REMEDIAL ACTION WORK PLAN

for

1607 SURF AVENUE
BROOKLYN NEW YORK

Prepared For:

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July 2021

Langan Project No. 170599501

LANGAN

CERTIFICATION

I, Jason J. Hayes, certify that I am currently a New York State registered professional engineer as defined in 6 NYCRR Part 375 and that this Remedial Action Work Plan (RAWP) was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).

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

STATE OF NEW YORK · JASON JAMES HAYES · 069491 · LICENSED PROFESSIONAL ENGINEER

Jason J. Hayes, PE	7/13/2021	
NYS Professional Engineer	Date	Signature

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

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LIST OF ACRONYMS

Acronym	Definition
AGV	Air Guideline Value
AOC	Area of Concern
AST	Aboveground Storage Tank
ASP	Analytical Services Protocol
ASTM	American Society for Testing Materials International
BCA	Brownfield Cleanup Agreement
BCP	Brownfield Cleanup Program
Bgs	Below Grade Surface
BMP	Best Management Practice
BTEX	Benzene, Toluene, Ethylbenzene, and Total Xylene
BUD	Beneficial Use Determination
C&D	Construction and Demolition
CAMP	Community Air Monitoring Plan
CFR	Code of Federal Regulations
CHASP	Construction Health and Safety Plan
CQAP	Construction Quality Assurance Plan
CP	Commissioner's Policy
CPP	Citizen Participation Plan
CSM	Conceptual Site Model
CVOC	Chlorinated Volatile Organic Compound
DER	Division of Environmental Remediation
DMM	Division of Materials Management
DUSR	Data Usability Summary Report
EC	Engineering Control
EDD	Electronic Data Deliverable
EE	Environmental Easement
el	Elevation
ELAP	Environmental Laboratory Approval Program
En-zone	New York State Environmental Zone
EPA	United States Environmental Protection Agency
ESA	Environmental Site Assessment
ESI	Environmental Site Investigation
eV	Electron Volt
FEMA	Federal Emergency Management Agency
FER	Final Engineering Report

Acronym	Definition
GPR	Ground Penetrating Radar
HASP	Health and Safety Plan
IC	Institutional Control
ISCO	In-Situ Chemical Oxidation
µg/L	Microgram Per Liter
$\mu g/m^3$	Microgram Per Cubic Meter
mg/kg	Milligram Per Kilogram
mg/L	Milligram per Liter
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NAVD88	North American Vertical Datum of 1988
NYCRR	New York Codes, Rules and Regulations
NYCDEP	New York City Department of Environmental Protection
NYCDOB	New York City Department of Buildings
NYCDOT	New York City Department of Transportation
NYCOER	New York City Office of Environmental Remediation
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYSDOT	New York State Department of Transportation
OSHA	United States Occupational Safety and Health Administration
PAH	Polycyclic Aromatic Hydrocarbon
PBS	Petroleum Bulk Storage
PCB	Polychlorinated Biphenyls
PCE	Tetrachloroethene
PFAS	Per- and poly-fluroalkyl substances
PG	Protection of Groundwater
PID	Photoionization Detector
PM10	10 Microns in Diameter
PPE	Personal Protective Equipment
ppm	Parts per million
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
QEP	Qualified Environmental Professional
RAO	Remedial Action Objective
RAWP	Remedial Action Work Plan
RCA	Recycled Concrete Aggregate
RCRA	Resource Conservation and Recovery Act

Acronym	**Definition**
RE	Remediation Engineer
REC	Recognized Environmental Condition
RI	Remedial Investigation
RIR	Remedial Investigation Report
RURR	Restricted Use Restricted-Residential
SCG	Standards, Criteria, and Guidance
SCO	Soil Cleanup Objective
SDS	Safety Data Sheet
SGV	Standards and Guidance Values
SMMP	Soil/Materials Management Plan
SMP	Site Management Plan
SOE	Support of Excavation
SPDES	State Pollution Discharge Elimination System
SVOC	Semivolatile Organic Compound
SWPPP	Stormwater Pollution Prevention Plan
TCE	Trichloroethene
TAL	Target Analyte List
TCL	Target Compound List
TOGS	Technical and Operational Guidance Series
UST	Underground Storage Tank
UU	Unrestricted Use
VOC	Volatile Organic Compound

EXECUTIVE SUMMARY

This Remedial Action Work Plan (RAWP) was prepared on behalf of Coney Island Associates Phase 2 LLC (the Volunteer) for the 1607 Surf Avenue site located in the Coney Island neighborhood of Brooklyn, New York (the site). The Volunteer intends to remediate the site in conjunction with a new affordable housing redevelopment under the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP) pursuant to Brownfield Cleanup Agreement (BCA) Index No. C224313-10-20, executed on November 11, 2020, for Site No. C224313.

This RAWP summarizes the nature and extent of contamination as determined from data gathered during the May 2018 Phase II Investigation completed by Hillman Consulting (Hillman), the Remedial Investigation (RI) completed by Langan between February 5, 2020 and February 20, 2020, and supplemental soil vapor investigations completed by Langan on December 3, 2020 and March 2, 2021. This RAWP identifies and evaluates remedial action alternatives, including Track 1 and Track 2 cleanups, their associated costs, and the recommended and preferred remedy: a Track 1 cleanup (or a Track 2 if Track 1 is not achieved). The remedy described in this document is consistent with the procedures defined in Title 6 of the New York Codes, Rules and Regulations (6 NYCRR) Part 375-3.8 and the NYSDEC Division of Environmental Remediation (DER) Program Policy: Technical Guidance for Site Investigation and Remediation (DER-10), and complies with applicable federal, state, and local laws, regulations, and requirements.

Site Description/Physical Setting/Site History

The site is located at 1607 Surf Avenue in the Coney Island neighborhood of Brooklyn, New York and is identified as Block 7062, Lot 28[1] on the department of Finance Tax Map. The 59,393 square-feet (1.36 acres) site is improved with an asphalt-paved parking lot and is bound by Surf Avenue to the south followed by MCU Park, West 16th Street to the east followed by a vacant parcel and several parking lots, West 17th Street to the west followed by a commercial office building and a parking lot, and a parking lot to the north.

According to the survey prepared by Meridian Layout Inc. on January 28, 2020, site surface elevations (el) range from about el 7.04 (at the northwest corner of the site) to el 7.22 (on the southeast corner)[2]. The topography of the site and surrounding area is generally level.

1 The site was formerly comprised of Block 7062, Lots 25, 28, and 34. All three lots are now merged into Block 7062, Lot 28.

2 Elevations refer to North American Vertical Datum of 1988 (NAVD88), which is about 1.1 feet above mean sea level at Sandy Hook, NJ.

Historical Sanborn Fire Insurance Maps indicate that the site was largely undeveloped with the southeastern part developed with residential dwellings, a shed, and a store in 1895. By 1906, the southern part of the site was developed with stores, sheds, and Johnