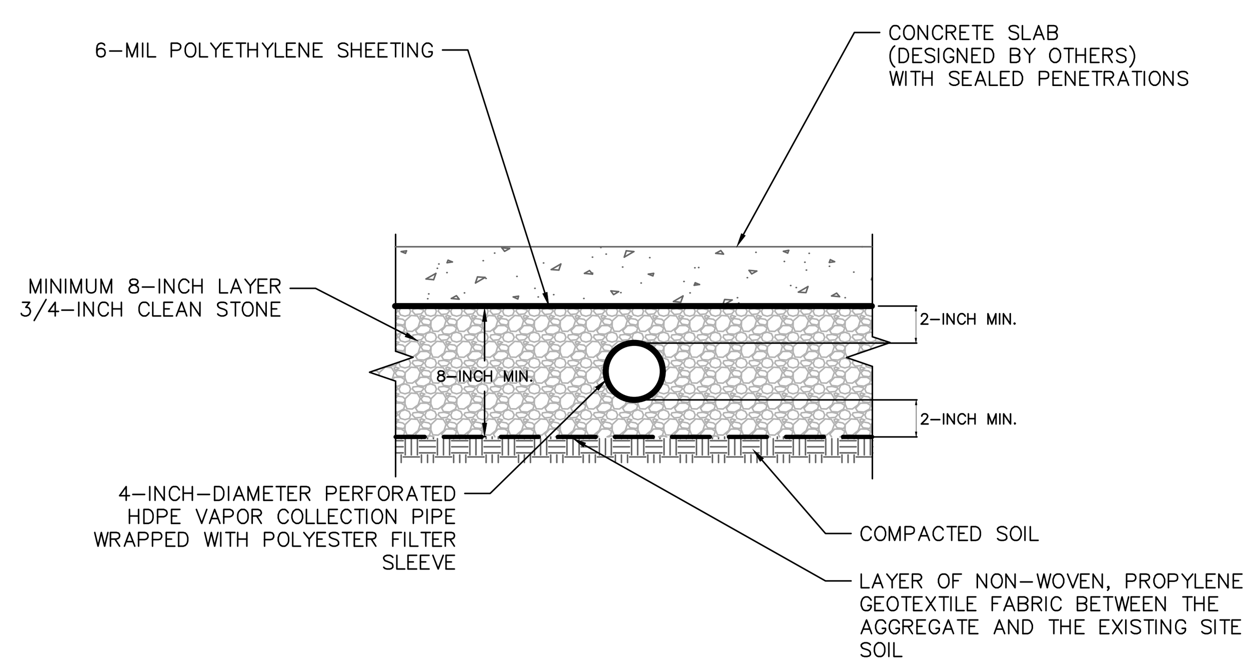
SUB-SLAB DEPRESSURIZATION SYSTEM PLAN

Project No. 170244603	Drawing No.
Date 6/26/2019	SSDS-1
Drawn By VDP	
Checked By PM	Sheet 1 of 3

PROJECT NO. 170244603

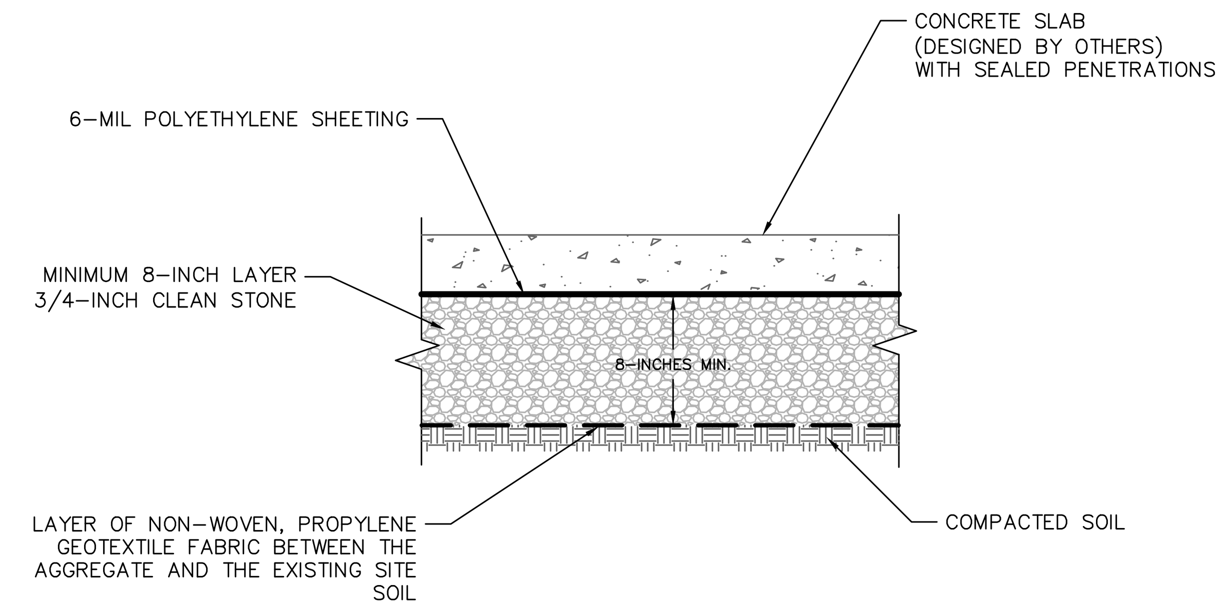
WARNING:
IT IS A VIOLATION OF THE NYS EDUCATION LAW ARTICLE 145 FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER THIS ITEM IN ANY WAY.

10 0 2 4 10
SCALE IN FEET



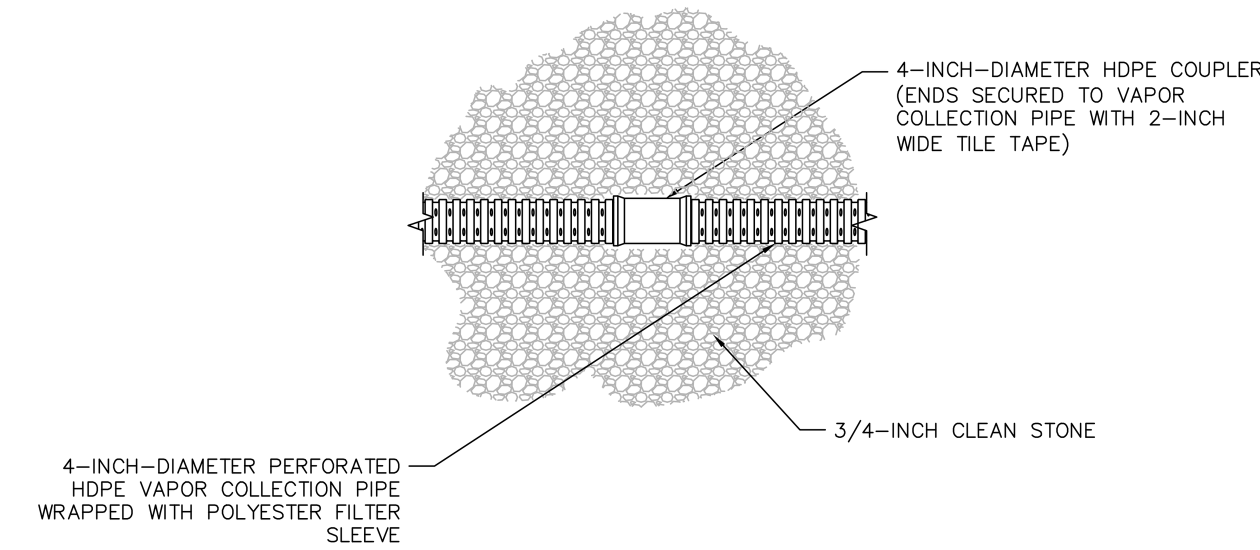
DETAIL 1: TYPICAL SECTION FOR VAPOR COLLECTION PIPE AND VAPOR BARRIER

NOT TO SCALE



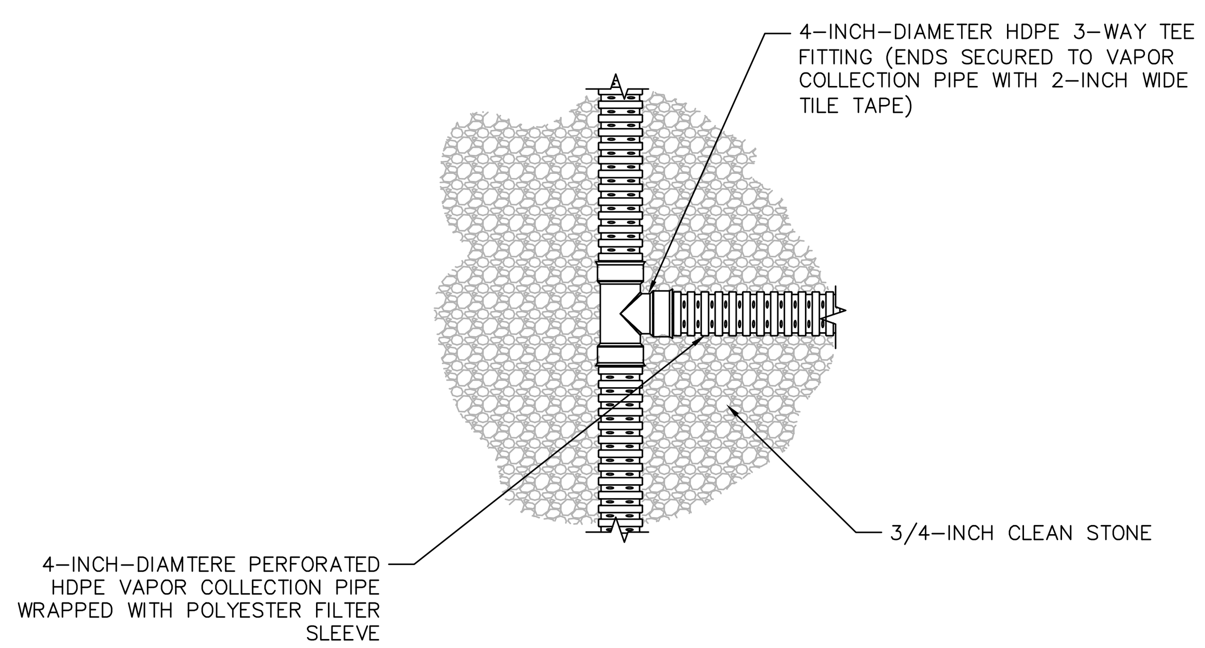
DETAIL 2: TYPICAL SECTION THROUGH SUB-SLAB

NOT TO SCALE



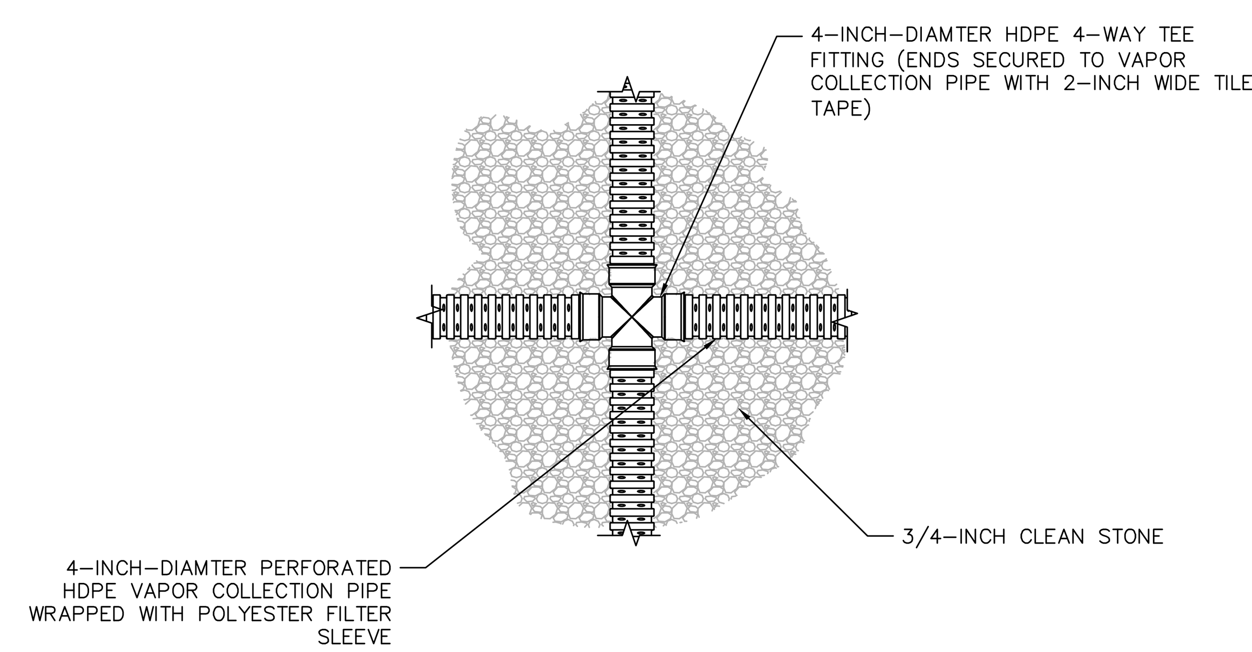
DETAIL 3: TYPICAL COUPLER CONNECTION FOR VAPOR COLLECTION PIPE (PLAN VIEW)

NOT TO SCALE



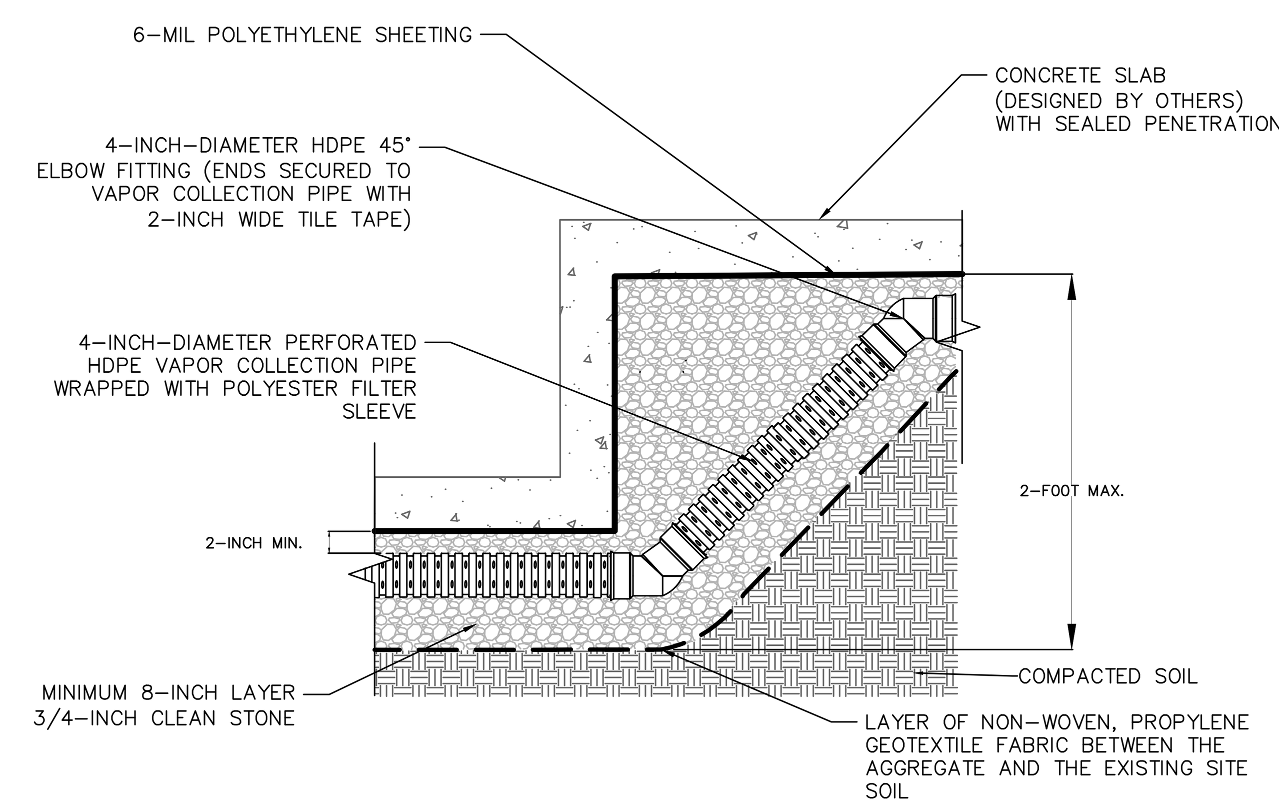
DETAIL 4: TYPICAL 3-WAY TEE FITTING CONNECTION FOR VAPOR COLLECTION PIPE (PLAN VIEW)

NOT TO SCALE



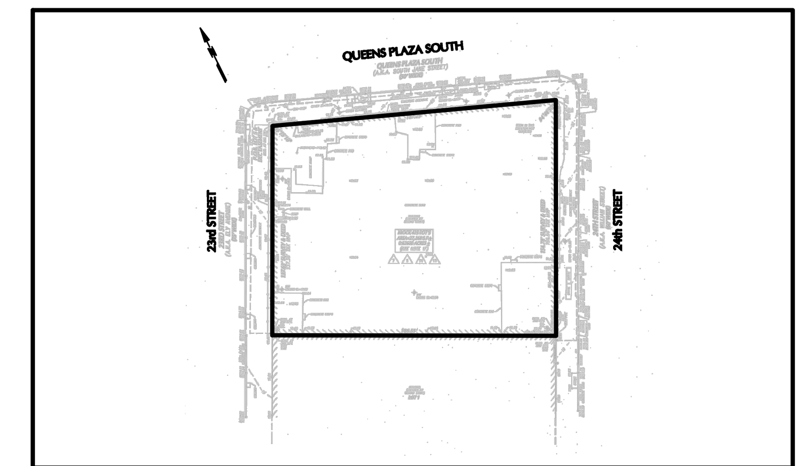
DETAIL 5: TYPICAL 4-WAY TEE FITTING CONNECTION FOR VAPOR COLLECTION PIPE (PLAN VIEW)

NOT TO SCALE



DETAIL 6: TYPICAL SECTION FOR PERFORATED SUBSLAB PIPE AT ELEVATION CHANGE BETWEEN TWO SLABS

NOT TO SCALE



PROJECT LOCATION MAP

SCALE: 1" = 100'

SOURCE:
TOPOGRAPHIC AND BOUNDARY SURVEY BY LANGAN (31 AUGUST 2018, AND REVISED 25 JULY 2019).

GENERAL NOTES:

1. DESIGN DETAILS AND DRAWING ARE ADAPTED FROM EPA DOCUMENT EPA/625/R-92/016.
2. INSTALLATION OF THE SUB-SLAB COMPONENTS AND RISER PIPES MUST BE COORDINATED WITH THE INSTALLATION OF OTHER UTILITIES AND STRUCTURAL COMPONENTS.
3. PERFORATED VAPOR COLLECTION PIPE SHALL BE 4-INCH ø FLEXIBLE, CORRUGATED, SMOOTH INTERIOR, PERFORATED, HIGH DENSITY POLYETHYLENE (HDPE) PIPE WITH A MINIMUM PIPE STIFFNESS OF 35 POUNDS PER SQUARE INCH (PSI) AT 5% DEFLECTION. PERFORATIONS SHALL BE SLOT-TYPE. THERE SHALL BE, AT A MINIMUM, THREE EQUALLY SPACED PERFORATIONS PER GROOVE (I.E. DEPRESSED SECTION OF THE PIPE) OF THE CORRUGATED PIPE. PERFORATIONS ON ALTERNATING GROOVES SHALL BE OFF-SET.
4. TOP OF PERFORATED VAPOR COLLECTION PIPE SHALL BE 2 INCHES FROM THE BOTTOM OF SLAB. WHEN NECESSARY, PERFORATED VAPOR COLLECTION PIPE MAY BE ROUTED UNDERNEATH OTHER UTILITIES AND PIPING IN THE SUBSURFACE; TOP OF PERFORATED VAPOR COLLECTION PIPE SHOULD NOT EXCEED 12 INCHES FROM THE BOTTOM OF THE SLAB.
5. ALL FITTINGS AND CONNECTIONS FOR THE VAPOR COLLECTION PIPE SHALL BE 4-INCH ø HDPE FITTINGS, MADE BY THE SAME MANUFACTURER AS THE 4-INCH ø PIPE, AND OF THE TYPE RECOMMENDED BY THE MANUFACTURER FOR USE WITH THE 4-INCH ø PIPE. SECURE ALL FITTINGS AND CONNECTIONS WITH 2-INCH WIDE TILE TAPE.
6. POLYESTER FILTER SLEEVES SHALL HAVE A MINIMUM AIR PERMEABILITY OF 70 CUBIC FEET/SQUARE FEET/MINUTE.
7. RISER PIPES (DESIGNED BY OTHERS) SHALL BE 4-INCH ø METAL PIPE OR OTHER MATERIAL THAT COMPLIES WITH APPLICABLE BUILDING CODE.
8. RISER PIPES (DESIGNED BY OTHERS) SHALL BE EXTENDED TO THE ROOF WITH MINIMAL CHANGES IN DIRECTION AS SHOWN ON THE MECHANICAL AND PLUMBING DRAWINGS.
9. ALL PIPE AND CONDUIT PENETRATIONS THROUGH THE SLAB (INCLUDING MECHANICAL, ELECTRICAL, PLUMBING, OR OTHER) SHALL BE SEALED WITH A HIGH ADHESIVE SEALANT, UNLESS OTHERWISE SPECIFIED. PENETRATIONS SHALL BE AIR-TIGHT.
10. RISER PIPE MUST BE CLEARLY LABELED "CAUTION: DO NOT ALTER SUBSLAB VAPOR VENT PIPE" IN EACH ACCESSIBLE AREA (A MINIMUM OF EVERY 10 LINEAR FEET OF RISER PIPE RUN).
11. SYSTEM INSTALLATION SHALL ADHERE TO: FINAL GUIDANCE FOR EVALUATING SOIL VAPOR INTRUSION IN THE STATE OF NEW YORK PREPARED BY NEW YORK STATE DEPARTMENT OF HEALTH (NYSDOH), DATED OCTOBER 2006 AND 2008 NEW YORK CITY MECHANICAL CODE, CHAPTER 5, SECTION MC 512-SUBSLAB EXHAUST SYSTEMS. POINT OF EXHAUST (DESIGNED BY OTHERS) SHALL BE
    - ABOVE THE EAVE OF THE ROOF (PREFERABLY, ABOVE THE HIGHEST EAVE OF THE BUILDING AND AT LEAST 12-INCHES ABOVE THE
    - SURFACE OF THE ROOF):
    - AT LEAST 10 FEET ABOVE GROUND LEVEL,
    - AT LEAST 10 FEET AWAY FROM ANY OPENING THAT IS LESS THAN 2 FEET BELOW THE EXHAUST POINT, AND
    - 10 FEET FROM ANY ADJOINING OR ADJACENT BUILDINGS, OR HVAC INTAKES OR SUPPLY REGISTERS.
14. ALL EXTERNAL PIPES SHALL BE PAINTED WITH A CORROSION RESISTANT COATING, DEPENDING ON PIPE MATERIAL.
15. 3/4-INCH CLEAN STONE = IN-PLACE STONE SHALL BE CLEAN, COARSE, NATURAL, ANGULAR, WASHED 3/4-INCH AGGREGATE WITH THE FOLLOWING GRADATION:

SIEVE SIZE	% PASSING BY WEIGHT
1 1/2-INCH	100
1-INCH	90-100
1/2-INCH	0-5
#200	<1

16. CLEAN STONE LAYER ON TOP OF PIPE SHALL NOT BE COMPACTED.
17. CONTRACTOR SHALL PROVIDE AS-BUILT DRAWINGS (SIGNED AND SEALED BY A NYS-LICENSED PROFESSIONAL ENGINEER) OF COMPLETE SUB-SLAB DEPRESSURIZATION SYSTEM TO ENGINEER FOLLOWING INSTALLATION.

Date	Description	No.

REVISIONS

SIGNATURE DATE SIGNED
PROFESSIONAL XXXXXXXXXX
STATE LIC. No. XXXXX

LANGAN
Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.
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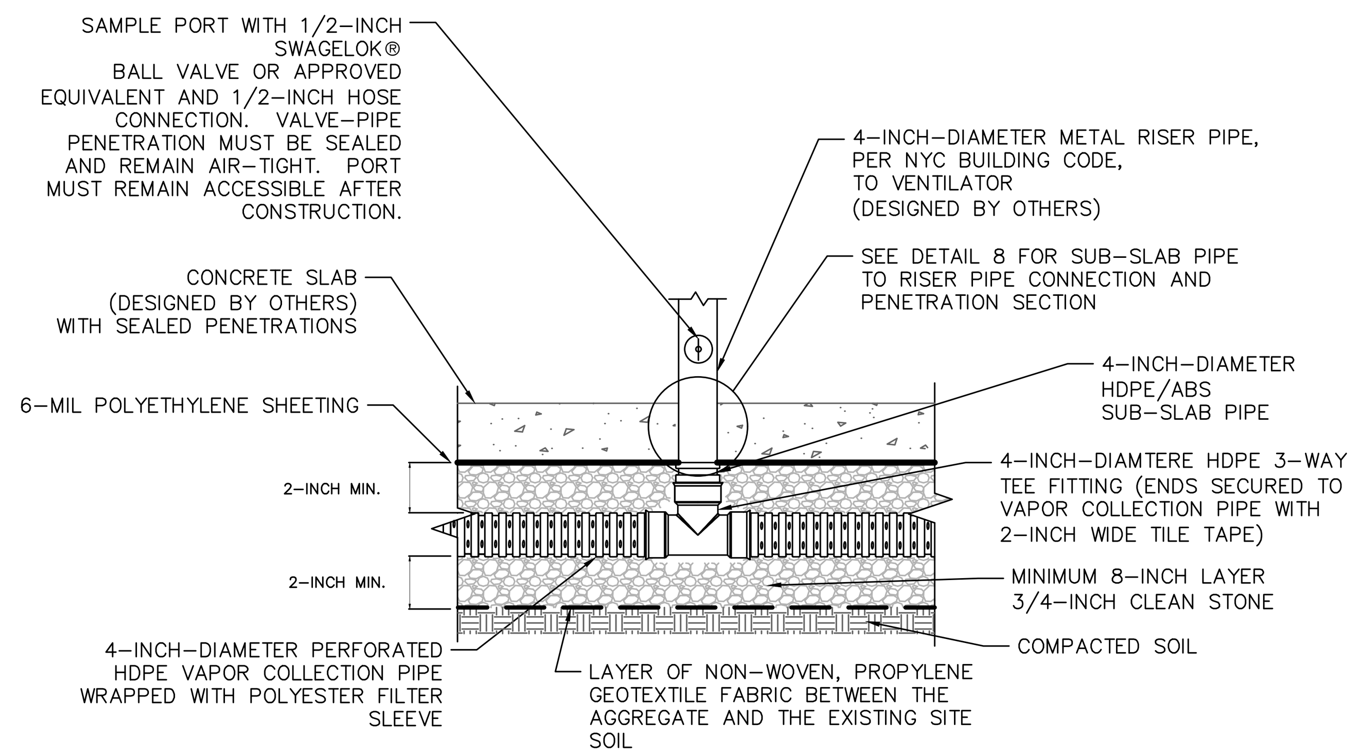
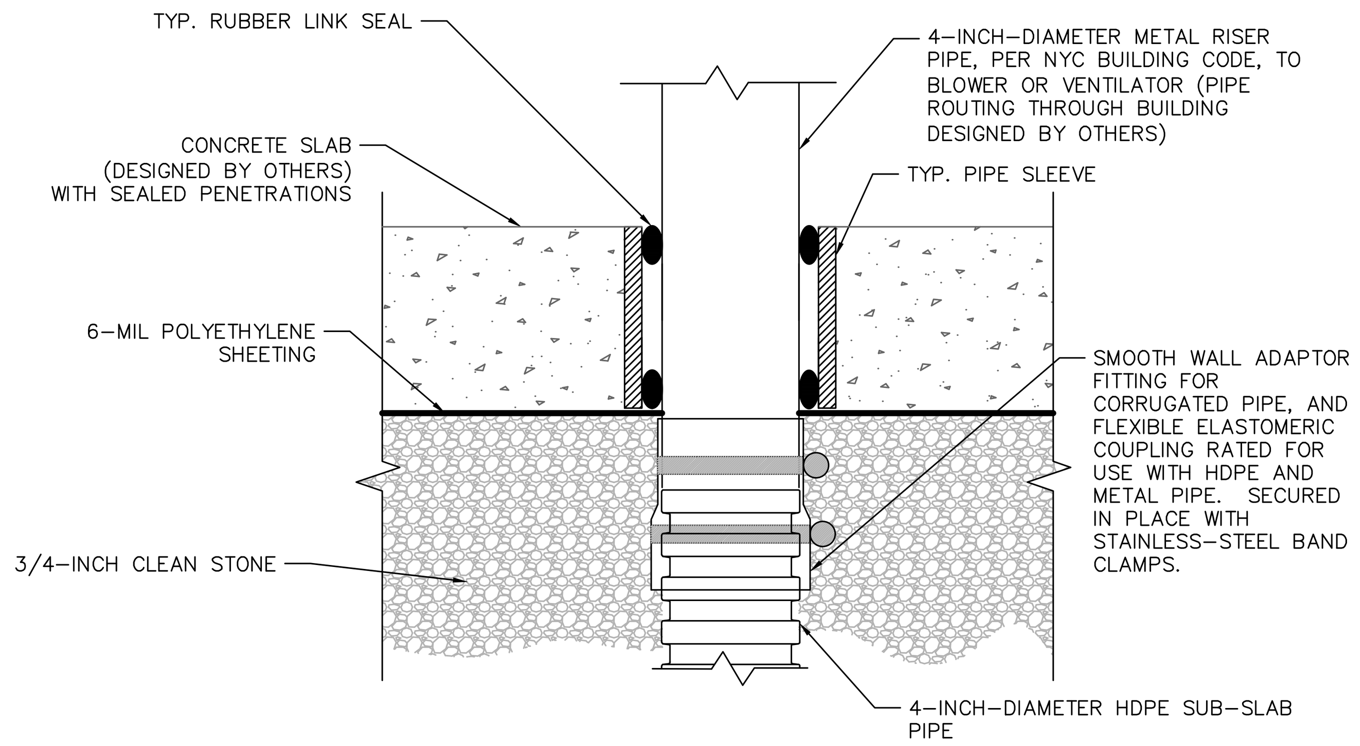
Project
23-10 QUEENS PLAZA SOUTH
BLOCK No. 425, LOT No. 5
LONG ISLAND CITY
QUEENS NEW YORK

Drawing Title
SUB-SLAB DEPRESSURIZATION SYSTEM DETAILS - 1

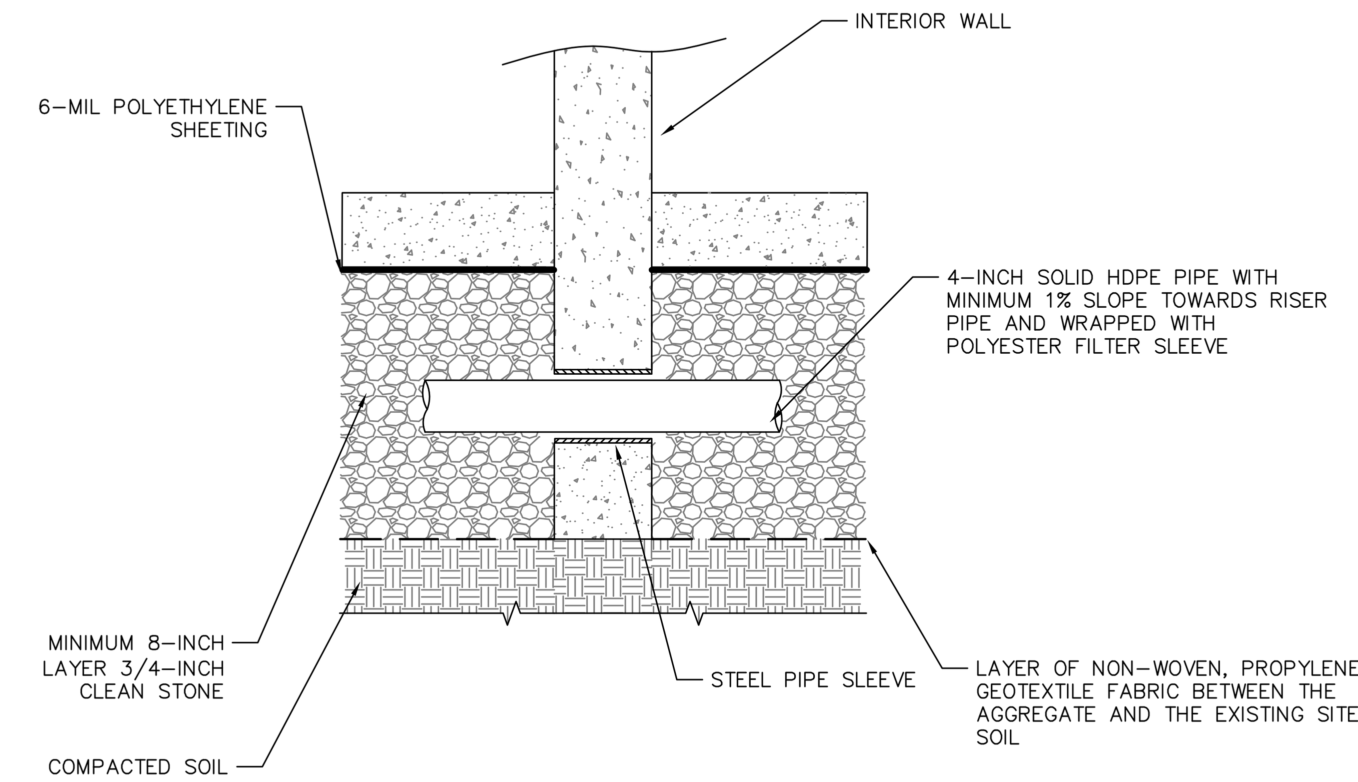
Project No.	170244603	Drawing No.
Date	6/26/2019	SSDS-2
Drawn By	VDP	
Checked By	PM	Sheet 2 of 3



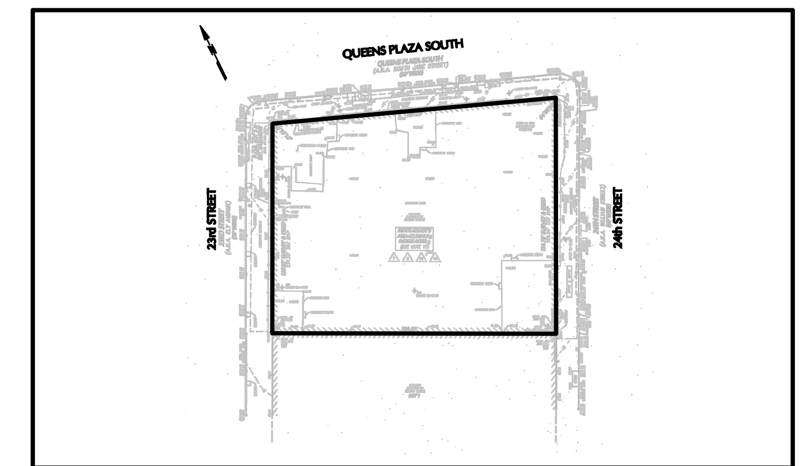
DETAIL 7: TYPICAL SECTION AT PERFORATED PIPE TO RISER PIPE
NOT TO SCALE



DETAIL 8: VAPOR COLLECTION PIPE TO RISER PIPE CONNECTION
NOT TO SCALE

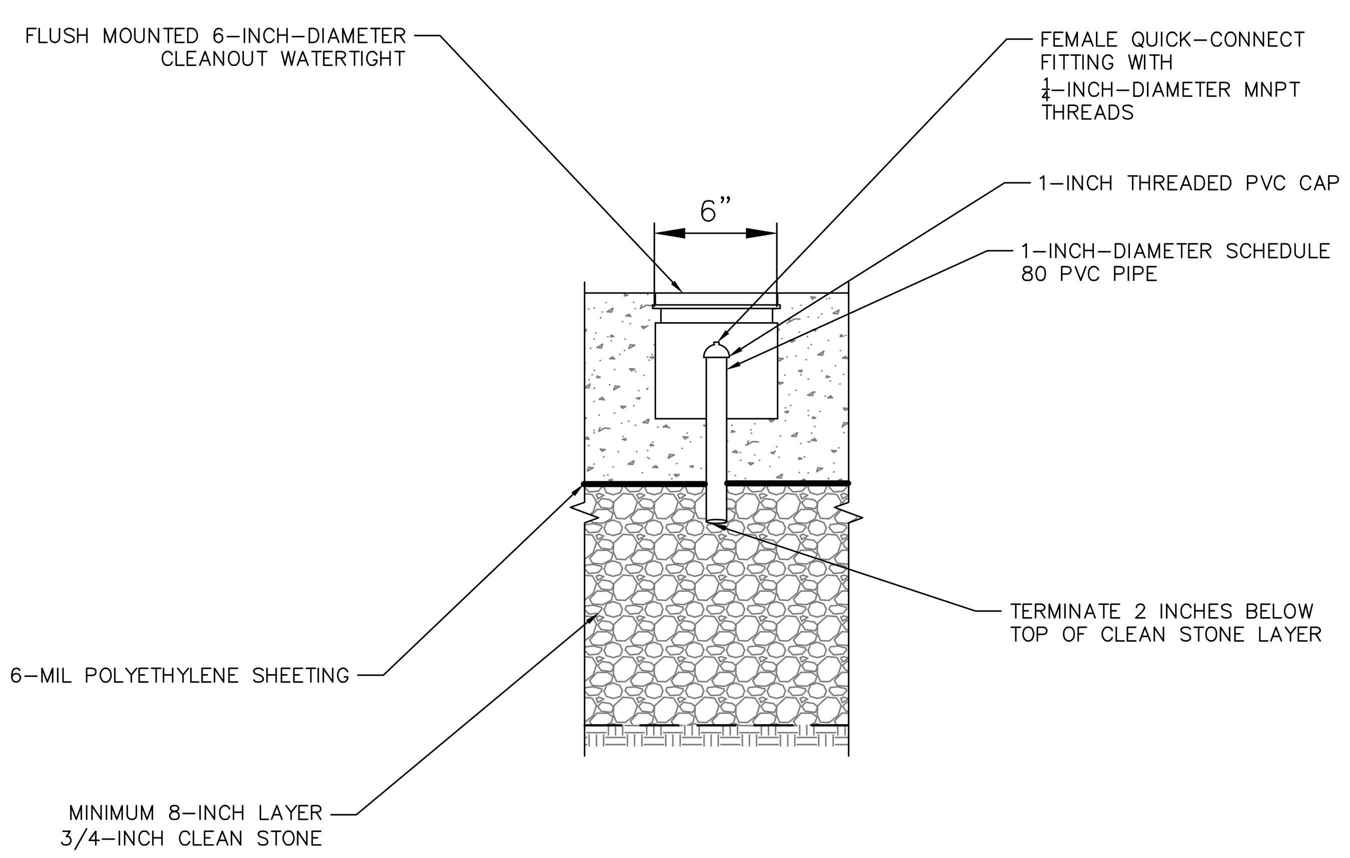


DETAIL 9: TYPICAL PIPE SLEEVE THROUGH INTERIOR WALL
NOT TO SCALE

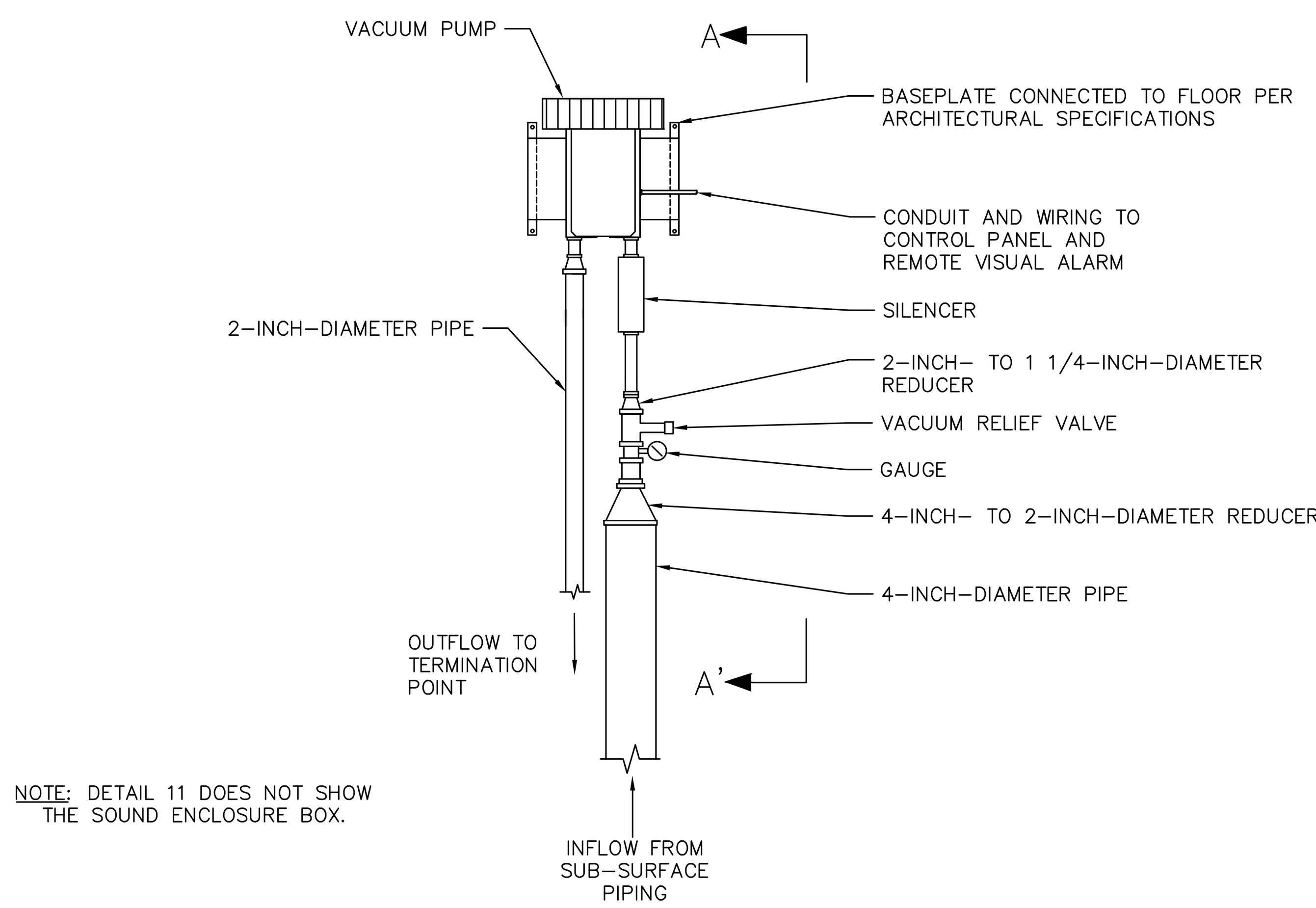


PROJECT LOCATION MAP
SCALE: 1" = 100'

SOURCE:
TOPOGRAPHIC AND BOUNDARY SURVEY BY LANGAN (31 AUGUST 2018, AND REVISED 25 JULY 2019).

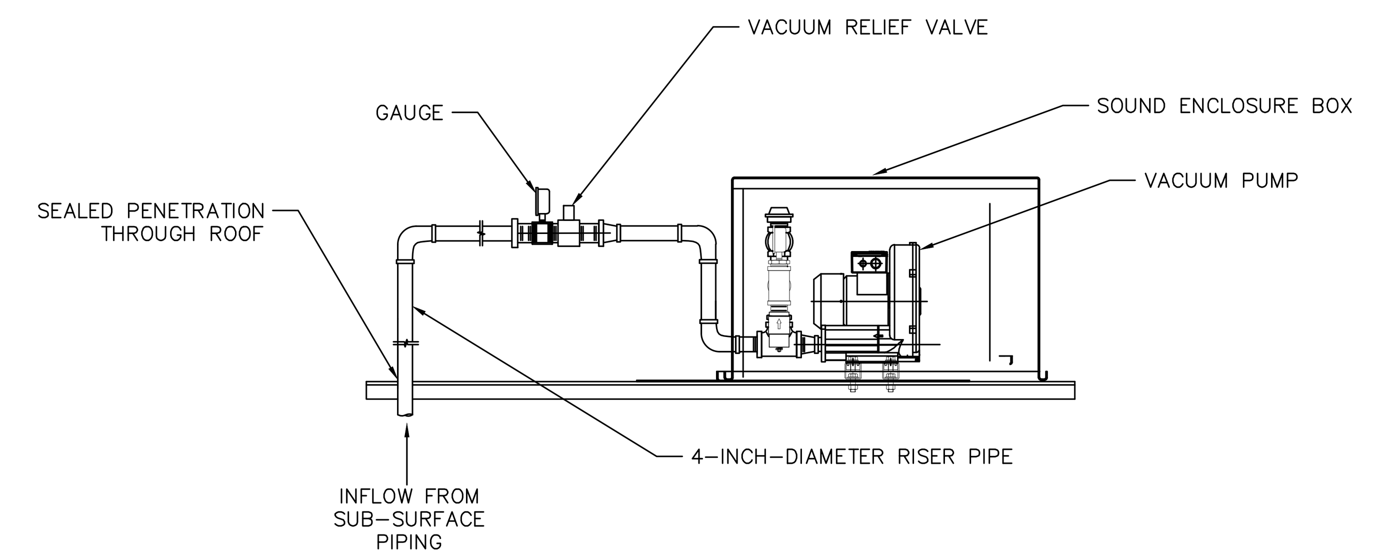


DETAIL 10: TYPICAL MONITORING POINT
NOT TO SCALE

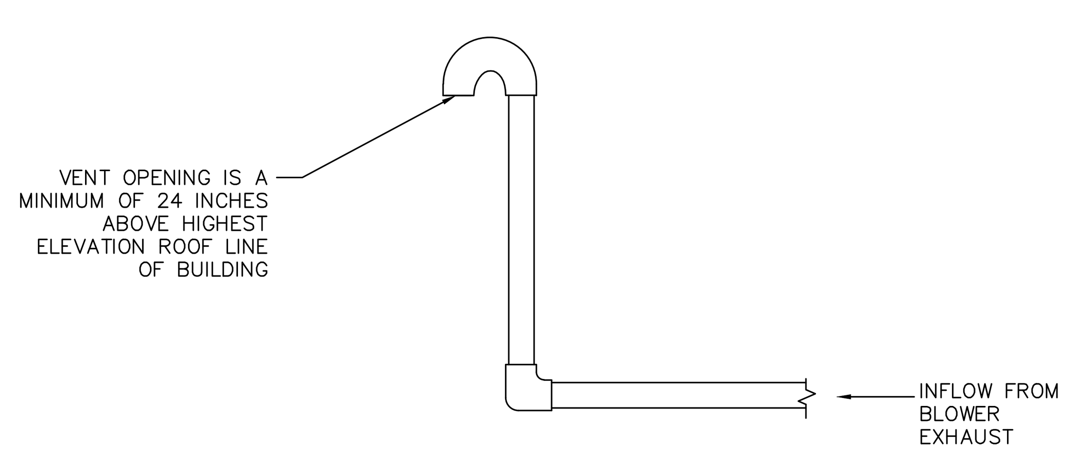


NOTE: DETAIL 11 DOES NOT SHOW THE SOUND ENCLOSURE BOX.

DETAIL 11: VACUUM BLOWER PLAN VIEW
NOT TO SCALE



DETAIL 12: VACUUM BLOWER SECTION VIEW (A-A')
NOT TO SCALE



DETAIL 13: VENT TERMINATION POINT SECTION VIEW
NOT TO SCALE

BLOWER NOTES:

1. THE COMPLETE BLOWER ASSEMBLY INCLUDING BLOWER, MOTOR, BASEPLATE, CONTROL PANEL, REMOTE VISUAL ALARM, VALVES, GAUGES, FILTER, AND FLEXIBLE HOSE SHALL BE PROVIDED BY THE MANUFACTURER.
2. BLOWER ASSEMBLY TO BE INSTALLED SHALL PROVIDE AT CONTINUOUS OPERATION MINIMUM OF 93 CUBIC FEET PER MINUTE (CFM) FLOW RATE AT 29 INCHES OF WATER COLUMN (INCHES WC) VACUUM AT BLOWER.
3. BLOWERS TO BE INSTALLED SHALL BE THE AIRTECH 3BA1500-7AT06 OR APPROVED ALTERNATIVE.
4. THE BLOWER SCHEMATICS ARE SHOWN TO ILLUSTRATE THE REQUIRED COMPONENTS AND THE GENERAL LOCATIONS IN THE PIPE RUN AND SHALL NOT BE CONSIDERED TO BE ACCURATE. THE ACTUAL CONFIGURATION AND DIMENSIONS OF THE BLOWER ASSEMBLY WILL VARY BASED ON MANUFACTURING METHODS AND FIELD CONDITIONS. FINAL DESIGN AND BLOWER SYSTEM SELECTED ARE SUBJECT TO APPROVAL BY THE ENGINEER. PROVIDE ALL BLOWER SPECIFICATIONS AND CUT SHEETS FOR COMMISSION AND/OR CONSTRUCTION MANAGER'S APPROVAL PRIOR TO INSTALLATION.
5. THE BLOWERS SHALL BE HOUSED IN A SD-4 METAL SOUND ENCLOSURE RATED AS EXPLOSION PROOF. THE BLOWERS SHALL BE INSTALLED WITHIN THE ENCLOSURE BY THE BLOWER MANUFACTURER.
6. THE ELECTRICAL PANEL FOR EACH BLOWER SHALL INCLUDE AN AUXILIARY CONTACT FOR THE REMOTE ALARM AND WILL BE MOUNTED ON THE EXTERIOR OF THE ENCLOSURE. THE ELECTRICAL PANEL SHALL BE HOUSED IN NEMA 7 ENCLOSURE. THE REMOTE ALARM SHALL BE LOCATED WITHIN A BUILDING MANAGERS OFFICE. THE ALARM SHALL CONSIST OF A WARNING LIGHT, NEMA 12 ENCLOSURE, AND ASSOCIATED RELAYS. THE REMOTE ALARM AND BLOWER CONTROL PANEL SHALL BE CONFIGURED SUCH THAT IF THE BLOWER STOPS OPERATING, THE REMOTE ALARM WILL BE ACTIVATED. A 120V ELECTRICAL SUPPLY SHALL BE PROVIDED TO THE REMOTE PANEL.
7. THE REMOTE VISUAL ALARM SHALL BE LABELED AS FOLLOWS:
   - SUB-SLAB VAPOR VENTING SYSTEM ALARM
   - BLOWER MALFUNCTION IF LIT
   - SERVICE BLOWER IMMEDIATELY
7. SUPPLY POWER TO BLOWER ASSEMBLY, INCLUDING BLOWER, CONTROL PANEL, AND REMOTE ALARM, IN ACCORDANCE WITH ELECTRICAL SPECIFICATIONS (TO BE PREPARED BY OTHERS).
8. BLOWER ASSEMBLY SHALL BE LOCATED ON ROOF, AS SHOWN ON MEP DRAWINGS (DESIGNED BY OTHERS).
9. RISER PIPE RUN WITHIN THE BUILDING IS LOCATED AS SHOWN ON MEP DRAWINGS (DESIGNED BY OTHERS).
10. THE RECOMMENDED BLOWER (AIRTECH 3BA1500-7AT06) WILL REQUIRE A THREE-PHASE, 60 HZ, 220 TO 250 VOLT POWER SUPPLY. POWER SUPPLY FOR AN APPROVED ALTERNATIVE SHALL COMPLY WITH THE MANUFACTURER SPECIFICATIONS.

Date	Description	No.

REVISIONS

SIGNATURE — DATE SIGNED
PROFESSIONAL XXXXXXXXXX
STATE LIC. No. XXXXX

LANGAN
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T: 212.479.5400 F: 212.479.5444 www.langan.com

Project
23-10 QUEENS PLAZA SOUTH
BLOCK No. 425, LOT No. 5
LONG ISLAND CITY
QUEENS NEW YORK

Drawing Title
SUB-SLAB DEPRESSURIZATION SYSTEM DETAILS - 2

Project No.	Drawing No.
170244603	SSDS-3
Date: 6/26/2019	
Drawn By: VDP	
Checked By: PM	Sheet 3 of 3

PROJECT NO. 170244603

APPENDIX F
QUALITY ASSURANCE PROJECT PLAN

QUALITY ASSURANCE PROJECT PLAN

23-10 QUEENS PLAZA SOUTH
Long Island City, New York
NYSDEC BCP Site No. C241160

Prepared For:

QPS 23-10 Developer LLC
c/o Property Markets Group
220 Fifth Avenue, 9th Floor
New York, New York 10001

Prepared By:

Langan Engineering, Environmental, Surveying,
Landscape Architecture and Geology, D.P.C.
21 Penn Plaza
360 West 31st Street, 8th Floor
New York, New York 10001

June 2019
Langan Project No. 170244603

LANGAN

TABLE OF CONTENTS

FIGURES

ATTACHMENTS

1.0 PROJECT DESCRIPTION

1.1 INTRODUCTION

This Quality Assurance Project Plan (QAPP) is for 23-10 Queens Plaza South, Long Island City, New York. The Site encompasses an area of about 27,200 square feet (±0.62 acres) with about 187 feet of frontage along Queens Plaza South to the north, about 155 feet of frontage along 24th Street to the east, and about 137 feet frontage along 23rd Street to the west and site is improved with a four-story vacant building with a full cellar. The Site was assigned Site No. C241160 in the Brownfield Cleanup Program (BCP), pursuant to a Brownfield Cleanup Agreement (BCA) with the New York State Department of Environmental Conservation (NYSDEC) executed on 8 August 2014.

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

1.2 PROJECT OBJECTIVES

The SMP does not mandate the collection of soil, groundwater, or soil vapor samples in the future. Indoor air and subslab depressurization (SSD) system samples will be collected following startup of the SSD system. Future building renovations and improvements or new construction requiring the disturbance, excavation, and/or off-site removal of soil or groundwater may warrant the collection and analysis of soil or groundwater samples in accordance with the Excavation Work Plan (EWP) included in Appendix D of the SMP, and NYSDEC Division of Environmental Remediation (DER)-10: Technical Guidance for Site Investigation and Remediation. In addition, soil vapor and/or air sampling may be required as a condition for discontinuation of the SSD system. Accordingly, this QAPP addresses sampling and analytical methods that may be necessary in support of future Site improvements or proposed modifications to the SMP. These objectives have been established in order to meet standards that will protect public health and the environment for the Site.

1.3 SCOPE OF WORK

The specific scope of work covered in this QAPP includes any future intrusive work at the Site that may be conducted beneath the Site cap and any Site activities covered under the SMP. The SMP only requires collection of air samples to evaluate the SSD system; however, the SMP governs future activities relative to the Site which may include soil or groundwater sampling.

2.0 DATA QUALITY OBJECTIVES AND PROCESS

Data Quality Objectives (DQOs) are qualitative and quantitative statements to help ensure that data of known and appropriate quality are obtained during the project. The overall objective is to evaluate the performance of the SSD through the collection of canister air samples. The sampling program will also provide for collection of soil, soil vapor, indoor air, or groundwater samples as part of a future need for sampling. 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 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 and groundwater 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. For soil vapor or air samples, analytical accuracy will be assessed by examining the percent recoveries that are added to each sample, internal standards, laboratory method blanks, and instrument calibration.
- **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

Any future remedial activities and investigations will be documented by Langan for QPS 23-10 Development 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 SMP, sampling will be conducted by Langan; the analytical services will be performed by Alpha Analytical, Inc. of Westborough, Massachusetts (NYSDOH ELAP certification number 11148). Data validation services will be performed by Emily Strake of Langan.

Résumés for Langan personnel can be found in Attachment B; key contacts for this project are as follows:

QPS 23-10 Development LLC:	Randy Marble Telephone: (212) 610-2854
Langan Project Manager:	Paul McMahon, PE Telephone: (212) 479-5451
Langan Health & Safety Officer:	Tony Moffa, CHMM Telephone: (215) 491-6500
Langan Quality Assurance Manager:	Gerald Nicholls, PE, CHMM Telephone: (212) 479-5559
Langan Data Validator:	Emily Strake, CEP Telephone: (215) 491-6526
Laboratory Representative:	Alpha Analytical, Inc. Ben Rao Telephone: (201) 812-2633

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 the engineering controls on 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 precision, accuracy or bias, representativeness, completeness, 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.

4.1 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. The following field duplicate precision criteria will be applied:

Aqueous and Canister Air Samples

- Results greater than 5 times the laboratory reporting limit (RL) must have a relative percent difference (RPD) $\leq 30\%$.
- Results less than 5 times the RL must have an absolute difference $\leq \pm$RL.

Soil Samples

- Results greater than 5 times the laboratory RL must have a RPD $\leq 50\%$.
- Results less than 5 times the RL must have an absolute difference $\leq 2\times \pm$RL.

RLs and method detection limits (MDL) are provided in Attachment A

Laboratory precision is assessed through the analysis of matrix spike/matrix spike duplicates (MS/MSD), laboratory control sample/laboratory control sample duplicates (LCS/LCSD) and subsequent calculation of RPD. For outliers, if additional sample volume is present, the MS/MSD should be reanalyzed and the RPD recomputed. If additional volume is not present, an evaluation will be performed to determine the extent of potential matrix interference.

4.2 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, 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 and trip blanks and through compliance to all sample handling, preservation, and holding time requirements. All field and trip blanks should be non-detect when analyzed by the laboratory. Any contaminant detected in an associated field blank will be 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/LCSD, surrogate compound recoveries, internal standard area counts, initial and continuing calibrations, and the results of method, initial and continuing calibration blanks. MS/MSD, LCS/LCSD, and surrogate percent recoveries will be 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.

4.3 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 will be 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 are required to read, understand, and follow each document as it pertains to the tasks at hand.

Representativeness in the laboratory is ensured by compliance with 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 analytical methods, laboratory-issued SOPs, the laboratory’s Quality Assurance Manual, and this QAPP. The laboratory is required to be properly certified and accredited.

4.4 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, groundwater (contingency) and sub-slab vapor 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.

4.5 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 will be 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 will be comparable when similar sampling and analytical methods are used as documented in the QAPP. Comparability will be 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 will be evaluated to determine whether they may be combined with contemporary data sets.

4.6 SENSITIVITY

Sensitivity is 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 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.

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

Site-specific MS and MSD samples will be prepared and analyzed by the analytical laboratory by spiking an aliquot of submitted sample volume with analytes of interest. An MS/MSD analysis will be analyzed at a rate of 1 out of every 20 samples, or one per analytical batch. MS/MSD samples are only required for soil and groundwater (contingency) samples.

5.0 SAMPLE COLLECTION AND FIELD DATA ACQUISITION PROCEDURES

Air sampling will be conducted in accordance with the established New York State Department of Health (NYSDOH) protocols contained in the Guidance for Evaluating Soil Vapor Intrusion in the State of New York (October 2006). Soil and groundwater sampling, if necessary, 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, filling out applicable Site inspection forms and checklists contained in Appendix G of the SMP, 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. If an incorrect entry is made, the information 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(s)
- Date and time of activity
- Sample identification number(s)
- Geographical location of sampling points with references to the Site, other facilities or a map coordinate system; sketches will be 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.
- 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 abbreviation in accordance with the sample nomenclature guidance provided in the following table and the Standard Operating Procedure provided in Attachment D.

Sample Nomenclature Summary	
AA	Ambient Air
DUP	Field Duplicate
EA	Effluent Air
FB	Field Blank
IA	Indoor Air
MW	Monitoring Well
SB	Soil Boring
SSV	Sub-slab Vapor
TB	Trip Blank
(#-#)	Depth Interval
MMDDYY	Date of Sampling

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.

5.1.3 Site Inspection Forms

Periodic Site inspections are a requirement of the SMP and are discussed in Section 5.1 of the SMP. It is required that all engineering controls be periodically inspected to ensure that (1) the ECs are in place and effective; (2) the SMP is being implemented; (3) the operation and maintenance of the SSD system is being implemented; and (4) the Site remedy continues to be protective of public health and the environment and is performing as designed. If sampling conducted at the Site includes intrusive activates that affect an engineering control, the relevant Site inspection form(s) should be completed.

5.2 EQUIPMENT CALIBRATION AND PREVENTATIVE MAINTENANCE

A PID will be used during the sampling activities to evaluate work zone action levels, screen soil samples, and collect monitoring well headspace readings. Field calibration and/or field checking of the PID will be the responsibility of the field team leader and the Site Health & Safety Officer, 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

A water quality meter (YSI 6820 or similar) will be used during purging of groundwater (contingency) to measure pH, specific conductance, temperature, dissolved oxygen, turbidity and oxidation-reduction-potential (ORP), every five minutes, or, depending on pump flow rate, after at least one full volume of the water quality meter flow through cell has passed through. A portable turbidity meter (LaMotte or similar) may also be used to measure turbidity. Water-quality meters should be calibrated and the results documented before use each day using standardized field calibration procedures and calibration checks.

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

Soil Samples

Soil samples will be visually classified and field screened using a PID to assess potential impacts from volatile organic compounds (VOCs) and for health and safety monitoring. Soil samples collected for analysis of VOCs will be collected using either En Core® or Terra Core® sampling equipment. For analysis of non-volatile parameters, samples will be homogenized and placed into glass jars. Samples will be collected with unused sterile sampling scoops or spoons and homogenized in unused sterile polyethylene zipper bags. 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 Sections 5.4 and 5.6. 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 samples will meet all quality assurance criteria set forth by this QAPP and DER-10.

Groundwater Samples (Contingency)

Groundwater sampling will be conducted using low-flow sampling procedures following USEPA guidance ("Low Stress [low flow] Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Wells", EQASOP-GW4, dated September 19, 2017).

During purging, field parameters should be measured, including: water level drawdown, purge rate, pH, specific conductance, temperature, dissolved oxygen, turbidity and oxidation-reduction-potential (ORP), every five minutes using a water quality meter (YSI 6820 or similar) and a depth-to-water interface probe that should be decontaminated between wells. Samples should generally not be collected until the field parameters have stabilized. Field parameters will be considered stable once three sets of measurements are within ±0.1 standard units for pH, ±3% for conductivity and temperature, ±10 millivolts for ORP, and ±10% for turbidity and dissolved oxygen. Purge rates should be adjusted to keep the drawdown in the well to less than 0.3 feet, as practical. Additionally, an attempt should be made to achieve a stable turbidity reading of less than 10 Nephelometric Turbidity Units (NTU) prior to sampling. If the turbidity reading does not stabilize at reading of less than 10 NTU for a given well, then both filtered and unfiltered samples should be collected from that well. If necessary, field filtration should be performed using a 0.45 micron disposable in-line filter. Groundwater samples should be collected after parameters have stabilized as noted above or the readings are within the precision of the meter. Deviations from the stabilization and drawdown criteria, if any, should be noted on the sampling logs.

Samples should be collected directly into laboratory-supplied 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 Sections 5.4 and 5.6. Analysis and/or extraction and digestion of collected groundwater samples will meet the holding times required for each analyte as specified in Attachment C. In addition, analysis of collected groundwater samples will meet all quality assurance criteria set forth by this QAPP and DER-10.

Sub-slab Vapor and Ambient Air Samples

Prior to sub-slab vapor and ambient air sample collection, a pre-sampling inspection will be conducted to document chemicals and potential subsurface pathways at the Site. The pre-sampling inspection will assess the potential for impacts from any chemical or petroleum storage within the on-site buildings. Air samples will be collected into laboratory-supplied, batch certified-clean Summa® canisters calibrated for a sampling rate of eight hours. The pressure gauges on each calibrated flow controller should be monitored throughout sample collection. Sample collection should be stopped when the pressure reading reaches -4 mmHg.

Sample Field Blanks, Trip Blanks and Duplicates

Field blanks will be collected for quality assurance purposes at a rate of one per 20 investigative samples per matrix (soil and groundwater only). 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 blank samples will be analyzed for the complete list of analytes on the day of sampling. To assess contamination resulting from sample transport, trip blanks will be collected at a rate of one per day if soil or groundwater (contingency) samples are analyzed for VOCs during that day.

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

5.4 SAMPLE CONTAINERS AND HANDLING

Certified, commercially clean sample containers will be obtained from the analytical laboratory. If soil samples or groundwater (contingency) are being collected, the laboratory will also prepare and supply the required trip blanks and field blank sample containers and reagent preservatives. Sample bottle containers, including the field blank containers, will be placed into plastic coolers by the laboratory. These coolers will be received by the field sampling team within 24 hours of their preparation in the laboratory. Prior to the commencement of field work, Langan field personnel will fill the plastic coolers with ice in Ziploc® bags (or equivalent) to maintain a temperature of 4° ±2° C.

Soil and/or groundwater (contingency) 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°±2°C while on-site and during sample shipment to the analytical laboratory.

Groundwater sampling (contingency) for per- and polyfluoroalkyl substances (PFAS) will be collected in accordance with EPA Method 537 Field Sampling Guidelines. PFAS samples will be collected first in High Density Polyethylene (HDPE)/polypropylene containers using sampling equipment either made with stainless steel, HDPE, or polypropylene. Food and beverages will be prohibited near the sampling equipment. Additionally, no cosmetics, moisturizers, hand cream, sun screen or clothing materials containing Gore-Tex™ or Tyvek® will be worn during sampling.

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

Soil and groundwater (contingency) sample containers will be placed in plastic coolers. Ice in Ziploc® bags (or equivalent) will be placed around sample containers. Cushioning material will be added around the sample containers if necessary. Chains-of-custody and other paperwork will be placed in a Ziploc® bag (or equivalent) and placed inside the cooler. The cooler will be taped closed 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 (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 by a laboratory-provided courier under the chain-of-custody protocols described in Section 5.9.

- 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

Decontamination procedures will be used for non-dedicated sampling equipment. Decontamination of field personnel is discussed in the site-specific sample Health and Safety Plan (HASP) included in Appendix E of the SMP. Field sampling equipment that is to be reused will be decontaminated in the field in accordance with the following procedures:

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

5.8 RESIDUALS MANAGEMENT

Debris (e.g., paper, plastic and disposable personal protective equipment) will be collected in plastic garbage bags and disposed of as non-hazardous industrial waste. Soil cuttings with no apparent staining, odors, or elevated PID readings will be used to backfill boring holes. Soil to be disposed off-site will be placed in 55-gallon, UN/Department of Transportation (DOT) approved drums. Decontamination and well development/purging fluids will be placed in DOT-approved fluid drums with closed tops. All drums will be properly labeled, sealed, and characterized as necessary.

If RI analytical data is insufficient to gain disposal facility acceptance, waste characterization samples will be analyzed for parameters that are typically required by disposal facilities, such as target compounds list (TCL) VOCs, semivolatile organic compounds (SVOCs), Resource Conservation and Recovery Act (RCRA) metals, polychlorinated biphenyls (PCBs), pesticides, herbicides, Toxicity Characteristic Leaching Procedure (TCLP) VOCs, TCLP SVOCs, TCLP metals, ignitability, corrosivity, reactivity, and paint filter. Additional sampling and analyses may be required based on the selected disposal facility.

Samples will be collected in accordance with the selected disposal facility’s requirements and will be collected to be representative of the material requiring disposal at a frequency consistent with disposal facility requirements. It is anticipated that all drummed material will be transported off-site and disposed of at a permitted facility.

5.9 CHAIN OF CUSTODY PROCEDURES

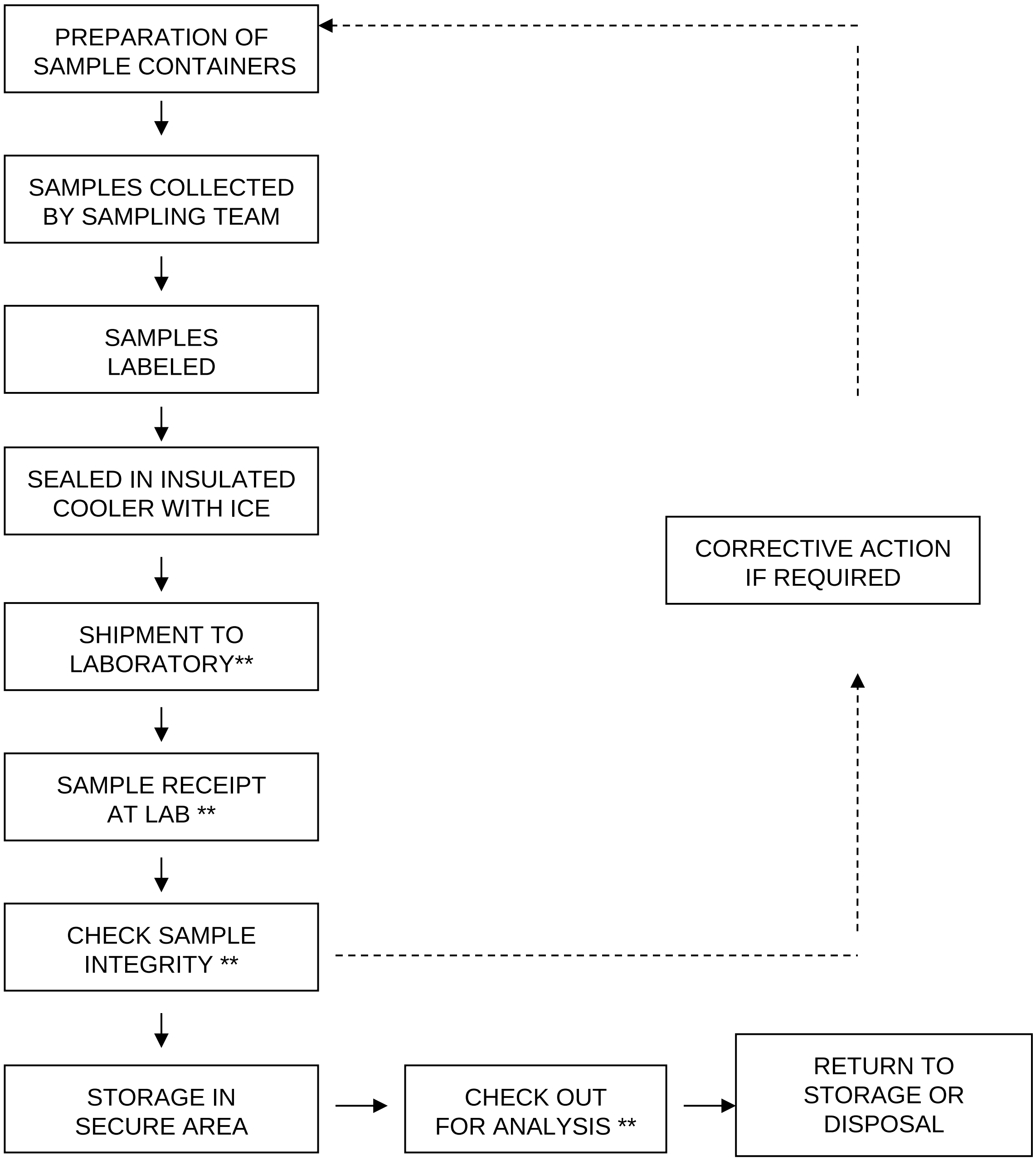
A chain-of-custody protocol has been established for collected samples that will be followed during sample handling activities in both field and laboratory operations. The primary purpose of the chain-of-custody procedures is to document the possession of the samples from collection through shipping,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

When soil and groundwater (contingency) samples are collected, sample coolers will be accompanied by the chain-of-custody form, sealed in a Ziploc® bag (or equivalent) and placed on top of the samples or taped to the inside of the cooler lid. If applicable, a shipping bill will be completed for each cooler and the shipping bill number recorded on the chain-of-custody form.

Samples will be packaged for shipment to the laboratory with the appropriate chain-of-custody form. A copy of the form will be retained by the 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. A flow chart showing a sample custody process is included as Figure 5.1, and an example chain-of-custody form for soil and groundwater (contingency) samples is included as Figure 5.2.

Figure 5.1 Sample Custody



** REQUIRES SIGN-OFF ON CHAIN-OF-CUSTODY FORM

Figure 5.2 Sample Chain-of-Custody Form – Soil and Groundwater Samples

NEW YORK CHAIN OF CUSTODY

Service Centers
Mahwah, NJ 07430: 35 Whitney Rd, Suite 5
Albany, NY 12205: 14 Walker Way
Tonawanda, NY 14150: 275 Cooper Ave, Suite 105

Page ___ of ___

Date Rec'd in Lab

ALPHA Job #

Westborough, MA 01581
8 Walkup Dr.
TEL: 508-898-9220
FAX: 508-898-9193

Mansfield, MA 02048
320 Forbes Blvd
TEL: 508-822-9300
FAX: 508-822-3288

Project Information
Project Name:
Project Location:
Project #
(Use Project name as Project #) ☐
Project Manager:
ALPHAQuote #:

Turn-Around Time
Standard ☐ Due Date:
Rush (only if pre approved) ☐ # of Days:

Client Information
Client:
Address:
Phone:
Fax:
Email:

Deliverables
☐ ASP-A ☐ ASP-B
☐ EQuIS (1 File) ☐ EQuIS (4 File)
☐ Other

Regulatory Requirement
☐ NY TOGS ☐ NY Part 375
☐ AWQ Standards ☐ NY CP-51
☐ NY Restricted Use ☐ Other
☐ NY Unrestricted Use
☐ NYC Sewer Discharge

Billing Information
☐ Same as Client Info
PO #

Disposal Site Information
Please identify below location of applicable disposal facilities.
Disposal Facility:
☐ NJ ☐ NY
☐ Other:

These samples have been previously analyzed by Alpha ☐

Other project specific requirements/comments:

Please specify Metals or TAL.

ANALYSIS

Sample Filtration
☐ **Done**
☐ **Lab to do**
Preservation
☐ **Lab to do**
(Please Specify below)

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler's Initials									Sample Specific Comments	Total Bottle

Preservative Code:
A = None
B = HCl
C = HNO_3
D = H_2SO_4
E = NaOH
F = MeOH
G = $NaHSO_4$
H = $Na_2S_2O_3$
K/E = Zn Ac/NaOH
O = Other

Container Code
P = Plastic
A = Amber Glass
V = Vial
G = Glass
B = Bacteria Cup
C = Cube
O = Other
E = Encore
D = BOD Bottle

Westboro: Certification No: MA935
Mansfield: Certification No: MA015

Container Type								
Preservative								

Relinquished By:	Date/Time	Received By:	Date/Time

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. BY EXECUTING THIS COC, THE CLIENT HAS READ AND AGREES TO BE BOUND BY ALPHA'S TERMS & CONDITIONS. (See reverse side.)

Form No: 01-25 HC (rev. 30-Sept-2013)

Figure 5.3 Sample Chain-of-Custody Form – Sub-slab Vapor and Ambient Air Samples

ALPHA ANALYTICAL

AIR ANALYSIS

CHAIN OF CUSTODY

PAGE_______ OF _______

320 Forbes Blvd, Mansfield, MA 02048
TEL: 508-822-9300 FAX: 508-822-3288

Date Rec'd in Lab:

ALPHA Job #:

Client Information	Project Information
Client:	Project Name:
Address:	Project Location:
	Project #:
	Project Manager:
	ALPHA Quote #:
Phone:	**Turn-Around Time**
Fax:	❑ Standard ❑ RUSH *(only confirmed if pre-approved!)*
Email:	**Date Due:** **Time:**
❑ These samples have been previously analyzed by Alpha	

Report Information - Data Deliverables

❑ FAX
❑ ADEx
Criteria Checker: ____________
(Default based on Regulatory Criteria Indicated)
Other Formats: ____________
❑ EMAIL (standard pdf report)
❑ Additional Deliverables:
Report to: (if different than Project Manager)

Billing Information

❑ Same as Client info PO #:

Regulatory Requirements/Report Limits

State/Fed	*Program*	*Res / Comm*

Other Project Specific Requirements/Comments:

Project-Specific Target Compound List: ❑

All Columns Below Must Be Filled Out — **COLLECTION** — **ANALYSIS**

ALPHA Lab ID (Lab Use Only)	Sample ID	End Date	Start Time	End Time	Initial Vacuum	Final Vacuum	Sample Matrix*	Sampler's Initials	Can Size	I D Can	I D - Flow Controller	TO-15	TO-15 SIM	APH (Subtract Non-petroleum HCs ❑)	Fixed Gases	Sulfides & Mercaptans by TO-15			Sample Comments (i.e. PID)

***SAMPLE MATRIX CODES**
AA = Ambient Air (Indoor/Outdoor)
SV = Soil Vapor/Landfill Gas/SVE
Other = Please Specify

Container Type

Relinquished By:	Date/Time	Received By:	Date/Time:

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. All samples submitted are subject to Alpha's Terms and Conditions.
See reverse side.

Form No: 101-02 Rev: (25-Sep-15)

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 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, the environmental consultant 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 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. Samples for VOCs will be maintained in satellite storage areas within the VOC laboratory. 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.

5.11 SPECIAL CONSIDERATIONS FOR PFAS SAMPLE COLLECTION

Groundwater samples (contingency) collected for analysis of PFAS will be collected in accordance with the specialized protocol outlined in this section. Groundwater samples collected from select wells will be analyzed for 1,4-dioxane with a detection limit no higher than 0.35 micrograms per liter, and for PFAS with a detection limit no higher than 2 nanograms per liter in accordance with the procedure outlined in Attachment E.

The following special considerations apply to the collection of groundwater samples for PFAS analysis to prevent cross-contamination:

- Field equipment will not contain Teflon®
- All sampling material will be made from stainless steel, HDPE, acetate, silicon, or polypropylene
- No waterproof field books will be used
- No plastic clipboards, binders, or spiral hard cover notebooks will be used

- No adhesives will be used
- No sharpies or permanent markers will be used; ball point pens are acceptable
- Aluminum foil will not be used
- PFAS samples will be kept in a separate cooler from other sampling containers
- Coolers will be filled only with regular ice

PFAS compound sampling protocol is provided in Attachment E.

5.12 PFAS TARGET ANALYTE LIST

DER has developed a PFAS target analyte list. At minimum, the laboratory will report the following PFAS target compounds:

Group	Analyte Name	Abbreviation	CAS #
Perfluoroalkyl carboxylates	Perfluorobutanoic acid	PFBA	375-22-4
	Perfluoropentanoic acid	PFPeA	2706-90-3
	Perfluorohexanoic acid	PFHxA	307-24-4
	Perfluoroheptanoic acid	PFHpA	375-85-9
	Perfluorooctanoic acid	PFOA	335-67-1
	Perfluorononanoic acid	PFNA	375-95-1
	Perfluorodecanoic acid	PFDA	335-76-2
	Perfluoroundecanoic acid	PFUA/PFUdA	2058-94-8
	Perfluorododecanoic acid	PFDoA	307-55-1
	Perfluorotridecanoic acid	PFTriA/PFTrDA	72629-94-8
	Perfluorotetradecanoic acid	PFTA/PFTeDA	376-06-7
Perfluoroalkyl sulfonates	Perfluorobutanesulfonic acid	PFBS	375-73-5
	Perfluorohexanesulfonic acid	PFHxS	355-46-4
	Perfluoroheptanesulfonic acid	PFHpS	375-92-8
	Perfluorooctanessulfonic acid	PFOS	1763-23-1
	Perfluorodecanesulfonic acid	PFDS	335-77-3
Fluorinated Telomer Sulfonates	6:2 Fluorotelomer sulfonate	6:2 FTS	27619-97-2
	8:2 Fluorotelomer sulfonate	8:2 FTS	39108-34-4
Perfluorooctane-sulfonamides	Perfluroroctanesulfonamide	FOSA	754-91-6
Perfluorooctane-sulfonamidoacetic acids	N-methyl perfluorooctanesulfonamidoacetic acid	N-MeFOSAA	2355-31-9
	N-ethyl perfluorooctanesulfonamidoacetic acid	N-EtFOSAA	2991-50-6

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 methodology 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 ASCII format from the laboratory information management system. 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 validation guidelines for organic and inorganic data review. Validation will include the following:

- Verification of the QC sample results;
- Verification of the identification of sample results (both positive hits and non-detects);
- Recalculation of 10% of all investigative sample results; and
- Preparation of Data Usability Summary Reports (DUSR).

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. A detailed assessment of each sample delivery group will follow. For each of the organic analytical methods, the following will be assessed:

- Holding times;
- Instrument tuning;
- Instrument calibrations;
- Blank results;
- System monitoring compounds or surrogate recovery compounds (as applicable);
- Internal standard area counts (if applicable);
- MS and MSD recoveries and RPDs
- LCS and LCSD recoveries and RPDs
- Endrin/DDT Breakdown (if applicable);
- Dual Column Analysis (if applicable);
- Target compound identification;
- Chromatogram quality;
- Pesticide cleanup (if applicable);
- Compound quantitation and reported detection limits;
- Overall system performance; and
- Results verification.

For each of the inorganic compounds, the following will be assessed:

- Holding times;
- Calibrations;
- Blank results;
- Interference check sample;
- Laboratory control samples;
- Laboratory Duplicates;
- Matrix Spike;
- Furnace atomic absorption analysis QC;
- Contract Required Detection Limit standards;
- ICP serial dilutions; and
- Results verification and reported detection limits.

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

- "U" - Not detected. The associated number indicates the approximate sample concentration necessary to be detected significantly greater than the level of the highest associated blank;
- "UJ" - Not detected. Quantitation limit may be inaccurate or imprecise;
- "J" - Analyte is present. Reported value may be associated with a higher level of uncertainty than is normally expected with the analytical method
- "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 Quality Assurance Manager (QAM). 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 QAM may plan, schedule, and approve system and performance audits based upon procedures customized to the project requirements. At times, the QAM 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 QAM 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. Additional audits may occur if conditions adverse to quality are detected or at the request of the Project Manager.

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 QAM 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 QAM 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 a 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 QAM, 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 personnel, field investigation teams, remedial response planning personnel, and laboratory groups monitor ongoing work performance during the normal course of daily responsibilities. Work may be audited at project 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 by email). 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.

USEPA, 2014. "Test Method for Evaluating Solid Waste," Update V dated July 2014 U.S. Environmental Protection Agency, Washington, D.C.

USEPA, 2016. Low/Medium Volatile Data Validation. SOP No. HW-33A, Revision 1, dated September 2016. USEPA Region II.

USEPA, 2015. PCB Aroclor Data Validation. SOP No. HW-37A, Revision 0, dated July 2015. USEPA Region II.

USEPA, 2016. ICP-AES Data Validation. SOP No. HW-3a, Revision 1, dated September 2016. USEPA Region II.

USEPA, 2016. Mercury and Cyanide Data Validation. SOP No. HW-3c, Revision 1, dated September 2016. USEPA Region II.

USEPA, 2016. Pesticide Data Validation. SOP No. HW-36A, Revision 1, dated October 2016. USEPA Region II.

USEPA, 2016. Semivolatile Data Validation. SOP No. HW-35A, Revision 1, dated September 2016. USEPA Region II.

USEPA, 2016. Analysis of Volatile Organic Compounds in Air Contained in Canisters by Method TO-15, Revision 6, dated September 2016. USEPA Region II.

ATTACHMENT A

LABORATORY REPORTING LIMITS AND METHOD DETECTION LIMITS

Date Created: 07/27/18
Created By: Ben Rao
File: PM5251-1
Page: 1

Langan Engineering & Environmental

TCL Volatiles - EPA 8260C/5035 High&Low (SOIL)

Holding Time: 14 days
Container/Sample Preservation: 1 - 1 Vial MeOH/2 Vial Water

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Methylene chloride	75-09-2	5	2.29	ug/kg	70-130	30	70-130	30	30			
1,1-Dichloroethane	75-34-3	1	0.145	ug/kg	70-130	30	70-130	30	30			
Chloroform	67-66-3	1.5	0.14	ug/kg	70-130	30	70-130	30	30			
Carbon tetrachloride	56-23-5	1	0.23	ug/kg	70-130	30	70-130	30	30			
1,2-Dichloropropane	78-87-5	1	0.125	ug/kg	70-130	30	70-130	30	30			
Dibromochloromethane	124-48-1	1	0.14	ug/kg	70-130	30	70-130	30	30			
1,1,2-Trichloroethane	79-00-5	1	0.267	ug/kg	70-130	30	70-130	30	30			
Tetrachloroethene	127-18-4	0.5	0.196	ug/kg	70-130	30	70-130	30	30			
Chlorobenzene	108-90-7	0.5	0.127	ug/kg	70-130	30	70-130	30	30			
Trichlorofluoromethane	75-69-4	4	0.695	ug/kg	70-139	30	70-139	30	30			
1,2-Dichloroethane	107-06-2	1	0.257	ug/kg	70-130	30	70-130	30	30			
1,1,1-Trichloroethane	71-55-6	0.5	0.167	ug/kg	70-130	30	70-130	30	30			
Bromodichloromethane	75-27-4	0.5	0.109	ug/kg	70-130	30	70-130	30	30			
trans-1,3-Dichloropropene	10061-02-6	1	0.273	ug/kg	70-130	30	70-130	30	30			
cis-1,3-Dichloropropene	10061-01-5	0.5	0.158	ug/kg	70-130	30	70-130	30	30			
1,3-Dichloropropene, Total	542-75-6	0.5	0.158	ug/kg				30	30			
1,3-Dichloropropene, Total	542-75-6	0.5	0.158	ug/kg				30	30			
1,1-Dichloropropene	563-58-6	0.5	0.159	ug/kg	70-130	30	70-130	30	30			
Bromoform	75-25-2	4	0.246	ug/kg	70-130	30	70-130	30	30			
1,1,2,2-Tetrachloroethane	79-34-5	0.5	0.166	ug/kg	70-130	30	70-130	30	30			
Benzene	71-43-2	0.5	0.166	ug/kg	70-130	30	70-130	30	30			
Toluene	108-88-3	1	0.543	ug/kg	70-130	30	70-130	30	30			
Ethylbenzene	100-41-4	1	0.141	ug/kg	70-130	30	70-130	30	30			
Chloromethane	74-87-3	4	0.932	ug/kg	52-130	30	52-130	30	30			
Bromomethane	74-83-9	2	0.581	ug/kg	57-147	30	57-147	30	30			
Vinyl chloride	75-01-4	1	0.335	ug/kg	67-130	30	67-130	30	30			
Chloroethane	75-00-3	2	0.452	ug/kg	50-151	30	50-151	30	30			
1,1-Dichloroethene	75-35-4	1	0.238	ug/kg	65-135	30	65-135	30	30			
trans-1,2-Dichloroethene	156-60-5	1.5	0.137	ug/kg	70-130	30	70-130	30	30			
Trichloroethene	79-01-6	0.5	0.137	ug/kg	70-130	30	70-130	30	30			
1,2-Dichlorobenzene	95-50-1	2	0.144	ug/kg	70-130	30	70-130	30	30			
1,3-Dichlorobenzene	541-73-1	2	0.148	ug/kg	70-130	30	70-130	30	30			
1,4-Dichlorobenzene	106-46-7	2	0.171	ug/kg	70-130	30	70-130	30	30			
Methyl tert butyl ether	1634-04-4	2	0.201	ug/kg	66-130	30	66-130	30	30			
p/m-Xylene	179601-23-1	2	0.56	ug/kg	70-130	30	70-130	30	30			
o-Xylene	95-47-6	1	0.291	ug/kg	70-130	30	70-130	30	30			
Xylene (Total)	1330-20-7	1	0.291	ug/kg				30	30			
Xylene (Total)	1330-20-7	1	0.291	ug/kg				30	30			
cis-1,2-Dichloroethene	156-59-2	1	0.175	ug/kg	70-130	30	70-130	30	30			
1,2-Dichloroethene (total)	540-59-0	1	0.137	ug/kg				30	30			
1,2-Dichloroethene (total)	540-59-0	1	0.137	ug/kg				30	30			
Dibromomethane	74-95-3	2	0.238	ug/kg	70-130	30	70-130	30	30			

Please Note that the RL information provided in this table is calculated using a 100% Solids factor (Soil/Solids only)
Please Note that the information provided in this table is subject to change at anytime at the discretion of Alpha Analytical, In

ALPHA ANALYTICAL
World Class Chemistry

Date Created: 07/27/18
Created By: Ben Rao
File: PM5251-1
Page: 2

Langan Engineering & Environmental

TCL Volatiles - EPA 8260C/5035 High&Low (SOIL)

Holding Time: 14 days
Container/Sample Preservation: 1 - 1 Vial MeOH/2 Vial Water

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Styrene	100-42-5	1	0.196	ug/kg	70-130	30	70-130	30	30			
Dichlorodifluoromethane	75-71-8	10	0.915	ug/kg	30-146	30	30-146	30	30			
Acetone	67-64-1	10	4.811	ug/kg	54-140	30	54-140	30	30			
Carbon disulfide	75-15-0	10	4.55	ug/kg	59-130	30	59-130	30	30			
2-Butanone	78-93-3	10	2.22	ug/kg	70-130	30	70-130	30	30			
Vinyl acetate	108-05-4	10	2.15	ug/kg	70-130	30	70-130	30	30			
4-Methyl-2-pentanone	108-10-1	10	1.28	ug/kg	70-130	30	70-130	30	30			
1,2,3-Trichloropropane	96-18-4	2	0.127	ug/kg	68-130	30	68-130	30	30			
2-Hexanone	591-78-6	10	1.18	ug/kg	70-130	30	70-130	30	30			
Bromochloromethane	74-97-5	2	0.205	ug/kg	70-130	30	70-130	30	30			
2,2-Dichloropropane	594-20-7	2	0.202	ug/kg	70-130	30	70-130	30	30			
1,2-Dibromoethane	106-93-4	1	0.279	ug/kg	70-130	30	70-130	30	30			
1,3-Dichloropropane	142-28-9	2	0.167	ug/kg	69-130	30	69-130	30	30			
1,1,1,2-Tetrachloroethane	630-20-6	0.5	0.132	ug/kg	70-130	30	70-130	30	30			
Bromobenzene	108-86-1	2	0.145	ug/kg	70-130	30	70-130	30	30			
n-Butylbenzene	104-51-8	1	0.167	ug/kg	70-130	30	70-130	30	30			
sec-Butylbenzene	135-98-8	1	0.146	ug/kg	70-130	30	70-130	30	30			
tert-Butylbenzene	98-06-6	2	0.118	ug/kg	70-130	30	70-130	30	30			
o-Chlorotoluene	95-49-8	2	0.191	ug/kg	70-130	30	70-130	30	30			
p-Chlorotoluene	106-43-4	2	0.108	ug/kg	70-130	30	70-130	30	30			
1,2-Dibromo-3-chloropropane	96-12-8	3	0.998	ug/kg	68-130	30	68-130	30	30			
Hexachlorobutadiene	87-68-3	4	0.169	ug/kg	67-130	30	67-130	30	30			
Isopropylbenzene	98-82-8	1	0.109	ug/kg	70-130	30	70-130	30	30			
p-Isopropyltoluene	99-87-6	1	0.109	ug/kg	70-130	30	70-130	30	30			
Naphthalene	91-20-3	4	0.65	ug/kg	70-130	30	70-130	30	30			
Acrylonitrile	107-13-1	4	1.15	ug/kg	70-130	30	70-130	30	30			
n-Propylbenzene	103-65-1	1	0.171	ug/kg	70-130	30	70-130	30	30			
1,2,3-Trichlorobenzene	87-61-6	2	0.322	ug/kg	70-130	30	70-130	30	30			
1,2,4-Trichlorobenzene	120-82-1	2	0.272	ug/kg	70-130	30	70-130	30	30			
1,3,5-Trimethylbenzene	108-67-8	2	0.193	ug/kg	70-130	30	70-130	30	30			
1,2,4-Trimethylbenzene	95-63-6	2	0.334	ug/kg	70-130	30	70-130	30	30			
1,4-Dioxane	123-91-1	100	35.1	ug/kg	65-136	30	65-136	30	30			
1,4-Diethylbenzene	105-05-5	2	0.177	ug/kg	70-130	30	70-130	30	30			
4-Ethyltoluene	622-96-8	2	0.384	ug/kg	70-130	30	70-130	30	30			
1,2,4,5-Tetramethylbenzene	95-93-2	2	0.191	ug/kg	70-130	30	70-130	30	30			
Ethyl ether	60-29-7	2	0.341	ug/kg	67-130	30	67-130	30	30			
trans-1,4-Dichloro-2-butene	110-57-6	5	1.42	ug/kg	70-130	30	70-130	30	30			
1,2-Dichloroethane-d4	*17060-07-0*									*70-130*		
2-Chloroethoxyethane												
Toluene-d8	*2037-26-5*									*70-130*		
4-Bromofluorobenzene	*460-00-4*									*70-130*		
Dibromofluoromethane	*1868-53-7*									*70-130*		

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NYTCL Semivolatiles - EPA 8270D (SOIL)

Holding Time: 14 days
Container/Sample Preservation: 1 - Glass 250ml/8oz unpreserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Acenaphthene	83-32-9	133.6	17.3012	ug/kg	31-137	50	31-137	50	50			
1,2,4-Trichlorobenzene	120-82-1	167	19.1048	ug/kg	38-107	50	38-107	50	50			
Hexachlorobenzene	118-74-1	100.2	18.704	ug/kg	40-140	50	40-140	50	50			
Bis(2-chloroethyl)ether	111-44-4	150.3	22.6452	ug/kg	40-140	50	40-140	50	50			
2-Chloronaphthalene	91-58-7	167	16.5664	ug/kg	40-140	50	40-140	50	50			
1,2-Dichlorobenzene	95-50-1	167	29.9932	ug/kg	40-140	50	40-140	50	50			
1,3-Dichlorobenzene	541-73-1	167	28.724	ug/kg	40-140	50	40-140	50	50			
1,4-Dichlorobenzene	106-46-7	167	29.1582	ug/kg	28-104	50	28-104	50	50			
3,3'-Dichlorobenzidine	91-94-1	167	44.422	ug/kg	40-140	50	40-140	50	50			
2,4-Dinitrotoluene	121-14-2	167	33.4	ug/kg	40-132	50	40-132	50	50			
2,6-Dinitrotoluene	606-20-2	167	28.6572	ug/kg	40-140	50	40-140	50	50			
Fluoranthene	206-44-0	100.2	19.1716	ug/kg	40-140	50	40-140	50	50			
4-Chlorophenyl phenyl ether	7005-72-3	167	17.869	ug/kg	40-140	50	40-140	50	50			
4-Bromophenyl phenyl ether	101-55-3	167	25.4842	ug/kg	40-140	50	40-140	50	50			
Bis(2-chloroisopropyl)ether	108-60-1	200.4	28.5236	ug/kg	40-140	50	40-140	50	50			
Bis(2-chloroethoxy)methane	111-91-1	180.36	16.7334	ug/kg	40-117	50	40-117	50	50			
Hexachlorobutadiene	87-68-3	167	24.4488	ug/kg	40-140	50	40-140	50	50			
Hexachlorocyclopentadiene	77-47-4	477.62	151.302	ug/kg	40-140	50	40-140	50	50			
Hexachloroethane	67-72-1	133.6	27.0206	ug/kg	40-140	50	40-140	50	50			
Isophorone	78-59-1	150.3	21.6766	ug/kg	40-140	50	40-140	50	50			
Naphthalene	91-20-3	167	20.3406	ug/kg	40-140	50	40-140	50	50			
Nitrobenzene	98-95-3	150.3	24.716	ug/kg	40-140	50	40-140	50	50			
NitrosoDiPhenylAmine(NDPA)/DPA	86-30-6	133.6	19.0046	ug/kg	36-157	50	36-157	50	50			
n-Nitrosodi-n-propylamine	621-64-7	167	25.7848	ug/kg	32-121	50	32-121	50	50			
Bis(2-Ethylhexyl)phthalate	117-81-7	167	57.782	ug/kg	40-140	50	40-140	50	50			
Butyl benzyl phthalate	85-68-7	167	42.084	ug/kg	40-140	50	40-140	50	50			
Di-n-butylphthalate	84-74-2	167	31.6632	ug/kg	40-140	50	40-140	50	50			
Di-n-octylphthalate	117-84-0	167	56.78	ug/kg	40-140	50	40-140	50	50			
Diethyl phthalate	84-66-2	167	15.4642	ug/kg	40-140	50	40-140	50	50			
Dimethyl phthalate	131-11-3	167	35.07	ug/kg	40-140	50	40-140	50	50			
Benzo(a)anthracene	56-55-3	100.2	18.8042	ug/kg	40-140	50	40-140	50	50			
Benzo(a)pyrene	50-32-8	133.6	40.748	ug/kg	40-140	50	40-140	50	50			
Benzo(b)fluoranthene	205-99-2	100.2	28.1228	ug/kg	40-140	50	40-140	50	50			
Benzo(k)fluoranthene	207-08-9	100.2	26.72	ug/kg	40-140	50	40-140	50	50			
Chrysene	218-01-9	100.2	17.368	ug/kg	40-140	50	40-140	50	50			
Acenaphthylene	208-96-8	133.6	25.7848	ug/kg	40-140	50	40-140	50	50			
Anthracene	120-12-7	100.2	32.565	ug/kg	40-140	50	40-140	50	50			
Benzo(ghi)perylene	191-24-2	133.6	19.6392	ug/kg	40-140	50	40-140	50	50			
Fluorene	86-73-7	167	16.2324	ug/kg	40-140	50	40-140	50	50			
Phenanthrene	85-01-8	100.2	20.3072	ug/kg	40-140	50	40-140	50	50			
Dibenzo(a,h)anthracene	53-70-3	100.2	19.3052	ug/kg	40-140	50	40-140	50	50			
Indeno(1,2,3-cd)Pyrene	193-39-5	133.6	23.2798	ug/kg	40-140	50	40-140	50	50			

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NYTCL Semivolatiles - EPA 8270D (SOIL)

Holding Time: 14 days
Container/Sample Preservation: 1 - Glass 250ml/8oz unpreserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Pyrene	129-00-0	100.2	16.5998	ug/kg	35-142	50	35-142	50	50			
Biphenyl	92-52-4	380.76	38.744	ug/kg	54-104	50	54-104	50	50			
4-Chloroaniline	106-47-8	167	30.394	ug/kg	40-140	50	40-140	50	50			
2-Nitroaniline	88-74-4	167	32.1976	ug/kg	47-134	50	47-134	50	50			
3-Nitroaniline	99-09-2	167	31.4962	ug/kg	26-129	50	26-129	50	50			
4-Nitroaniline	100-01-6	167	69.138	ug/kg	41-125	50	41-125	50	50			
Dibenzofuran	132-64-9	167	15.7982	ug/kg	40-140	50	40-140	50	50			
2-Methylnaphthalene	91-57-6	200.4	20.1736	ug/kg	40-140	50	40-140	50	50			
Acetophenone	98-86-2	167	20.6746	ug/kg	14-144	50	14-144	50	50			
2,4,6-Trichlorophenol	88-06-2	100.2	31.6632	ug/kg	30-130	50	30-130	50	50			
P-Chloro-M-Cresol	59-50-7	167	24.883	ug/kg	26-103	50	26-103	50	50			
2-Chlorophenol	95-57-8	167	19.7394	ug/kg	25-102	50	25-102	50	50			
2,4-Dichlorophenol	120-83-2	150.3	26.8536	ug/kg	30-130	50	30-130	50	50			
2,4-Dimethylphenol	105-67-9	167	55.11	ug/kg	30-130	50	30-130	50	50			
2-Nitrophenol	88-75-5	360.72	62.792	ug/kg	30-130	50	30-130	50	50			
4-Nitrophenol	100-02-7	233.8	68.136	ug/kg	11-114	50	11-114	50	50			
2,4-Dinitrophenol	51-28-5	801.6	77.822	ug/kg	4-130	50	4-130	50	50			
4,6-Dinitro-o-cresol	534-52-1	434.2	80.16	ug/kg	10-130	50	10-130	50	50			
Pentachlorophenol	87-86-5	133.6	36.74	ug/kg	17-109	50	17-109	50	50			
Phenol	108-95-2	167	25.217	ug/kg	26-90	50	26-90	50	50			
2-Methylphenol	95-48-7	167	25.885	ug/kg	30-130.	50	30-130.	50	50			
3-Methylphenol/4-Methylphenol	106-44-5	240.48	26.1522	ug/kg	30-130	50	30-130	50	50			
2,4,5-Trichlorophenol	95-95-4	167	31.9972	ug/kg	30-130	50	30-130	50	50			
Benzoic Acid	65-85-0	541.08	169.004	ug/kg	10-110	50	10-110	50	50			
Benzyl Alcohol	100-51-6	167	51.102	ug/kg	40-140	50	40-140	50	50			
Carbazole	86-74-8	167	16.2324	ug/kg	54-128	50	54-128	50	50			
2-Fluorophenol	*367-12-4*									*25-120*		
Phenol-d6	*13127-88-3*									*10-120*		
Nitrobenzene-d5	*4165-60-0*									*23-120*		
2-Fluorobiphenyl	*321-60-8*									*30-120*		
2,4,6-Tribromophenol	*118-79-6*									*10-136*		
4-Terphenyl-d14	*1718-51-0*									*18-120*		

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TCL Pesticides - EPA 8081B (SOIL)

Holding Time: 14 days
Container/Sample Preservation: 1 - Glass 250ml/8oz unpreserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Delta-BHC	319-86-8	7.992	1.5651	ug/kg	30-150	30	30-150	50	50			
Lindane	58-89-9	3.33	1.48851	ug/kg	30-150	30	30-150	50	50			
Alpha-BHC	319-84-6	3.33	0.94572	ug/kg	30-150	30	30-150	50	50			
Beta-BHC	319-85-7	7.992	3.0303	ug/kg	30-150	30	30-150	50	50			
Heptachlor	76-44-8	3.996	1.79154	ug/kg	30-150	30	30-150	50	50			
Aldrin	309-00-2	7.992	2.81385	ug/kg	30-150	30	30-150	50	50			
Heptachlor epoxide	1024-57-3	14.985	4.4955	ug/kg	30-150	30	30-150	50	50			
Endrin	72-20-8	3.33	1.3653	ug/kg	30-150	30	30-150	50	50			
Endrin aldehyde	7421-93-4	9.99	3.4965	ug/kg	30-150	30	30-150	50	50			
Endrin ketone	53494-70-5	7.992	2.05794	ug/kg	30-150	30	30-150	50	50			
Dieldrin	60-57-1	4.995	2.4975	ug/kg	30-150	30	30-150	50	50			
4,4'-DDE	72-55-9	7.992	1.84815	ug/kg	30-150	30	30-150	50	50			
4,4'-DDD	72-54-8	7.992	2.85048	ug/kg	30-150	30	30-150	50	50			
4,4'-DDT	50-29-3	14.985	6.4269	ug/kg	30-150	30	30-150	50	50			
Endosulfan I	959-98-8	7.992	1.88811	ug/kg	30-150	30	30-150	50	50			
Endosulfan II	33213-65-9	7.992	2.67066	ug/kg	30-150	30	30-150	50	50			
Endosulfan sulfate	1031-07-8	3.33	1.58508	ug/kg	30-150	30	30-150	50	50			
Methoxychlor	72-43-5	14.985	4.662	ug/kg	30-150	30	30-150	50	50			
Toxaphene	8001-35-2	149.85	41.958	ug/kg	30-150	30	30-150	50	50			
cis-Chlordane	5103-71-9	9.99	2.78388	ug/kg	30-150	30	30-150	50	50			
trans-Chlordane	5103-74-2	9.99	2.63736	ug/kg	30-150	30	30-150	50	50			
Chlordane	57-74-9	64.935	26.4735	ug/kg	30-150	30	30-150	50	50			
2,4,5,6-Tetrachloro-m-xylene	*877-09-8*									*30-150*		
Decachlorobiphenyl	*2051-24-3*									*30-150*		

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Herbicides -EPA 8151A (SOIL)

Holding Time: 14 days
Container/Sample Preservation: 1 - Glass 250ml/8oz unpreserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
2,4-D	94-75-7	0.1665	0.0104895	mg/kg	30-150	30	30-150	30	30			
2,4,5-T	93-76-5	0.1665	0.0051615	mg/kg	30-150	30	30-150	30	30			
2,4,5-TP (Silvex)	93-72-1	0.1665	0.0044289	mg/kg	30-150	30	30-150	30	30			
DCAA	*19719-28-9*									*30-150*		

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TCL PCBs - EPA 8082A (SOIL)

Holding Time: 14 days
Container/Sample Preservation: 1 - Glass 250ml/8oz unpreserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Aroclor 1016	12674-11-2	33.5	3.7989	ug/kg	40-140	50	40-140	50	50			
Aroclor 1221	11104-28-2	33.5	5.0987	ug/kg	40-140	50	40-140	50	50			
Aroclor 1232	11141-16-5	33.5	3.2964	ug/kg	40-140	50	40-140	50	50			
Aroclor 1242	53469-21-9	33.5	4.1004	ug/kg	40-140	50	40-140	50	50			
Aroclor 1248	12672-29-6	33.5	3.7587	ug/kg	40-140	50	40-140	50	50			
Aroclor 1254	11097-69-1	33.5	2.7336	ug/kg	40-140	50	40-140	50	50			
Aroclor 1260	11096-82-5	33.5	3.4974	ug/kg	40-140	50	40-140	50	50			
Aroclor 1262	37324-23-5	33.5	2.7537	ug/kg	40-140	50	40-140	50	50			
Aroclor 1268	11100-14-4	33.5	2.3718	ug/kg	40-140	50	40-140	50	50			
PCBs, Total	1336-36-3	33.5	1.541	ug/kg				50	50			
PCBs, Total	1336-36-3	33.5	1.541	ug/kg				50	50			
2,4,5,6-Tetrachloro-m-xylene	*877-09-8*									*30-150*		
Decachlorobiphenyl	*2051-24-3*									*30-150*		

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METALS by 6010D (SOIL)

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria	Holding Time	Container/Sample Preservation
Aluminum, Total	7429-90-5	4	1.08	mg/kg	48-151		75-125	20	20		180 days	Metals Only-Glass 60mL/2oz unpreserved
Antimony, Total	7440-36-0	2	0.152	mg/kg	1-208		75-125	20	20		180 days	Metals Only-Glass 60mL/2oz unpreserved
Arsenic, Total	7440-38-2	0.4	0.0832	mg/kg	79-121		75-125	20	20		180 days	Metals Only-Glass 60mL/2oz unpreserved
Barium, Total	7440-39-3	0.4	0.0696	mg/kg	83-117		75-125	20	20		180 days	Metals Only-Glass 60mL/2oz unpreserved
Beryllium, Total	7440-41-7	0.2	0.0132	mg/kg	83-117		75-125	20	20		180 days	Metals Only-Glass 60mL/2oz unpreserved
Cadmium, Total	7440-43-9	0.4	0.0392	mg/kg	83-117		75-125	20	20		180 days	Metals Only-Glass 60mL/2oz unpreserved
Calcium, Total	7440-70-2	4	1.4	mg/kg	81-119		75-125	20	20		180 days	Metals Only-Glass 60mL/2oz unpreserved
Chromium, Total	7440-47-3	0.4	0.0384	mg/kg	80-120		75-125	20	20		180 days	Metals Only-Glass 60mL/2oz unpreserved
Cobalt, Total	7440-48-4	0.8	0.0664	mg/kg	84-115		75-125	20	20		180 days	Metals Only-Glass 60mL/2oz unpreserved
Copper, Total	7440-50-8	0.4	0.1032	mg/kg	81-118		75-125	20	20		180 days	Metals Only-Glass 60mL/2oz unpreserved
Iron, Total	7439-89-6	2	0.3612	mg/kg	45-155		75-125	20	20		180 days	Metals Only-Glass 60mL/2oz unpreserved
Lead, Total	7439-92-1	2	0.1072	mg/kg	81-117		75-125	20	20		180 days	Metals Only-Glass 60mL/2oz unpreserved
Magnesium, Total	7439-95-4	4	0.616	mg/kg	76-124		75-125	20	20		180 days	Metals Only-Glass 60mL/2oz unpreserved
Manganese, Total	7439-96-5	0.4	0.0636	mg/kg	81-117		75-125	20	20		180 days	Metals Only-Glass 60mL/2oz unpreserved
Nickel, Total	7440-02-0	1	0.0968	mg/kg	83-117		75-125	20	20		180 days	Metals Only-Glass 60mL/2oz unpreserved
Potassium, Total	7440-09-7	100	5.76	mg/kg	71-129		75-125	20	20		180 days	Metals Only-Glass 60mL/2oz unpreserved
Selenium, Total	7782-49-2	0.8	0.1032	mg/kg	78-122		75-125	20	20		180 days	Metals Only-Glass 60mL/2oz unpreserved
Silver, Total	7440-22-4	0.4	0.1132	mg/kg	75-124		75-125	20	20		180 days	Metals Only-Glass 60mL/2oz unpreserved
Sodium, Total	7440-23-5	80	1.26	mg/kg	72-127		75-125	20	20		180 days	Metals Only-Glass 60mL/2oz unpreserved
Thallium, Total	7440-28-0	0.8	0.126	mg/kg	80-120		75-125	20	20		180 days	Metals Only-Glass 60mL/2oz unpreserved
Vanadium, Total	7440-62-2	0.4	0.0812	mg/kg	78-122		75-125	20	20		180 days	Metals Only-Glass 60mL/2oz unpreserved
Zinc, Total	7440-66-6	2	0.1172	mg/kg	82-118		75-125	20	20		180 days	Metals Only-Glass 60mL/2oz unpreserved

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METALS by 7471B (SOIL)

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria	Holding Time	Container/Sample Preservation
Mercury, Total	7439-97-6	0.08	0.016896	mg/kg	72-128		80-120	20	20		28 days	Metals Only-Glass 60mL/2oz unpreserved

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WETCHEM (SOIL)

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Method	Holding Time	Container/Sample Preservation
Cyanide, Reactive	57-12-5	10	10	mg/kg	30-125	40		40	40	7.3	14 days	1 - Glass 250ml/8oz unpreserved
Sulfide, Reactive	NONE	10	10	mg/kg	60-125	40		40	40	7.3	14 days	1 - Glass 250ml/8oz unpreserved
Chromium, Hexavalent	18540-29-9	0.8	0.16	mg/kg	80-120	20	75-125	20	20	7196A	30 days	1 - Glass 120ml/4oz unpreserved
Cyanide, Total	57-12-5	1	0.212	mg/kg	80-120	35	75-125	35	35	9010C/9012B	14 days	1 - Glass 250ml/8oz unpreserved
pH	12408-02-5	0		SU	99-101			5	5	9045D	24 hours	1 - Glass 250ml/8oz unpreserved

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TPH by GC-FID Quantitation Only (SOIL)

Holding Time: 14 days
Container/Sample Preservation: 1 - Glass 250ml/8oz unpreserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
TPH	NONE	33350	3835.25	ug/kg	40-140	40	40-140	40	40			
Total Petroleum Hydrocarbons (C9-C44)	NONE	33350	3341.67	ug/kg	40-140	40	40-140	40	40			
o-Terphenyl	*84-15-1*									*40-140*		

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Langan Engineering & Environmental

TPH - Gasoline Range Organics (SOIL)

Holding Time: 14 days
Container/Sample Preservation: 1 - Vial MeOH preserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Gasoline Range Organics	NONE	2500	48.15	ug/kg	80-120	20	80-120	20	20			
1,1,1-Trifluorotoluene	*98-08-8*									*70-130*		
4-Bromofluorobenzene	*460-00-4*									*70-130*		

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TCL Volatiles - EPA 8260C (WATER)

Holding Time: 14 days
Container/Sample Preservation: 3 - Vial HCl preserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Methylene chloride	75-09-2	2.5	0.7	ug/l	70-130	20	70-130	20	20			
1,1-Dichloroethane	75-34-3	2.5	0.7	ug/l	70-130	20	70-130	20	20			
Chloroform	67-66-3	2.5	0.7	ug/l	70-130	20	70-130	20	20			
Carbon tetrachloride	56-23-5	0.5	0.134	ug/l	63-132	20	63-132	20	20			
1,2-Dichloropropane	78-87-5	1	0.137	ug/l	70-130	20	70-130	20	20			
Dibromochloromethane	124-48-1	0.5	0.149	ug/l	63-130	20	63-130	20	20			
1,1,2-Trichloroethane	79-00-5	1.5	0.5	ug/l	70-130	20	70-130	20	20			
Tetrachloroethene	127-18-4	0.5	0.181	ug/l	70-130	20	70-130	20	20			
Chlorobenzene	108-90-7	2.5	0.7	ug/l	75-130	20	75-130	20	20			
Trichlorofluoromethane	75-69-4	2.5	0.7	ug/l	62-150	20	62-150	20	20			
1,2-Dichloroethane	107-06-2	0.5	0.132	ug/l	70-130	20	70-130	20	20			
1,1,1-Trichloroethane	71-55-6	2.5	0.7	ug/l	67-130	20	67-130	20	20			
Bromodichloromethane	75-27-4	0.5	0.192	ug/l	67-130	20	67-130	20	20			
trans-1,3-Dichloropropene	10061-02-6	0.5	0.164	ug/l	70-130	20	70-130	20	20			
cis-1,3-Dichloropropene	10061-01-5	0.5	0.144	ug/l	70-130	20	70-130	20	20			
1,3-Dichloropropene, Total	542-75-6	0.5	0.144	ug/l				20	20			
1,3-Dichloropropene, Total	542-75-6	0.5	0.144	ug/l				20	20			
1,1-Dichloropropene	563-58-6	2.5	0.7	ug/l	70-130	20	70-130	20	20			
Bromoform	75-25-2	2	0.65	ug/l	54-136	20	54-136	20	20			
1,1,2,2-Tetrachloroethane	79-34-5	0.5	0.167	ug/l	67-130	20	67-130	20	20			
Benzene	71-43-2	0.5	0.159	ug/l	70-130	20	70-130	20	20			
Toluene	108-88-3	2.5	0.7	ug/l	70-130	20	70-130	20	20			
Ethylbenzene	100-41-4	2.5	0.7	ug/l	70-130	20	70-130	20	20			
Chloromethane	74-87-3	2.5	0.7	ug/l	64-130	20	64-130	20	20			
Bromomethane	74-83-9	2.5	0.7	ug/l	39-139	20	39-139	20	20			
Vinyl chloride	75-01-4	1	0.0714	ug/l	55-140	20	55-140	20	20			
Chloroethane	75-00-3	2.5	0.7	ug/l	55-138	20	55-138	20	20			
1,1-Dichloroethene	75-35-4	0.5	0.169	ug/l	61-145	20	61-145	20	20			
trans-1,2-Dichloroethene	156-60-5	2.5	0.7	ug/l	70-130	20	70-130	20	20			
Trichloroethene	79-01-6	0.5	0.175	ug/l	70-130	20	70-130	20	20			
1,2-Dichlorobenzene	95-50-1	2.5	0.7	ug/l	70-130	20	70-130	20	20			
1,3-Dichlorobenzene	541-73-1	2.5	0.7	ug/l	70-130	20	70-130	20	20			
1,4-Dichlorobenzene	106-46-7	2.5	0.7	ug/l	70-130	20	70-130	20	20			
Methyl tert butyl ether	1634-04-4	2.5	0.7	ug/l	63-130	20	63-130	20	20			
p/m-Xylene	179601-23-1	2.5	0.7	ug/l	70-130	20	70-130	20	20			
o-Xylene	95-47-6	2.5	0.7	ug/l	70-130	20	70-130	20	20			
Xylene (Total)	1330-20-7	2.5	0.7	ug/l				20	20			
Xylene (Total)	1330-20-7	2.5	0.7	ug/l				20	20			
cis-1,2-Dichloroethene	156-59-2	2.5	0.7	ug/l	70-130	20	70-130	20	20			
1,2-Dichloroethene (total)	540-59-0	2.5	0.7	ug/l				20	20			
1,2-Dichloroethene (total)	540-59-0	2.5	0.7	ug/l				20	20			
Dibromomethane	74-95-3	5	1	ug/l	70-130	20	70-130	20	20			

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TCL Volatiles - EPA 8260C (WATER)

Holding Time: 14 days
Container/Sample Preservation: 3 - Vial HCl preserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
1,2,3-Trichloropropane	96-18-4	2.5	0.7	ug/l	64-130	20	64-130	20	20			
Acrylonitrile	107-13-1	5	1.5	ug/l	70-130	20	70-130	20	20			
Styrene	100-42-5	2.5	0.7	ug/l	70-130	20	70-130	20	20			
Dichlorodifluoromethane	75-71-8	5	1	ug/l	36-147	20	36-147	20	20			
Acetone	67-64-1	5	1.46	ug/l	58-148	20	58-148	20	20			
Carbon disulfide	75-15-0	5	1	ug/l	51-130	20	51-130	20	20			
2-Butanone	78-93-3	5	1.94	ug/l	63-138	20	63-138	20	20			
Vinyl acetate	108-05-4	5	1	ug/l	70-130	20	70-130	20	20			
4-Methyl-2-pentanone	108-10-1	5	1	ug/l	59-130	20	59-130	20	20			
2-Hexanone	591-78-6	5	1	ug/l	57-130	20	57-130	20	20			
Bromochloromethane	74-97-5	2.5	0.7	ug/l	70-130	20	70-130	20	20			
2,2-Dichloropropane	594-20-7	2.5	0.7	ug/l	63-133	20	63-133	20	20			
1,2-Dibromoethane	106-93-4	2	0.65	ug/l	70-130	20	70-130	20	20			
1,3-Dichloropropane	142-28-9	2.5	0.7	ug/l	70-130	20	70-130	20	20			
1,1,1,2-Tetrachloroethane	630-20-6	2.5	0.7	ug/l	64-130	20	64-130	20	20			
Bromobenzene	108-86-1	2.5	0.7	ug/l	70-130	20	70-130	20	20			
n-Butylbenzene	104-51-8	2.5	0.7	ug/l	53-136	20	53-136	20	20			
sec-Butylbenzene	135-98-8	2.5	0.7	ug/l	70-130	20	70-130	20	20			
tert-Butylbenzene	98-06-6	2.5	0.7	ug/l	70-130	20	70-130	20	20			
o-Chlorotoluene	95-49-8	2.5	0.7	ug/l	70-130	20	70-130	20	20			
p-Chlorotoluene	106-43-4	2.5	0.7	ug/l	70-130	20	70-130	20	20			
1,2-Dibromo-3-chloropropane	96-12-8	2.5	0.7	ug/l	41-144	20	41-144	20	20			
Hexachlorobutadiene	87-68-3	2.5	0.7	ug/l	63-130	20	63-130	20	20			
Isopropylbenzene	98-82-8	2.5	0.7	ug/l	70-130	20	70-130	20	20			
p-Isopropyltoluene	99-87-6	2.5	0.7	ug/l	70-130	20	70-130	20	20			
Naphthalene	91-20-3	2.5	0.7	ug/l	70-130	20	70-130	20	20			
n-Propylbenzene	103-65-1	2.5	0.7	ug/l	69-130	20	69-130	20	20			
1,2,3-Trichlorobenzene	87-61-6	2.5	0.7	ug/l	70-130	20	70-130	20	20			
1,2,4-Trichlorobenzene	120-82-1	2.5	0.7	ug/l	70-130	20	70-130	20	20			
1,3,5-Trimethylbenzene	108-67-8	2.5	0.7	ug/l	64-130	20	64-130	20	20			
1,2,4-Trimethylbenzene	95-63-6	2.5	0.7	ug/l	70-130	20	70-130	20	20			
1,4-Dioxane	123-91-1	250	60.8	ug/l	56-162	20	56-162	20	20			
1,4-Diethylbenzene	105-05-5	2	0.7	ug/l	70-130	20	70-130	20	20			
4-Ethyltoluene	622-96-8	2	0.7	ug/l	70-130	20	70-130	20	20			
1,2,4,5-Tetramethylbenzene	95-93-2	2	0.542	ug/l	70-130	20	70-130	20	20			
Ethyl ether	60-29-7	2.5	0.7	ug/l	59-134	20	59-134	20	20			
trans-1,4-Dichloro-2-butene	110-57-6	2.5	0.7	ug/l	70-130	20	70-130	20	20			
1,2-Dichloroethane-d4	*17060-07-0*									*70-130*		
Toluene-d8	*2037-26-5*									*70-130*		
4-Bromofluorobenzene	*460-00-4*									*70-130*		
Dibromofluoromethane	*1868-53-7*									*70-130*		

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NYTCL Semivolatiles - EPA 8270D (WATER)

Holding Time: 7 days
Container/Sample Preservation: 2 - Amber 1000ml unpreserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Acenaphthene	83-32-9	2	0.591	ug/l	37-111	30	37-111	30	30			
1,2,4-Trichlorobenzene	120-82-1	5	0.661	ug/l	39-98	30	39-98	30	30			
Hexachlorobenzene	118-74-1	2	0.579	ug/l	40-140	30	40-140	30	30			
Bis(2-chloroethyl)ether	111-44-4	2	0.669	ug/l	40-140	30	40-140	30	30			
2-Chloronaphthalene	91-58-7	2	0.64	ug/l	40-140	30	40-140	30	30			
1,2-Dichlorobenzene	95-50-1	2	0.732	ug/l	40-140	30	40-140	30	30			
1,3-Dichlorobenzene	541-73-1	2	0.688	ug/l	40-140	30	40-140	30	30			
1,4-Dichlorobenzene	106-46-7	2	0.708	ug/l	36-97	30	36-97	30	30			
3,3'-Dichlorobenzidine	91-94-1	5	1.39	ug/l	40-140	30	40-140	30	30			
2,4-Dinitrotoluene	121-14-2	5	0.845	ug/l	48-143	30	48-143	30	30			
2,6-Dinitrotoluene	606-20-2	5	1.12	ug/l	40-140	30	40-140	30	30			
Fluoranthene	206-44-0	2	0.568	ug/l	40-140	30	40-140	30	30			
4-Chlorophenyl phenyl ether	7005-72-3	2	0.625	ug/l	40-140	30	40-140	30	30			
4-Bromophenyl phenyl ether	101-55-3	2	0.731	ug/l	40-140	30	40-140	30	30			
Bis(2-chloroisopropyl)ether	108-60-1	2	0.696	ug/l	40-140	30	40-140	30	30			
Bis(2-chloroethoxy)methane	111-91-1	5	0.626	ug/l	40-140	30	40-140	30	30			
Hexachlorobutadiene	87-68-3	2	0.717	ug/l	40-140	30	40-140	30	30			
Hexachlorocyclopentadiene	77-47-4	20	7.84	ug/l	40-140	30	40-140	30	30			
Hexachloroethane	67-72-1	2	0.682	ug/l	40-140	30	40-140	30	30			
Isophorone	78-59-1	5	0.601	ug/l	40-140	30	40-140	30	30			
Naphthalene	91-20-3	2	0.68	ug/l	40-140	30	40-140	30	30			
Nitrobenzene	98-95-3	2	0.753	ug/l	40-140	30	40-140	30	30			
NitrosoDiPhenylAmine(NDPA)/DPA	86-30-6	2	0.644	ug/l	40-140	30	40-140	30	30			
n-Nitrosodi-n-propylamine	621-64-7	5	0.7	ug/l	29-132	30	29-132	30	30			
Bis(2-Ethylhexyl)phthalate	117-81-7	3	0.91	ug/l	40-140	30	40-140	30	30			
Butyl benzyl phthalate	85-68-7	5	1.26	ug/l	40-140	30	40-140	30	30			
Di-n-butylphthalate	84-74-2	5	0.689	ug/l	40-140	30	40-140	30	30			
Di-n-octylphthalate	117-84-0	5	1.14	ug/l	40-140	30	40-140	30	30			
Diethyl phthalate	84-66-2	5	0.628	ug/l	40-140	30	40-140	30	30			
Dimethyl phthalate	131-11-3	5	0.65	ug/l	40-140	30	40-140	30	30			
Benzo(a)anthracene	56-55-3	2	0.61	ug/l	40-140	30	40-140	30	30			
Benzo(a)pyrene	50-32-8	2	0.539	ug/l	40-140	30	40-140	30	30			
Benzo(b)fluoranthene	205-99-2	2	0.635	ug/l	40-140	30	40-140	30	30			
Benzo(k)fluoranthene	207-08-9	2	0.597	ug/l	40-140	30	40-140	30	30			
Chrysene	218-01-9	2	0.543	ug/l	40-140	30	40-140	30	30			
Acenaphthylene	208-96-8	2	0.658	ug/l	45-123	30	45-123	30	30			
Anthracene	120-12-7	2	0.645	ug/l	40-140	30	40-140	30	30			
Benzo(ghi)perylene	191-24-2	2	0.611	ug/l	40-140	30	40-140	30	30			
Fluorene	86-73-7	2	0.619	ug/l	40-140	30	40-140	30	30			
Phenanthrene	85-01-8	2	0.613	ug/l	40-140	30	40-140	30	30			
Dibenzo(a,h)anthracene	53-70-3	2	0.548	ug/l	40-140	30	40-140	30	30			
Indeno(1,2,3-cd)Pyrene	193-39-5	2	0.707	ug/l	40-140	30	40-140	30	30			

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NYTCL Semivolatiles - EPA 8270D (WATER)

Holding Time: 7 days
Container/Sample Preservation: 2 - Amber 1000ml unpreserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Pyrene	129-00-0	2	0.569	ug/l	26-127	30	26-127	30	30			
Biphenyl	92-52-4	2	0.757	ug/l	40-140	30	40-140	30	30			
4-Chloroaniline	106-47-8	5	0.632	ug/l	40-140	30	40-140	30	30			
2-Nitroaniline	88-74-4	5	1.14	ug/l	52-143	30	52-143	30	30			
3-Nitroaniline	99-09-2	5	1.22	ug/l	25-145	30	25-145	30	30			
4-Nitroaniline	100-01-6	5	1.3	ug/l	51-143	30	51-143	30	30			
Dibenzofuran	132-64-9	2	0.656	ug/l	40-140	30	40-140	30	30			
2-Methylnaphthalene	91-57-6	2	0.72	ug/l	40-140	30	40-140	30	30			
Acetophenone	98-86-2	5	0.847	ug/l	39-129	30	39-129	30	30			
2,4,6-Trichlorophenol	88-06-2	5	0.681	ug/l	30-130	30	30-130	30	30			
P-Chloro-M-Cresol	59-50-7	2	0.617	ug/l	23-97	30	23-97	30	30			
2-Chlorophenol	95-57-8	2	0.631	ug/l	27-123	30	27-123	30	30			
2,4-Dichlorophenol	120-83-2	5	0.769	ug/l	30-130	30	30-130	30	30			
2,4-Dimethylphenol	105-67-9	5	1.64	ug/l	30-130	30	30-130	30	30			
2-Nitrophenol	88-75-5	10	1.52	ug/l	30-130	30	30-130	30	30			
4-Nitrophenol	100-02-7	10	1.77	ug/l	10-80	30	10-80	30	30			
2,4-Dinitrophenol	51-28-5	20	5.47	ug/l	20-130	30	20-130	30	30			
4,6-Dinitro-o-cresol	534-52-1	10	2.1	ug/l	20-164	30	20-164	30	30			
Pentachlorophenol	87-86-5	10	3.43	ug/l	9-103	30	9-103	30	30			
Phenol	108-95-2	5	1.89	ug/l	12-110	30	12-110	30	30			
2-Methylphenol	95-48-7	5	1.02	ug/l	30-130	30	30-130	30	30			
3-Methylphenol/4-Methylphenol	106-44-5	5	1.11	ug/l	30-130	30	30-130	30	30			
2,4,5-Trichlorophenol	95-95-4	5	0.715	ug/l	30-130	30	30-130	30	30			
Benzoic Acid	65-85-0	50	12.9	ug/l	10-164	30	10-164	30	30			
Benzyl Alcohol	100-51-6	2	0.725	ug/l	26-116	30	26-116	30	30			
Carbazole	86-74-8	2	0.627	ug/l	55-144	30	55-144	30	30			
2-Fluorophenol	*367-12-4*									*21-120*		
Phenol-d6	*13127-88-3*									*10-120*		
Nitrobenzene-d5	*4165-60-0*									*23-120*		
2-Fluorobiphenyl	*321-60-8*									*15-120*		
2,4,6-Tribromophenol	*118-79-6*									*10-120*		
4-Terphenyl-d14	*1718-51-0*									*41-149*		

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NYTCL Semivolatiles -EPA 8270D-SIM (WATER)

Holding Time: 7 days
Container/Sample Preservation: 2 - Amber 1000ml unpreserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Acenaphthene	83-32-9	0.1	0.035	ug/l	40-140	40	40-140	40	40			
2-Chloronaphthalene	91-58-7	0.2	0.035	ug/l	40-140	40	40-140	40	40			
Fluoranthene	206-44-0	0.1	0.038	ug/l	40-140	40	40-140	40	40			
Hexachlorobutadiene	87-68-3	0.5	0.036	ug/l	40-140	40	40-140	40	40			
Naphthalene	91-20-3	0.1	0.043	ug/l	40-140	40	40-140	40	40			
Benzo(a)anthracene	56-55-3	0.1	0.018	ug/l	40-140	40	40-140	40	40			
Benzo(a)pyrene	50-32-8	0.1	0.039	ug/l	40-140	40	40-140	40	40			
Benzo(b)fluoranthene	205-99-2	0.1	0.016	ug/l	40-140	40	40-140	40	40			
Benzo(k)fluoranthene	207-08-9	0.1	0.042	ug/l	40-140	40	40-140	40	40			
Chrysene	218-01-9	0.1	0.038	ug/l	40-140	40	40-140	40	40			
Acenaphthylene	208-96-8	0.1	0.035	ug/l	40-140	40	40-140	40	40			
Anthracene	120-12-7	0.1	0.035	ug/l	40-140	40	40-140	40	40			
Benzo(ghi)perylene	191-24-2	0.1	0.042	ug/l	40-140	40	40-140	40	40			
Fluorene	86-73-7	0.1	0.037	ug/l	40-140	40	40-140	40	40			
Phenanthrene	85-01-8	0.1	0.015	ug/l	40-140	40	40-140	40	40			
Dibenzo(a,h)anthracene	53-70-3	0.1	0.039	ug/l	40-140	40	40-140	40	40			
Indeno(1,2,3-cd)Pyrene	193-39-5	0.1	0.04	ug/l	40-140	40	40-140	40	40			
Pyrene	129-00-0	0.1	0.04	ug/l	40-140	40	40-140	40	40			
2-Methylnaphthalene	91-57-6	0.1	0.045	ug/l	40-140	40	40-140	40	40			
Pentachlorophenol	87-86-5	0.8	0.22	ug/l	40-140	40	40-140	40	40			
Hexachlorobenzene	118-74-1	0.8	0.032	ug/l	40-140	40	40-140	40	40			
Hexachloroethane	67-72-1	0.8	0.03	ug/l	40-140	40	40-140	40	40			
2-Fluorophenol	*367-12-4*									*21-120*		
Phenol-d6	*13127-88-3*									*10-120*		
Nitrobenzene-d5	*4165-60-0*									*23-120*		
2-Fluorobiphenyl	*321-60-8*									*15-120*		
2,4,6-Tribromophenol	*118-79-6*									*10-120*		
4-Terphenyl-d14	*1718-51-0*									*41-149*		

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TCL Pesticides - EPA 8081B (WATER)

Holding Time: 7 days
Container/Sample Preservation: 2 - Amber 120ml unpreserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Delta-BHC	319-86-8	0.02	0.00467	ug/l	30-150	20	30-150	30	30			
Lindane	58-89-9	0.02	0.00434	ug/l	30-150	20	30-150	30	30			
Alpha-BHC	319-84-6	0.02	0.00439	ug/l	30-150	20	30-150	30	30			
Beta-BHC	319-85-7	0.02	0.0056	ug/l	30-150	20	30-150	30	30			
Heptachlor	76-44-8	0.02	0.0031	ug/l	30-150	20	30-150	30	30			
Aldrin	309-00-2	0.02	0.00216	ug/l	30-150	20	30-150	30	30			
Heptachlor epoxide	1024-57-3	0.02	0.00415	ug/l	30-150	20	30-150	30	30			
Endrin	72-20-8	0.04	0.00429	ug/l	30-150	20	30-150	30	30			
Endrin aldehyde	7421-93-4	0.04	0.0081	ug/l	30-150	20	30-150	30	30			
Endrin ketone	53494-70-5	0.04	0.00477	ug/l	30-150	20	30-150	30	30			
Dieldrin	60-57-1	0.04	0.00429	ug/l	30-150	20	30-150	30	30			
4,4'-DDE	72-55-9	0.04	0.00381	ug/l	30-150	20	30-150	30	30			
4,4'-DDD	72-54-8	0.04	0.00464	ug/l	30-150	20	30-150	30	30			
4,4'-DDT	50-29-3	0.04	0.00432	ug/l	30-150	20	30-150	30	30			
Endosulfan I	959-98-8	0.02	0.00345	ug/l	30-150	20	30-150	30	30			
Endosulfan II	33213-65-9	0.04	0.00519	ug/l	30-150	20	30-150	30	30			
Endosulfan sulfate	1031-07-8	0.04	0.00481	ug/l	30-150	20	30-150	30	30			
Methoxychlor	72-43-5	0.2	0.00684	ug/l	30-150	20	30-150	30	30			
Toxaphene	8001-35-2	0.2	0.0627	ug/l	30-150	20	30-150	30	30			
cis-Chlordane	5103-71-9	0.02	0.00666	ug/l	30-150	20	30-150	30	30			
trans-Chlordane	5103-74-2	0.02	0.00627	ug/l	30-150	20	30-150	30	30			
Chlordane	57-74-9	0.2	0.0463	ug/l	30-150	20	30-150	30	30			
2,4,5,6-Tetrachloro-m-xylene	*877-09-8*									*30-150*		
Decachlorobiphenyl	*2051-24-3*									*30-150*		

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Herbicides -EPA 8151A (WATER)

Holding Time: 7 days
Container/Sample Preservation: 2 - Amber 1000ml unpreserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria
2,4-D	94-75-7	10	0.498	ug/l	30-150	25	30-150	25	25	
2,4,5-T	93-76-5	2	0.531	ug/l	30-150	25	30-150	25	25	
2,4,5-TP (Silvex)	93-72-1	2	0.539	ug/l	30-150	25	30-150	25	25	
DCAA	*19719-28-9*									*30-150*

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TCL PCBs - EPA 8082A (WATER)

Holding Time: 7 days
Container/Sample Preservation: 2 - Amber 1000ml unpreserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Aroclor 1016	12674-11-2	0.083	0.019588	ug/l	40-140	50	40-140	50	50			
Aroclor 1221	11104-28-2	0.083	0.031872	ug/l	40-140	50	40-140	50	50			
Aroclor 1232	11141-16-5	0.083	0.027058	ug/l	40-140	50	40-140	50	50			
Aroclor 1242	53469-21-9	0.083	0.029548	ug/l	40-140	50	40-140	50	50			
Aroclor 1248	12672-29-6	0.083	0.022576	ug/l	40-140	50	40-140	50	50			
Aroclor 1254	11097-69-1	0.083	0.034611	ug/l	40-140	50	40-140	50	50			
Aroclor 1260	11096-82-5	0.083	0.01992	ug/l	40-140	50	40-140	50	50			
Aroclor 1262	37324-23-5	0.083	0.017098	ug/l	40-140	50	40-140	50	50			
Aroclor 1268	11100-14-4	0.083	0.027058	ug/l	40-140	50	40-140	50	50			
PCBs, Total	1336-36-3	0.083	0.017098	ug/l				50	50			
PCBs, Total	1336-36-3	0.083	0.017098	ug/l				50	50			
2,4,5,6-Tetrachloro-m-xylene	*877-09-8*									*30-150*		
Decachlorobiphenyl	*2051-24-3*									*30-150*		

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METALS by 6020B (WATER)

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria	Holding Time	Container/Sample Preservation
Aluminum, Total	7429-90-5	0.01	0.00327	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Antimony, Total	7440-36-0	0.004	0.000429	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Arsenic, Total	7440-38-2	0.0005	0.000165	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Barium, Total	7440-39-3	0.0005	0.000173	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Beryllium, Total	7440-41-7	0.0005	0.000107	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Cadmium, Total	7440-43-9	0.0002	0.0000599	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Calcium, Total	7440-70-2	0.1	0.0394	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Chromium, Total	7440-47-3	0.001	0.000178	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Cobalt, Total	7440-48-4	0.0005	0.000163	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Copper, Total	7440-50-8	0.001	0.000384	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Iron, Total	7439-89-6	0.05	0.0191	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Lead, Total	7439-92-1	0.001	0.000343	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Magnesium, Total	7439-95-4	0.07	0.0242	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Manganese, Total	7439-96-5	0.001	0.00044	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Nickel, Total	7440-02-0	0.002	0.000556	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Potassium, Total	7440-09-7	0.1	0.0309	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Selenium, Total	7782-49-2	0.005	0.00173	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Silver, Total	7440-22-4	0.0004	0.000163	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Sodium, Total	7440-23-5	0.1	0.0293	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Thallium, Total	7440-28-0	0.0005	0.000143	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Vanadium, Total	7440-62-2	0.005	0.00157	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Zinc, Total	7440-66-6	0.01	0.00341	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved

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METALS by 7470A (WATER)

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria	Holding Time	Container/Sample Preservation
Mercury, Total	7439-97-6	0.0002	0.000066	mg/l	80-120		75-125	20	20		28 days	1 - Plastic 500ml HNO3 preserved

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WETCHEM (WATER)

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Method	Holding Time	Container/Sample Preservation
Chromium, Hexavalent	18540-29-9	0.01	0.003	mg/l	85-115	20	85-115	20	20	7196A	24 hours	1 - Plastic 500ml unpreserved
Cyanide, Total	57-12-5	0.005	0.0018	mg/l	85-115	20	80-120	20	20	9010C/9012B	14 days	1 - Plastic 250ml NaOH preserved

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TPH by GC-FID Quantitation Only (WATER)

Holding Time: 7 days
Container/Sample Preservation: 2 - Amber 1000ml unpreserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
TPH	NONE	200	42	ug/l	40-140	40	40-140	40	40			
Total Petroleum Hydrocarbons (C9-C44)	NONE	500	43.1	ug/l	40-140	40	40-140	40	40			
o-Terphenyl	*84-15-1*									*40-140*		

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TPH - Gasoline Range Organics (WATER)

Holding Time: 14 days
Container/Sample Preservation: 3 - Vial HCl preserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Gasoline Range Organics	NONE	50	3.048	ug/l	80-120	20	80-120	20	20			
1,1,1-Trifluorotoluene	*98-08-8*									*70-130*		
4-Bromofluorobenzene	*460-00-4*									*70-130*		

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1,4 Dioxane via EPA 8270D-SIM (WATER)

Holding Time: 7 days
Container/Sample Preservation: 2 - Amber 500ml unpreserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
1,4-Dioxane	123-91-1	150	75	ng/l	40-140	30	40-140	30	30			
1,4-Dioxane-d8	*17647-74-4*									*15-110*		
1,4-Dioxane-d8 (IS)	17647-74-4			ng/l								

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NY PFAAs via EPA 537(M)-Isotope Dilution (WATER)

Holding Time: 14 days
Container/Sample Preservation: 1 - 3 Plastic Trizma/1 Plastic/1 H20+Trizma

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Perfluorobutanoic Acid (PFBA)	375-22-4	2	0.1312	ng/l	50-150	30	50-150	30	30			
Perfluoropentanoic Acid (PFPeA)	2706-90-3	2	0.0856	ng/l	50-150	30	50-150	30	30			
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	2	0.11	ng/l	50-150	30	50-150	30	30			
Perfluorohexanoic Acid (PFHxA)	307-24-4	2	0.1264	ng/l	50-150	30	50-150	30	30			
Perfluoroheptanoic Acid (PFHpA)	375-85-9	2	0.0924	ng/l	50-150	30	50-150	30	30			
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	2	0.1076	ng/l	50-150	30	50-150	30	30			
Perfluorooctanoic Acid (PFOA)	335-67-1	2	0.0504	ng/l	50-150	30	50-150	30	30			
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	27619-97-2	2	0.194	ng/l	50-150	30	50-150	30	30			
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	2	0.1552	ng/l	50-150	30	50-150	30	30			
Perfluorononanoic Acid (PFNA)	375-95-1	2	0.1008	ng/l	50-150	30	50-150	30	30			
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	2	0.1116	ng/l	50-150	30	50-150	30	30			
Perfluorodecanoic Acid (PFDA)	335-76-2	2	0.1904	ng/l	50-150	30	50-150	30	30			
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	39108-34-4	2	0.2908	ng/l	50-150	30	50-150	30	30			
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSA	2355-31-9	2	0.2504	ng/l	50-150	30	50-150	30	30			
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	2	0.1912	ng/l	50-150	30	50-150	30	30			
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	2	0.2224	ng/l	50-150	30	50-150	30	30			
Perfluorooctanesulfonamide (FOSA)	754-91-6	2	0.2268	ng/l	50-150	30	50-150	30	30			
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	2	0.3728	ng/l	50-150	30	50-150	30	30			
Perfluorododecanoic Acid (PFDoA)	307-55-1	2	0.0916	ng/l	50-150	30	50-150	30	30			
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	2	0.0904	ng/l	50-150	30	50-150	30	30			
Perfluorotetradecanoic Acid (PFTA)	376-06-7	2	0.072	ng/l	50-150	30	50-150	30	30			
Perfluoro[13C4]Butanoic Acid (MPFBA)	*NONE*									*50-150*		
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	*NONE*									*50-150*		
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	*NONE*									*50-150*		
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	*NONE*									*50-150*		
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	*NONE*									*50-150*		
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	*NONE*									*50-150*		
Perfluoro[13C8]Octanoic Acid (M8PFOA)	*NONE*									*50-150*		
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-	*NONE*									*50-150*		
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	*NONE*									*50-150*		
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	*NONE*									*50-150*		
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	*NONE*									*50-150*		
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-	*NONE*									*50-150*		
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid	*NONE*									*50-150*		
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	*NONE*									*50-150*		
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	*NONE*									*50-150*		
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (	*NONE*									*50-150*		
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	*NONE*									*50-150*		
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	*NONE*									*50-150*		

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Volatile Organics in Air: TO-15 (SOIL_VAPOR)

Holding Time: 30 days
Container/Sample Preservation: 1 - Canister - 2.7 Liter

Analyte	CAS #	RL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
1,1,1-Trichloroethane	71-55-6	1.09	$\mu g/m^3$	70-130			25	25			
1,1,2,2-Tetrachloroethane	79-34-5	1.37	$\mu g/m^3$	70-130			25	25			
1,1,2-Trichloroethane	79-00-5	1.09	$\mu g/m^3$	70-130			25	25			
1,1-Dichloroethane	75-34-3	0.809	$\mu g/m^3$	70-130			25	25			
1,1-Dichloroethene	75-35-4	0.793	$\mu g/m^3$	70-130			25	25			
1,2,3-Trimethylbenzene	526-73-8		$\mu g/m^3$	70-130			25	25			
1,2,4-Trichlorobenzene	120-82-1	1.48	$\mu g/m^3$	70-130			25	25			
1,2,4-Trimethylbenzene	95-63-6	0.983	$\mu g/m^3$	70-130			25	25			
1,2,4,5-Tetramethylbenzene	95-93-2		$\mu g/m^3$	70-130			25	25			
1,2-Dibromoethane	106-93-4	1.54	$\mu g/m^3$	70-130			25	25			
1,2-Dichlorobenzene	95-50-1	1.2	$\mu g/m^3$	70-130			25	25			
1,2-Dichloroethane	107-06-2	0.809	$\mu g/m^3$	70-130			25	25			
1,2-Dichloropropane	78-87-5	0.924	$\mu g/m^3$	70-130			25	25			
1,3,5-Trimethylbenzene	108-67-8	0.983	$\mu g/m^3$	70-130			25	25			
1,3-Butadiene	106-99-0	0.442	$\mu g/m^3$	70-130			25	25			
1,3-Dichlorobenzene	541-73-1	1.2	$\mu g/m^3$	70-130			25	25			
1,4-Dichlorobenzene	106-46-7	1.2	$\mu g/m^3$	70-130			25	25			
1,4-Dioxane	123-91-1	0.721	$\mu g/m^3$	70-130			25	25			
2,2,4-Trimethylpentane	540-84-1	0.934	$\mu g/m^3$	70-130			25	25			
2-Butanone	78-93-3	1.47	$\mu g/m^3$	70-130			25	25			
2-Hexanone	591-78-6	0.82	$\mu g/m^3$	70-130			25	25			
2-Methylthiophene	554-14-3		$\mu g/m^3$	70-130			25	25			
3-Methylthiophene	616-44-4		$\mu g/m^3$	70-130			25	25			
3-Chloropropene	107-05-1	0.626	$\mu g/m^3$	70-130			25	25			
2-Ethylthiophene	872-55-9		$\mu g/m^3$	70-130			25	25			
4-Ethyltoluene	622-96-8	0.983	$\mu g/m^3$	70-130			25	25			
Acetone	67-64-1	2.38	$\mu g/m^3$	70-130			25	25			
Benzene	71-43-2	0.639	$\mu g/m^3$	70-130			25	25			
Benzyl chloride	100-44-7	1.04	$\mu g/m^3$	70-130			25	25			
Benzothiophene	95-15-8		$\mu g/m^3$	70-130			25	25			
Bromodichloromethane	75-27-4	1.34	$\mu g/m^3$	70-130			25	25			
Bromoform	75-25-2	2.07	$\mu g/m^3$	70-130			25	25			
Bromomethane	74-83-9	0.777	$\mu g/m^3$	70-130			25	25			
Carbon disulfide	75-15-0	0.623	$\mu g/m^3$	70-130			25	25			
Carbon tetrachloride	56-23-5	1.26	$\mu g/m^3$	70-130			25	25			
Chlorobenzene	108-90-7	0.921	$\mu g/m^3$	70-130			25	25			
Chloroethane	75-00-3	0.528	$\mu g/m^3$	70-130			25	25			
Chloroform	67-66-3	0.977	$\mu g/m^3$	70-130			25	25			
Chloromethane	74-87-3	0.413	$\mu g/m^3$	70-130			25	25			
cis-1,2-Dichloroethene	156-59-2	0.793	$\mu g/m^3$	70-130			25	25			
cis-1,3-Dichloropropene	10061-01-5	0.908	$\mu g/m^3$	70-130			25	25			
Cyclohexane	110-82-7	0.688	$\mu g/m^3$	70-130			25	25			

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Langan Engineering & Environmental

Volatile Organics in Air: TO-15 (SOIL_VAPOR)

Holding Time: 30 days
Container/Sample Preservation: 1 - Canister - 2.7 Liter

Analyte	CAS #	RL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Dibromochloromethane	124-48-1	1.7	$\mu g/m^3$	70-130			25	25			
Dichlorodifluoromethane	75-71-8	0.989	$\mu g/m^3$	70-130			25	25			
Ethyl Alcohol	GCDAI06	9.42	$\mu g/m^3$	70-130			25	25			
Ethyl Acetate	141-78-6	1.8	$\mu g/m^3$	70-130			25	25			
Ethylbenzene	100-41-4	0.869	$\mu g/m^3$	70-130			25	25			
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	1.53	$\mu g/m^3$	70-130			25	25			
1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	1.4	$\mu g/m^3$	70-130			25	25			
Hexachlorobutadiene	87-68-3	2.13	$\mu g/m^3$	70-130			25	25			
iso-Propyl Alcohol	67-63-0	1.23	$\mu g/m^3$	70-130			25	25			
Methylene chloride	75-09-2	1.74	$\mu g/m^3$	70-130			25	25			
4-Methyl-2-pentanone	108-10-1	2.05	$\mu g/m^3$	70-130			25	25			
Methyl tert butyl ether	1634-04-4	0.721	$\mu g/m^3$	70-130			25	25			
Methyl Methacrylate	80-62-6	2.05	$\mu g/m^3$	70-130			25	25			
p/m-Xylene	179601-23-1	1.74	$\mu g/m^3$	70-130			25	25			
o-Xylene	95-47-6	0.869	$\mu g/m^3$	70-130			25	25			
Xylene (Total)	1330-20-7		$\mu g/m^3$	70-130			25	25			
Heptane	142-82-5	0.82	$\mu g/m^3$	70-130			25	25			
n-Heptane	142-82-5		$\mu g/m^3$	70-130			25	25			
n-Hexane	110-54-3	0.705	$\mu g/m^3$	70-130			25	25			
Propylene	115-07-1	0.861	$\mu g/m^3$	70-130			25	25			
Styrene	100-42-5	0.852	$\mu g/m^3$	70-130			25	25			
Tetrachloroethene	127-18-4	1.36	$\mu g/m^3$	70-130			25	25			
Thiophene	110-02-1		$\mu g/m^3$	70-130			25	25			
Tetrahydrofuran	109-99-9	1.47	$\mu g/m^3$	70-130			25	25			
Toluene	108-88-3	0.754	$\mu g/m^3$	70-130			25	25			
trans-1,2-Dichloroethene	156-60-5	0.793	$\mu g/m^3$	70-130			25	25			
1,2-Dichloroethene (total)	540-59-0		$\mu g/m^3$	70-130			25	25			
trans-1,3-Dichloropropene	10061-02-6	0.908	$\mu g/m^3$	70-130			25	25			
1,3-Dichloropropene, Total	542-75-6		$\mu g/m^3$	70-130			25	25			
Trichloroethene	79-01-6	1.07	$\mu g/m^3$	70-130			25	25			
Trichlorofluoromethane	75-69-4	1.12	$\mu g/m^3$	70-130			25	25			
Vinyl acetate	108-05-4	3.52	$\mu g/m^3$	70-130			25	25			
Vinyl bromide	593-60-2	0.874	$\mu g/m^3$	70-130			25	25			
Vinyl chloride	75-01-4	0.511	$\mu g/m^3$	70-130			25	25			
Naphthalene	91-20-3	1.05	$\mu g/m^3$	70-130			25	25			
Total HC As Hexane	NONE		$\mu g/m^3$	70-130			25	25			
Total VOCs As Toluene	NONE		$\mu g/m^3$	70-130			25	25			
Propane	74-98-6	0.902	$\mu g/m^3$	70-130			25	25			
Acrylonitrile	107-13-1	1.09	$\mu g/m^3$	70-130			25	25			
Acrolein	107-02-8	1.15	$\mu g/m^3$	70-130			25	25			
1,1,1,2-Tetrachloroethane	630-20-6	1.37	$\mu g/m^3$	70-130			25	25			
Isopropylbenzene	98-82-8	0.983	$\mu g/m^3$	70-130			25	25			

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Langan Engineering & Environmental

Volatile Organics in Air: TO-15 (SOIL_VAPOR)

Holding Time: 30 days
Container/Sample Preservation: 1 - Canister - 2.7 Liter

Analyte	CAS #	RL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
1,2,3-Trichloropropane	96-18-4	1.21	$\mu g/m^3$	70-130			25	25			
Acetonitrile	75-05-8	0.336	$\mu g/m^3$	70-130			25	25			
Bromobenzene	108-86-1	0.793	$\mu g/m^3$	70-130			25	25			
Chlorodifluoromethane	75-45-6	0.707	$\mu g/m^3$	70-130			25	25			
Dichlorofluoromethane	75-43-4	0.842	$\mu g/m^3$	70-130			25	25			
Dibromomethane	74-95-3	1.42	$\mu g/m^3$	70-130			25	25			
Pentane	109-66-0	0.59	$\mu g/m^3$	70-130			25	25			
Octane	111-65-9	0.34	$\mu g/m^3$	70-130			25	25			
Tertiary-Amyl Methyl Ether	994-05-8	0.836	$\mu g/m^3$	70-130			25	25			
o-Chlorotoluene	95-49-8	1.04	$\mu g/m^3$	70-130			25	25			
p-Chlorotoluene	106-43-4	1.04	$\mu g/m^3$	70-130			25	25			
2,2-Dichloropropane	594-20-7	0.924	$\mu g/m^3$	70-130			25	25			
1,1-Dichloropropene	563-58-6	0.908	$\mu g/m^3$	70-130			25	25			
Isopropyl Ether	108-20-3	0.836	$\mu g/m^3$	70-130			25	25			
Ethyl-Tert-Butyl-Ether	637-92-3	0.836	$\mu g/m^3$	70-130			25	25			
1,2,3-Trichlorobenzene	87-61-6	1.48	$\mu g/m^3$	70-130			25	25			
Ethyl ether	60-29-7	0.606	$\mu g/m^3$	70-130			25	25			
n-Butylbenzene	104-51-8	1.1	$\mu g/m^3$	70-130			25	25			
sec-Butylbenzene	135-98-8	1.1	$\mu g/m^3$	70-130			25	25			
tert-Butylbenzene	98-06-6	1.1	$\mu g/m^3$	70-130			25	25			
1,2-Dibromo-3-chloropropane	96-12-8	1.93	$\mu g/m^3$	70-130			25	25			
p-Isopropyltoluene	99-87-6	1.1	$\mu g/m^3$	70-130			25	25			
n-Propylbenzene	103-65-1	0.983	$\mu g/m^3$	70-130			25	25			
1,3-Dichloropropane	142-28-9	0.924	$\mu g/m^3$	70-130			25	25			
Methanol	67-56-1	6.55	$\mu g/m^3$	70-130			25	25			
Acetaldehyde	75-07-0		$\mu g/m^3$	70-130			25	25			
Butane	106-97-8	0.475	$\mu g/m^3$	70-130			25	25			
Nonane (C9)	111-84-2	1.05	$\mu g/m^3$	70-130			25	25			
Decane (C10)	124-18-5	1.16	$\mu g/m^3$	70-130			25	25			
Undecane	1120-21-4	1.28	$\mu g/m^3$	70-130			25	25			
Indane	496-11-7		$\mu g/m^3$	70-130			25	25			
Indene	95-13-6		$\mu g/m^3$	70-130			25	25			
1-Methylnaphthalene	90-12-0		$\mu g/m^3$	70-130			25	25			
Dodecane (C12)	112-40-3	1.39	$\mu g/m^3$	70-130			25	25			
Butyl Acetate	123-86-4	2.38	$\mu g/m^3$	70-130			25	25			
tert-Butyl Alcohol	75-65-0	1.52	$\mu g/m^3$	70-130			25	25			
2-Methylnaphthalene	91-57-6		$\mu g/m^3$	70-130			25	25			
1,2-Dichloroethane-d4	*17060-07-0*								*70-130*		
Toluene-d8	*2037-26-5*								*70-130*		
Bromofluorobenzene	*460-00-4*								*70-130*		

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Langan Engineering & Environmental

Volatile Organics in Air by TO-15 SIM (SOIL_VAPOR)

Holding Time: 30 days
Container/Sample Preservation: 1 - Canister - 2.7 Liter

Analyte	CAS #	RL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
1,1,1-Trichloroethane	71-55-6	0.109	$\mu g/m^3$	70-130	25		25	25			
1,1,1,2-Tetrachloroethane	630-20-6	0.137	$\mu g/m^3$	70-130	25		25	25			
1,1,2,2-Tetrachloroethane	79-34-5	0.137	$\mu g/m^3$	70-130	25		25	25			
1,1,2-Trichloroethane	79-00-5	0.109	$\mu g/m^3$	70-130	25		25	25			
1,1-Dichloroethane	75-34-3	0.081	$\mu g/m^3$	70-130	25		25	25			
1,1-Dichloroethene	75-35-4	0.079	$\mu g/m^3$	70-130	25		25	25			
1,2,4-Trimethylbenzene	95-63-6	0.098	$\mu g/m^3$	70-130	25		25	25			
1,2-Dibromoethane	106-93-4	0.154	$\mu g/m^3$	70-130	25		25	25			
1,2-Dichlorobenzene	95-50-1	0.12	$\mu g/m^3$	70-130	25		25	25			
1,2-Dichloroethane	107-06-2	0.081	$\mu g/m^3$	70-130	25		25	25			
1,2-Dichloropropane	78-87-5	0.092	$\mu g/m^3$	70-130	25		25	25			
1,3,5-Trimethylbenzene	108-67-8	0.098	$\mu g/m^3$	70-130	25		25	25			
1,3-Butadiene	106-99-0	0.044	$\mu g/m^3$	70-130	25		25	25			
1,3-Dichlorobenzene	541-73-1	0.12	$\mu g/m^3$	70-130	25		25	25			
1,4-Dichlorobenzene	106-46-7	0.12	$\mu g/m^3$	70-130	25		25	25			
1,4-Dioxane	123-91-1	0.36	$\mu g/m^3$	70-130	25		25	25			
2,2,4-Trimethylpentane	540-84-1		$\mu g/m^3$	70-130	25		25	25			
2-Hexanone	591-78-6		$\mu g/m^3$	70-130	25		25	25			
3-Chloropropene	107-05-1		$\mu g/m^3$	70-130	25		25	25			
4-Ethyltoluene	622-96-8	0.098	$\mu g/m^3$	70-130	25		25	25			
Benzene	71-43-2	0.319	$\mu g/m^3$	70-130	25		25	25			
Benzyl chloride	100-44-7	1.04	$\mu g/m^3$	70-130	25		25	25			
Bromodichloromethane	75-27-4	0.134	$\mu g/m^3$	70-130	25		25	25			
Bromoform	75-25-2	0.207	$\mu g/m^3$	70-130	25		25	25			
Bromomethane	74-83-9	0.078	$\mu g/m^3$	70-130	25		25	25			
Carbon disulfide	75-15-0		$\mu g/m^3$	70-130	25		25	25			
Carbon tetrachloride	56-23-5	0.126	$\mu g/m^3$	70-130	25		25	25			
Chlorobenzene	108-90-7	0.461	$\mu g/m^3$	70-130	25		25	25			
Chloroethane	75-00-3	0.264	$\mu g/m^3$	70-130	25		25	25			
Chloroform	67-66-3	0.098	$\mu g/m^3$	70-130	25		25	25			
Chloromethane	74-87-3	0.413	$\mu g/m^3$	70-130	25		25	25			
cis-1,2-Dichloroethene	156-59-2	0.079	$\mu g/m^3$	70-130	25		25	25			
trans-1,2-Dichloroethene	156-60-5	0.079	$\mu g/m^3$	70-130	25		25	25			
1,2-Dichloroethene (total)	540-59-0		$\mu g/m^3$	70-130	25		25	25			
cis-1,3-Dichloropropene	10061-01-5	0.091	$\mu g/m^3$	70-130	25		25	25			
1,3-Dichloropropene (Total)	542-75-6		$\mu g/m^3$	70-130	25		25	25			
Cyclohexane	110-82-7		$\mu g/m^3$	70-130	25		25	25			
Dibromochloromethane	124-48-1	0.17	$\mu g/m^3$	70-130	25		25	25			
Dichlorodifluoromethane	75-71-8	0.989	$\mu g/m^3$	70-130	25		25	25			
Ethyl Alcohol	GCDAI06		$\mu g/m^3$	70-130	25		25	25			
Ethyl Acetate	141-78-6		$\mu g/m^3$	70-130	25		25	25			
Ethylbenzene	100-41-4	0.087	$\mu g/m^3$	70-130	25		25	25			

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Volatile Organics in Air by TO-15 SIM (SOIL_VAPOR)

Holding Time: 30 days
Container/Sample Preservation: 1 - Canister - 2.7 Liter

Analyte	CAS #	RL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	0.383	$\mu g/m^3$	70-130	25		25	25			
1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	0.349	$\mu g/m^3$	70-130	25		25	25			
Methylene chloride	75-09-2	1.74	$\mu g/m^3$	70-130	25		25	25			
Methyl tert butyl ether	1634-04-4	0.721	$\mu g/m^3$	70-130	25		25	25			
Naphthalene	91-20-3	0.262	$\mu g/m^3$	70-130	25		25	25			
p/m-Xylene	179601-23-1	0.174	$\mu g/m^3$	70-130	25		25	25			
o-Xylene	95-47-6	0.087	$\mu g/m^3$	70-130	25		25	25			
Xylene (Total)	1330-20-7		$\mu g/m^3$	70-130	25		25	25			
Heptane	142-82-5		$\mu g/m^3$	70-130	25		25	25			
n-Hexane	110-54-3		$\mu g/m^3$	70-130	25		25	25			
Propylene	115-07-1		$\mu g/m^3$	70-130	25		25	25			
Styrene	100-42-5	0.085	$\mu g/m^3$	70-130	25		25	25			
Tetrachloroethene	127-18-4	0.136	$\mu g/m^3$	70-130	25		25	25			
Tetrahydrofuran	109-99-9		$\mu g/m^3$	70-130	25		25	25			
Toluene	108-88-3	0.188	$\mu g/m^3$	70-130	25		25	25			
trans-1,3-Dichloropropene	10061-02-6	0.091	$\mu g/m^3$	70-130	25		25	25			
Trichloroethene	79-01-6	0.107	$\mu g/m^3$	70-130	25		25	25			
1,2,4-Trichlorobenzene	120-82-1	0.371	$\mu g/m^3$	70-130	25		25	25			
Trichlorofluoromethane	75-69-4	0.281	$\mu g/m^3$	70-130	25		25	25			
Vinyl acetate	108-05-4		$\mu g/m^3$	70-130	25		25	25			
Vinyl bromide	593-60-2		$\mu g/m^3$	70-130	25		25	25			
Hexachlorobutadiene	87-68-3	0.533	$\mu g/m^3$	70-130	25		25	25			
iso-Propyl Alcohol	67-63-0		$\mu g/m^3$	70-130	25		25	25			
Vinyl chloride	75-01-4	0.051	$\mu g/m^3$	70-130	25		25	25			
Acrylonitrile	107-13-1	1.09	$\mu g/m^3$	70-130	25		25	25			
n-Butylbenzene	104-51-8	1.1	$\mu g/m^3$	70-130	25		25	25			
sec-Butylbenzene	135-98-8	1.1	$\mu g/m^3$	70-130	25		25	25			
Isopropylbenzene	98-82-8	0.983	$\mu g/m^3$	70-130	25		25	25			
p-Isopropyltoluene	99-87-6	1.1	$\mu g/m^3$	70-130	25		25	25			
Acetone	67-64-1	2.38	$\mu g/m^3$	70-130	25		25	25			
2-Butanone	78-93-3	1.47	$\mu g/m^3$	70-130	25		25	25			
4-Methyl-2-pentanone	108-10-1	2.05	$\mu g/m^3$	70-130	25		25	25			
Halothane	151-67-7		$\mu g/m^3$	70-130	25		25	25			
1,2,3-Trichlorobenzene	87-61-6	0.371	$\mu g/m^3$	70-130	25		25	25			
1,2-Dichloroethane-d4	*17060-07-0*								*70-130*		
Toluene-d8	*2037-26-5*								*70-130*		
Bromofluorobenzene	*460-00-4*								*70-130*		

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ATTACHMENT B

RÉSUMÉS

Gerald F. Nicholls, PE, CHMM

Senior Project Manager

Environmental Engineering & Hazardous Materials Management

15 years in the industry

Mr. Nicholls' expertise includes management of remediation and site investigations, brownfield cleanups, remedial design, industrial hygiene, air monitoring and environmental health and safety projects including data collection, inspection and reporting for projects throughout New York and New Jersey. He works closely with various private, Department of Defense, state, commercial, industrial, and municipal clients, acting as a liaison between the client and project team.

As a Senior Project Manager, Mr. Nicholls is responsible for supervising project staff; conducting technical review; maintaining quality control; budget forecasting and control; and managing the technical and financial aspects of active projects.

Selected Projects

- New York City School Construction Authority On-Call Contract for Hazmat Consulting Services, Various Locations, Five Boroughs of New York, NY
- G4 Capital third party due diligence reviews and environmental risk evaluations, Various Locations, New York, NY
- 140 6th Avenue, Sub-Membrane Depressurization System Design, Spill Remediation, Subslab Remediation and Monitoring Well Piping Design, Remediation Oversight, and Construction Administration, New York, NY
- 23-01 42nd Road, Phase I, Phase II Remedial Investigation, Remedial Action Work Plan, Sub-Membrane Depressurization System Design, Underground Storage Tank Closure and Remediation, Brownfield Cleanup Program, Remediation Oversight, Construction Administration, Long Island City, NY
- 23-10 Queens Plaza South, Phase I, Phase II Remedial Investigation, Remedial Action Work Plan, Sub-Membrane Depressurization System Design, Underground Storage Tank Closure and Remediation, Brownfield Cleanup Program, Remediation Oversight, Construction Administration, Long Island City, NY
- 170 Amsterdam Avenue, Remedial Action Work Plan, Voluntary Cleanup Program, Remediation Oversight, Construction Administration, New York, NY
- Urban Health Plan, Medical Building, DNAPL Delineation, Remedial Action Work Plan, Hazardous Waste Management and Minimization, Brownfield Cleanup Program, Bronx, NY
- Whitehead Realty, Acme Sites, DNAPL Delineation, Site Characterization, Remedial Investigation and Reporting, Brooklyn, NY
- Second Avenue Subway, Air Monitoring and Ventilated Air Treatment Program, New York, NY
- West 17th Street Development, DNAPL Assessment, DNAPL Recovery, Remedial Design, Closure through Brownfield Cleanup

Education

M.S., Environmental Engineering
New Jersey Institute of Technology

B.S., Chemistry and
Environmental Studies (Double Major)
Ursinus College

Professional Registration

Professional Engineer (PE) in NY

Certified Hazardous Materials Manager (CHMM)

Affiliations

City of Jersey City Environmental Commission, Former Commission, Vice Chair and Chair

Alliance of Hazardous Materials Professionals (AHMP)

Academy of Hazardous Materials Managers (ACHMM), NJ Chapter

American Chemical Society

Association of NJ Environmental Commissions (ANJEC)

Program, Remediation Oversight, Bid Documents, ISS and Containment Wall Design, Construction Administration, New York, NY
- New York University Spill Sites, 4 Washington Square Village, 7-13, Washington Square North, and 251 Mercer Street, Fuel Oil Spill Cleanup and Closure, New York, NY
- Dormitory Authority of New York (DASNY), City College of New York, Fuel Protection and Leak Detection System Repair and Upgrades, New York, NY
- Surfactant Remediation Project, In-Situ Chemical Oxidation Design and Implementation and Site Closure, Margate City, NJ
- NYU Langone Medical Center, New Science Building, Remediation Oversight and Construction Administration, Voluntary Cleanup Program, New York, NY
- 86 Warren Street, Waste Characterization and Construction Documents, New York, NY
- 459 Smith Street, Due Diligence and Cost Estimating, Brooklyn, NY
- 491 Wortman Ave, Air Sparge/Soil Vapor Extraction Design and Implementation, Brownfield Cleanup Program, Bid Documents, Construction Administration, Brooklyn, NY
- Gowanus Canal Northside, Demolition and Decommissioning of MOSF, Remediation Investigation, Brownfield Cleanup Program, Brooklyn, NY
- 163 6th Street, Phase I and Phase II Due Diligence, Spill Response, Remedial Action Work Plan, Brooklyn, NY
- 111 Leroy Street, New York, NY
- 45 Broad Street, Waste Characterization, Construction Documents, New York, NY
- 411 Broadway, Phase I, Remedial Investigation, Air/Noise Coordination for E-Designation, New York, NY
- Modera on the Hudson, Remediation Oversight, Remedial Action Work Plan, Submembrane Depressurization System Design, Yonkers, NY
- Honeywell Quanta, Remedial Design Peer Review, Edgewater, NJ
- New York University Tandon School of Engineering (Spill 1009933), Remediation, Laser-Induced Fluorescence Investigation, Remedial System Optimization, Product Recovery, Spill Cleanup, Brooklyn, NY
- 237-261 North 9th Street, Peer Review and Due Diligence, Brooklyn, NY

Selected Publications, Reports, and Presentations

"Biodegradation Pathways and End Products of Sodium Dioctyl Sulfosuccinate/Sodium Hexadecyl Diphenyl Oxide Disulfonate Surfactant Solution." Florida Remediation Conference, Orlando, Florida, November 2005.

Anthony Moffa, Jr., ASP, CHMM, COSS

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 over 15 years 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. 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)

Affiliations

Pennsylvania Chamber of Business & Industry

Chemical Council of New Jersey

New Jersey Business & Industry Association

Geoprofessional Business Association

Certifications and Training

Hazardous Waste Operations and Emergency Response Training

OSHA Site Supervisor Training

10 & 30-Hour Construction Safety & Health Training

30-Hour Construction Safety & Health Training

10-Hour Industry Safety & Health Training

Confined Space Awareness & Entry

Competent Person in Excavations

Hazard Communications

Defensive Driving Training

LANGAN

PAUL MCMAHON, PE

PROJECT MANAGER

ENVIRONMENTAL ENGINEERING

Mr. McMahon is an environmental engineer working in the NY Metro area. He has experience with projects in the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP), Voluntary Cleanup Program (VCP) and Spill Programs, and New York City Office of Environmental Remediation (NYCOER) “E” Designated and VCP sites. His field experience includes conducting Phase II Environmental Site Investigations (ESI), remedial investigations, and indoor air quality analysis Investigations, and performing remediation oversight. Mr. McMahon’s most recent experience includes the preparation of investigation reports and investigation work plans, management of NYSDEC BCP remediation projects and NYSDEC spill remediation projects, design of submembrane depressurization systems, and development of remediation work plans.

SELECTED PROJECTS

- 55 Bank Street, NYSDEC BCP Site Remediation Project Management,
  White Plains, NY
- 23-01 42nd Road, NYSDEC BCP Site Remediation Oversight and Project Management, Long Island City, NY
- 23-10 Queens Plaza South, NYSDEC BCP Remedial Investigation Report, Interim Remedial Measures Work Plan, and Remediation Project Management, Long Island City, NY
- Brooklyn Navy Yard Dock 72, Management of Environmental Oversight in Accordance with NYSDEC VCP Site Management Plan, Brooklyn, NY
- Purves Street Development, Tall Residential Building, Phase II ESI/NYSDEC BCP Remedial Investigation, Remedial Action Work Plan, and Site Remediation Project Management, Long Island City, NY
- 27-21 44th Drive, NYSDEC BCP Site Remediation Project Management, Long Island City, NY
- NYU Tandon School of Engineering, NYSDEC Spill Investigation and Remediation Project Management, Brooklyn, NY
- Parcel B West, East Harlem, Affordable Housing Development, NYSDEC BCP Remedial Investigation, Remedial Action Work Plan, and Site Remediation Project Management, New York, NY
- 267-273 West 87th Street, NYSDEC BCP Remedial Investigation and Remedial Action Work Plan, and Site Remediation Project Management, New York, NY
- DuPont-Stauffer Landfill, NYSDEC Superfund Site, Site Management Plan Compliance, Newburgh, NY
- 190 Riverside Drive, Fuel Oil Spill Emergency Response, Site Investigation, and Remediation, New York, NY
- 473 President Street, NYSDEC BCP Remedial Investigation, Interim Remedial Measures, Project Management, Brooklyn, NY

EDUCATION

M.E., Environmental Engineering
Manhattan College

B.S., Civil Engineering
Washington University in St. Louis

PROFESSIONAL REGISTRATION

Professional Engineer (PE) in NY

10-Hour OSHA

40-Hour OSHA HAZWOPER

- 175-225 3rd Street, NYSDEC BCP Remedial Investigation, Project Management, Brooklyn, NY
- 322 West 57th Street, Sheffield Building Oversight of Emergency Spill Response, New York, NY
- Hudson Yards Terra Firma and Hudson Yards Platform, Construction Oversight and Community Air Monitoring Program, New York, NY
- Columbia University Manhattanville Redevelopment, Remediation Oversight and Community Air Monitoring Program, New York, NY

Emily G. Strake

Project Chemist/ Risk Assessor
Environmental Engineering

17 years in the industry ~ 5 years with Langan

Ms. Strake has 17 years of environmental chemistry, risk assessment, auditing, and quality assurance experience. Most recently, she has focused her efforts on human health risk assessment, and has been the primary author or key contributor of risk assessment reports and screening evaluations for projects governed under RCRA, CERCLA, NJDEP, DNREC, SWRCB, DTSC, PADEP, CTDEEP, ODEQ, NYSDEC and MDE. She has experience in site-specific strategy development, which has enabled her to perform assessments to focus areas of investigation and identify risk-based alternatives for reducing remediation costs. Ms. Strake is a member of the Interstate Technology and Regulatory Council Risk Assessment Team responsible for the development and review of organizational risk assessment guidance documents and serves as a National Trainer in risk assessment for the organization.

Ms. Strake has extensive experience in environmental data validation, focused on ensuring laboratory deliverables follow specific guidelines as described by regulatory agencies and the analytical methods employed. In addition, she has experience in EQuIS chemical database management. She also has a broad range of environmental field experience and maintains current OSHA HAZWOPER certification. Ms. Strake is experienced in auditing laboratory and field-sampling activities for compliance with Quality Assurance Project Plans (QAPPs), the National Environmental Laboratory Accreditation Conference Standards Quality Systems manual, and applicable USEPA Guidance. Ms. Strake has also audited on-site laboratories in support of groundwater treatment operations and implemented corrective actions. Her responsibilities include writing reports on the value of laboratory work, writing/editing QAPPs for clients and project-specific sites, peer reviewing colleague's work, and mentoring staff within the office. She has also served as the Quality Assurance officer for several long-term projects, responsible for the achievement of all forms of Quality Control/Quality Assurance by onsite personnel relating to sampling, analysis, and data evaluation.

Selected Project Experience

Major League Soccer's San Jose Earthquakes Stadium, Santa Clara, CA
DuPont, Waynesboro, VA
PECO/Exelon, Various Locations
Texas Instruments, San Francisco, CA
Regency, Philadelphia, PA
Veteran's Affairs, Palo Alto, CA
DOW Chemical, Various Locations
Avon, Rye, NY
Golden Gate National Parks Conservancy, San Francisco, CA
Sunoco Refineries, Various Locations
Honeywell, Highland Park, NJ
Delaware City Refinery, DE

Education

MBA
The University of Scranton

B.S., Chemistry
Cedar Crest College

Professional Licenses

Board Certified Environmental Professional (CEP)

Training

40 hr. OSHA HAZWOPER Training/Nov 2002

8 hr. HAZWOPER Supervisor/June 2004

8 hr. OSHA HAZWOPER Refresher/2013

Affiliations

The Society for Risk Analysis

Interstate Technology and Regulatory Council

LANGAN

Occidental Chemical, Bakersfield, CA
Floreffe Terminal, Pittsburgh, PA
Ryder, Hartford, CT
Rohm and Haas, Philadelphia, PA

ATTACHMENT C

ANALYTICAL METHODS/
QUALITY ASSURANCE SUMMARY TABLE

ATTACHMENT C

ANALYTICAL METHODS/QUALITY ASSURANCE SUMMARY TABLE

Matrix Type	Field Parameters	Laboratory Parameters	Analytical Methods	Sample Preservation	Sample Container Volume and Type	Sample Hold Time	Field Duplicate Samples	Field Blank Samples	Trip Blank Samples	Ambient Air Samples	MS/MSD Samples
Soil	Total VOCs via PID	Part 375 + TCL VOCs	EPA 8260C	Cool to 4°C	Two 40-ml VOC vials with 5ml H_2O, one with MeOH or 3 En Core Samplers (separate container for % solids)	14 days if froze to -7 C° or extruded into methanol (vials); 48 hours otherwise (En Cores)	1 per 20 samples (minimum 1)	1 per 20 samples (minimum 1)	1 per Shipment of VOC samples	NA	1 per 20 samples
		Part 375 + TCL SVOCs	EPA 8270D	Cool to 4°C	4 oz. amber glass jar	14 days extract, 40 days after extraction to analysis			NA		
		Part 375 + TAL Metals + Cyanide	EPA 6010D, EPA 7471B, EPA 7196A, EPA 9010C/9012B	Cool to 4°C	2 oz. amber glass jar	6 months, except mercury 28 days and cyanide 14 days					
		Part 375 + TCL Pesticides	EPA 8081B	Cool to 4°C	4 oz. amber glass jar	14 days extract, 40 days after extraction to analysis					
		Part 375 + TCL PCBs	EPA 8082A	Cool to 4°C	4 oz. amber glass jar	14 days extract, 40 days after extraction to analysis					
Groundwater	Temperature, Turbidity, pH, ORP, Conductivity	Part 375 + TCL VOCs	EPA 8260C	Cool to 4°C; HCl to pH <2; no headspace	Three 40-mL VOC vials with Teflon® -lined cap	Analyze within 14 days of collection	1 per 20 samples (minimum 1)	1 per 20 samples (minimum 1)	1 per Shipment of VOC samples	NA	1 per 20 samples
		Part 375 + TCL SVOCs	EPA 8270D and 8270D with SIM	Cool to 4°C	Two 1-Liter Amber Glass	7 days to extract; 40 days after extraction to analysis			NA		
		1,4-Dioxane as SVOC	EPA 8270D With SIM	Cool to 4°C	Two 1-Liter Amber Glass	7 days to extract; 40 days after extraction to analysis					
		Part 375 + TCL Pesticides	EPA 8081B	Cool to 4°C	Two 1-Liter Amber Glass	7 days to extract; 40 days after extraction to analysis					
		PCBs	EPA 8082A	Cool to 4°C							
		PFAS	EPA 537M	Cool to 4°C; Trizma	Three 250-mL HDPE or polypropylene container	14 days to extract; 28 days after extraction to analysis					
		Part 375 + TAL Metals	EPA 6020B, 7470A	Cool to 4°C; HNO_3 to pH <2	250 mL plastic	6 months, except Mercury 28 days					
		Hexavalent Chromium	EPA 7196A	Cool to 4°C	250 mL plastic	24 Hours					
		Cyanide	EPA 9010CB/9012B	NaOH plus 0.6g ascorbic acid	250 mL plastic	14 days					
Sub-slab Vapor	Total VOCs, Oxygen, LEL, CO, and H_2S, with MultiGas Meter	TO-15 Listed VOCs	EPA TO-15	Ambient Temperature	2.7-Liter Summa Canister	Analyze within 30 days of collection	NA	NA	NA	1 per 10 samples (minimum 1)	NA
Ambient Air	Total VOCs via PID									NA	

Notes:
1. PID - Photoionization Detector
2. VOC - Volatile organic compound
3. EPA - Environmental Protection Agency
4. TCL - Target compound list
5. TAL - Target analyte list
6. ORP - Oxidation reduction potential
7. DO - Dissolved oxygen
8. LEL - Lower explosive limit
9. CO -Carbon monoxide
10. H_2S - Hydrogen sulfide
11. NA - Not applicable

ATTACHMENT D

SAMPLE NOMENCLATURE STANDARD OPERATING PROCEDURE

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

PFAS SAMPLING PROTOCOL

EPA 537 Field Sampling Guidelines

Sampling for PFAAs via EPA 537 can be challenging due to the prevalence of these compounds in consumer products. The following guidelines are strongly recommended when conducting sampling.

Reference-NHDES https://www.des.nh.gov/organization/divisions/waste/hwrb/documents/pfc-stakeholder-notification-20161122.pdf

Field Clothing and PPE

- No clothing or boots containing Gore-TexTM
- All safety boots made from polyurethane and PVC
- No materials containing Tyvek®
- Do not use fabric softener on clothing to be worn in field
- Do not used cosmetics, moisturizers, hand cream, or other related products the morning of sampling
- Do not use unauthorized sunscreen or insect repellant (see reference above for acceptable products)

Sample Containers

- All sample containers made of HDPE or polypropylene
- Caps are unlined and made of HDPE or polypropylene

Wet Weather (as applicable)

Wet weather gear made of polyurethane and PVC only

Equipment Decontamination

- “PFC-free” water on-site for decontamination of sample equipment. No other water sources to be used.
- Only Alconox and Liquinox can be used as decontamination materials

Food Considerations

- No food or drink on-site with exception of bottled water and/or hydration drinks (i.e., Gatorade and Powerade) that is available for consumption only in the staging area

Other Recommendations

Sample for PFCs first! Other containers for other methods may have PFCs present on their sampling containers

Field Equipment

- Must not contain Teflon® (aka PTFE) or LDPE materials
- All sampling materials must be made from stainless steel, HDPE, acetate, silicon, or polypropylene
- No waterproof field books can be used
- No plastic clipboards, binders, or spiral hard cover notebooks can be used
- No adhesives (i.e.Post-It Notes) can be used
- Sharpies and permanent markers not allowed; regular ball point pens are acceptable
- Aluminum foil must not be used
- Keep PFC samples in separate cooler, away from sampling containers that may contain PFCs
- Coolers filled with regular ice only. Do not use chemical (blue) ice packs.

EPA Method 537 (PFAS) Sampling Instructions

Please read instructions entirely prior to sampling event.

*Sampler must wash hands before wearing nitrile gloves in order to limit contamination during sampling.

Each sample set* requires a set of containers to comply with the method as indicated below.
*sample set is composed of samples collected from the same sample site and at the same time.

Container Count	Container Type	Preservative
3 Sampling Containers - Empty	250 mL container	Pre preserved with 1.25 g Trizma
Reagent Water for Field Blank use	250 mL container	Pre preserved with 1.25 g Trizma
1 Field Blank (FRB) Container - Empty	250 mL container	Unpreserved

**** Sampling container <u>must be filled to the neck</u>. For instructional purposes a black line has been drawn to illustrate the required fill level for each of the 3 Sample containers**

Field blanks are recommended and the containers have been provided, please follow the instructions below.

Field Blank Instructions:

1. Locate the Reagent Water container from the bottle order. The Reagent Water container will be prefilled with PFAS-free water and is preserved with Trizma.
2. Locate the empty container labeled “Field Blank”.
3. Open both containers and proceed to transfer contents of the “Reagent Water” container into the “Field Blank” container.
4. If field blanks are to be analyzed, they need to be noted on COC, and will be billed accordingly as a sample.

Both the <u>empty</u> Reagent Water container and the <u>filled</u> Field Blank container must be returned to the laboratory along with the samples taken.

Sampling Instructions:

1. Each sampling event requires 3 containers to be filled to the neck of the provided containers for each sampling location.
2. Before sampling, remove faucet aerator, run water for 5 min, slow water to flow of pencil to avoid splashing and fill sample containers to neck of container (as previously illustrated) and invert 5 times.
3. Do not overfill or rinse the container.
4. Close containers securely. Place containers in sealed ZipLoc bags, and in a separate cooler (no other container types).
5. Ensure Chain-of-Custody and all labels on containers contain required information.Place sample, Field Blank and empty Reagent Blank containers in ice filled cooler (do not use blue ice) and return to the laboratory. Samples should be kept at 4°C ±2. Samples must not exceed 10°C during first 48 hours after collection. Hold time is 14 days.

Please contact your project manager with additional questions or concerns.

Collection of Groundwater Samples for Perfluorooctanoic Acid (PFOA) and Perfluorinated Compounds (PFCs) from Monitoring Wells Sample Protocol

Samples collected using this protocol are intended to be analyzed for perfluorooctanoic acid (PFOA) and other perfluorinated compounds by Modified (Low Level) Test Method 537.

The procedure used must be consistent with the NYSDEC March 1991 Sampling Guidelines and Protocols http://www.dec.ny.gov/docs/remediation_hudson_pdf/sgpsect5.pdf with the following materials limitations.

At this time acceptable materials for sampling include: stainless steel, high density polyethylene (HDPE), PVC, silicone, acetate and polypropylene. Equipment blanks should be generated at least daily. Additional materials may be acceptable if pre-approved by NYSDEC. Requests to use alternate equipment should include clean equipment blanks. **NOTE: Grunfos pumps and bladder pumps are known to contain PFC materials (e.g. Teflon™ washers for Grunfos pumps and LDPE bladders for bladder pumps).** <u>All sampling equipment components and sample containers should not come in contact with aluminum foil, low density polyethylene (LDPE), glass or polytetrafluoroethylene (PTFE, Teflon™) materials including sample bottle cap liners with a PTFE layer.</u> Standard two step decontamination using detergent and clean water rinse will be performed for equipment that does come in contact with PFC materials. Clothing that contains PTFE material (including GORE-TEX®) or that have been waterproofed with PFC materials must be avoided. Many food and drink packaging materials and "plumbers thread seal tape" contain PFCs.

All clothing worn by sampling personnel must have been laundered multiple times. The sampler must wear nitrile gloves while filling and sealing the sample bottles.

Pre-cleaned sample bottles with closures, coolers, ice, sample labels and a chain of custody form will be provided by the laboratory.

1. Fill two pre-cleaned 500 mL HDPE or polypropylene bottle with the sample.
2. Cap the bottles with an acceptable cap and liner closure system.
3. Label the sample bottles.
4. Fill out the chain of custody.
5. Place in a cooler maintained at 4 ± 2º Celsius.

Collect one equipment blank for every sample batch, not to exceed 20 samples.

Collect one field duplicate for every sample batch, not to exceed 20 samples.

Collect one matrix spike / matrix spike duplicate (MS/MSD) for every sample batch, not to exceed 20 samples.

Request appropriate data deliverable (Category A or B) and an electronic data deliverable.

Issue: NYSDEC has committed to analyzing representative groundwater samples at remediation sites for emerging contaminants (1,4-dioxane and PFAS) as described in the below guidance.

Implementation

NYSDEC project managers will be contacting site owners to schedule sampling for these chemicals. Only groundwater sampling is required. The number of samples required will be similar to the number of samples where "full TAL/TCL sampling" would typically be required in a remedial investigation. If sampling is not feasible (e.g., the site no longer has any monitoring wells in place), sampling may be waived on a site-specific basis after first considering potential sources of these chemicals and whether there are water supplies nearby.

Upon a new site being brought into any program (i.e., SSF, BCP), PFAS and 1,4-dioxane will be incorporated into the investigation of groundwater as part of the standard "full TAL/TCL" sampling. Until an SCO is established for PFAS, soil samples do not need to be analyzed for PFAS unless groundwater contamination is detected. Separate guidance will be developed to address sites where emerging contaminants are found in the groundwater. The analysis currently performed for SVOCs in soil is adequate for evaluation of 1,4-dioxane, which already has an established SCO.

Analysis and Reporting

Labs should provide a full category B deliverable, and a DUSR should be prepared by a data validator, and the electronic data submission should meet the requirements provided at: https://www.dec.ny.gov/chemical/62440.html ,

The work plan should explicitly describe analysis and reporting requirements.

PFAS sample analysis: Currently, ELAP does not offer certification for PFAS compounds in matrices other than finished drinking water. However, laboratories analyzing environmental samples (ex. soil, sediments, and groundwater) are required, by DER, to hold ELAP certification for PFOA and PFOS in drinking water by EPA Method 537 or ISO 25101.

Modified EPA Method 537 is the preferred method to use for groundwater samples due to the ability to achieve 2 ng/L (ppt) detection limits. If contract labs or work plans submitted by responsible parties indicate that they are not able to achieve similar reporting limits, the project manager should discuss this with a DER chemist. Note: Reporting limits for PFOA and PFOS should not exceed 2 ng/L.

PFAS sample reporting: DER has developed a PFAS target analyte list (below) with the intent of achieving reporting consistency between labs for commonly reportable analytes. It is expected that reported results for PFAS will include, at a minimum, all the compounds listed. This list may be updated in the future as new information is learned and as labs develop new capabilities. If lab and/or matrix specific issues are encountered for any particular compounds, the NYSDEC project manager will make case-by-case decisions as to whether particular analytes may be temporarily or permanently discontinued from analysis for each site. Any technical lab issues should be brought to the attention of a NYSDEC chemist.

Some sampling using this full PFAS target analyte list is needed to understand the nature of contamination. It may also be critical to differentiate PFAS compounds associated with a site from other sources of these chemicals. Like routine refinements to parameter lists based on investigative findings, the full PFAS target analyte list may not be needed for all sampling intended to define the extent of contamination. Project managers may approve a shorter analyte list (e.g., just the UCMR3 list) for some reporting on a case by case basis.

1,4-Dioxane Analysis and Reporting: The method detection limit (MDL) for 1,4-dioxane should be no higher than 0.28 µg/l (ppb). ELAP offers certification for both EPA Methods 8260 and 8270. In order to get the appropriate detection limits, the lab would need to run either of these methods in "selective ion monitoring" (SIM) mode. DER is advising the use of method 8270, since this method provides a more robust extraction procedure, uses a larger sample volume, and is less vulnerable to interference from chlorinated solvents (we acknowledge that 8260 has been shown to have a higher recovery in some studies).

Full PFAS Target Analyte List

Group	Chemical Name	Abbreviation	CAS Number
Perfluoroalkyl sulfonates	**Perfluorobutanesulfonic acid**	**PFBS**	**375-73-5**
	Perfluorohexanesulfonic acid	**PFHxS**	**355-46-4**
	Perfluoroheptanesulfonic acid	PFHpS	375-92-8
	Perfluorooctanessulfonic acid	**PFOS**	**1763-23-1**
	Perfluorodecanesulfonic acid	PFDS	335-77-3
Perfluoroalkyl carboxylates	Perfluorobutanoic acid	PFBA	375-22-4
	Perfluoropentanoic acid	PFPeA	2706-90-3
	Perfluorohexanoic acid	PFHxA	307-24-4
	Perfluoroheptanoic acid	**PFHpA**	**375-85-9**
	Perfluorooctanoic acid	**PFOA**	**335-67-1**
	Perfluorononanoic acid	**PFNA**	**375-95-1**
	Perfluorodecanoic acid	PFDA	335-76-2
	Perfluoroundecanoic acid	PFUA/PFUdA	2058-94-8
	Perfluorododecanoic acid	PFDoA	307-55-1
	Perfluorotridecanoic acid	PFTriA/PFTrDA	72629-94-8
	Perfluorotetradecanoic acid	PFTA/PFTeDA	376-06-7
Fluorinated Telomer Sulfonates	6:2 Fluorotelomer sulfonate	6:2 FTS	27619-97-2
	8:2 Fluorotelomer sulfonate	8:2 FTS	39108-34-4
Perfluorooctane-sulfonamides	Perfluroroctanesulfonamide	FOSA	754-91-6
Perfluorooctane-sulfonamidoacetic acids	N-methyl perfluorooctanesulfonamidoacetic acid	N-MeFOSAA	2355-31-9
	N-ethyl perfluorooctanesulfonamidoacetic acid	N-EtFOSAA	2991-50-6

Bold entries depict the 6 original UCMR3 chemicals

Collection of Groundwater Samples for Perfluorooctanoic Acid (PFOA) and Perfluorinated Compounds (PFCs) from Monitoring Wells Sample Protocol

Samples collected using this protocol are intended to be analyzed for perfluorooctanoic acid (PFOA) and other perfluorinated compounds by Modified (Low Level) Test Method 537.

The sampling procedure used must be consistent with the NYSDEC March 1991 SAMPLING GUIDELINES AND PROTOCOLS
http://www.dec.ny.gov/regulations/2636.html with the following materials limitations.

At this time acceptable materials for sampling include: stainless steel, high density polyethylene (HDPE) and polypropylene. Additional materials may be acceptable if proven not to contain PFCs. **NOTE: Grunfos pumps and bladder pumps are known to contain PFC materials (e.g. Teflon™ washers for Grunfos pumps and LDPE bladders for bladder pumps).** All sampling equipment components and sample containers should not come in contact with aluminum foil, low density polyethylene (LDPE), glass or polytetrafluoroethylene (PTFE, Teflon™) materials including sample bottle cap liners with a PTFE layer. Standard two step decontamination using detergent and clean water rinse should be considered for equipment that does come in contact with PFC materials. Clothing that contains PTFE material (including GORE-TEX®) or that have been waterproofed with PFC materials must be avoided. Many food and drink packaging materials and "plumbers thread seal tape" contain PFCs.

All clothing worn by sampling personnel must have been laundered multiple times. The sampler must wear nitrile gloves while filling and sealing the sample bottles.

Pre-cleaned sample bottles with closures, coolers, ice, sample labels and a chain of custody form will be provided by the laboratory.

1. Fill two pre-cleaned 500 mL HDPE or polypropylene bottle with the sample.
2. Cap the bottles with an acceptable cap and liner closure system.
3. Label the sample bottles.
4. Fill out the chain of custody.
5. Place in a cooler maintained at 4 ± 2º Celsius.

Collect one equipment blank for every sample batch, not to exceed 20 samples.

Collect one field duplicate for every sample batch, not to exceed 20 samples.

Collect one matrix spike / matrix spike duplicate (MS/MSD) for every sample batch, not to exceed 20 samples.

Request appropriate data deliverable (Category A or B) and an electronic data deliverable.

APPENDIX G
MONITORING PLAN FORMS

SITE INSPECTION CHECKLIST

Site Name: ____________ Location: ____________ Project Number: ____________

Inspector Name: ____________ Date: ____________ Weather Conditions: ____________

Reason for Inspection (i.e., routine, severe condition, etc.): ____________

Check one of the following:
(Y: Yes N: No N/A: Not Applicable)

		Y	N	N/A	Normal Situation	Remarks
	General					
1	What are the current site conditions?	-	-	-		
2	Are all applicable site records (e.g., documentation of construction activity, SSD system maintenance and repair, most current easement, etc.) complete and up to date?					
	Environmental Easement					
3	Has site use remained the same?					
4	Does it appear that all environmental easement restrictions have been followed?					
	Impermeable Cap					
5	Are there any indications of a breach in the capping system at the time of this inspection?					
6	Are there any cracks in the building slabs?					
7	Are there any cracks in the building walls?					
8	Is there any construction activity, or indication of any construction activity within the past certification year (including any tenant improvements), that included the breaching of the capping system, on-site at the time of this inspection?					
9	If YES to number 7, is there documentation that the Soil Management Plan, HASP, and CAMP for the site was/is being followed?					
	SSD System					
5	Are all visible SSD system components intact and operational at the time of this inspection?					

***** If the answer to any of the above questions indicate non-compliance with any IC/ECs for the site, additional remarks must be provided and, where applicable, documentation attached to this checklist detailing additional inspection and repair activities.**

Additional remarks: ____________

Minimum Inspection Schedule:
- Site-wide inspections will be conducted annually, per certification year, at a minimum.
- Additional inspections will also be conducted at times of severe weather condition events.
- All inspection events will use this checklist.

COMPOSITE COVER SYSTEM INSPECTION CHECKLIST

Site Name: ______________ Location: ______________ Project Number: ______________

Inspector Name: ______________ Date: ______________ Weather Conditions: ______________

Reason for Inspection (i.e., routine, severe condition, etc.): ______________

Check one of the following:
(Y: Yes N: No N/A: Not Applicable)

		Y	N	N/A	Normal Situation	Remarks
	General					
1	What are the current site conditions?	--	--	--		
	Impermeable Cap					
2	Are there any indications of a breach in the capping system at the time of this inspection?					
3	Is there any construction activity, or indication of any construction activity within the past certification year (including any tenant improvements), that included the breaching of the capping system, on-site at the time of this inspection?					
4	If YES to number 3, is there documentation that the Soil Management Plan, HASP, and CAMP for the site was/is being followed?					

***** If the answer to any of the above questions indicate non-compliance with ECs for the site, additional remarks must be provided and, where applicable, documentation attached to this checklist detailing additional inspection and repair activities.**

Additional remarks: ______________

Minimum Inspection Schedule:

- Site-wide inspections will be conducted annually, per certification year, at a minimum.
- Additional inspections will also be conducted at times of severe weather condition events.
- All inspection events will use this checklist.

SMD SYSTEM INSPECTION CHECKLIST

Site Name: ____________ Location: ____________ Project Number: ____________

Inspector Name: ____________ Date: ____________ Weather Conditions: ____________

Reason for Inspection (i.e., routine, severe condition, etc.): ____________

Check one of the following:
(Y: Yes N: No N/A: Not Applicable)

		Y	N	N/A	Normal Situation	Remarks
	Records					
1	Is the Operations & Maintenance Plan readily available on-site?					
2	Based on site records, when was the last inspection, maintenance, or repair event?					
3	Based on site records, was the system inoperational for any amount of time since the last inspection, maintenance, or repair event? For how long? Provide details.					
	Alarm System					
4	Do the alarm lights indicate that the system is operational?					
	General System					
5	Is there any construction activity, or indication of any construction activity within the past certification year (including any tenant improvements), that included the breaching of the floor slab, on-site at the time of this inspection?					
6	If YES to number 5, is there documentation that the Soil Management Plan, HASP, and CAMP for the site was/is being followed?					
7	If YES to number 5, is there documentation that all breaches in the floor slab have been sealed?					
8	Does all visible SSD piping appear intact and undamaged?					
9	Have any intake points been constructed at the roof near (less than 10 feet) the SSD blower discharge point?					
	SSD Blower Unit					
10	Is the SSD blower operational at the time of the inspection?					
11	What is the measured velocity?					
12	Is the SSD blower expelling air at the discharge point?					
	SSD Monitoring Points					
13	What is the vacuum reading at monitoring point MP-1					
14	What is the vacuum reading at monitoring point MP-2					
15	What is the vacuum reading at monitoring point MP-3					
16	What is the vacuum reading at monitoring point MP-4					
17	What is the vacuum reading at monitoring point MP-5					
18	What is the vacuum reading at monitoring point MP-6					
19	What is the vacuum reading at monitoring point MP-7					

***** If the answer to any of the above questions indicates that the SMD system is non-operational or malfunctioning, or that this EC is in non-compliance, additional remarks must be provided and, where applicable, documentation attached to this checklist detailing additional inspection and repair activities.**

Additional remarks: ____________

Minimum Inspection Schedule:

• SSD system inspections will be conducted quarterly for the first certification year at a minimum; annually thereafter.
• Additional inspections will also be conducted at times of maintenance, repair, or severe condition events.
• The minimum schedule will be revised, as necessary, following the first certification year.
• All inspection events will use this checklist.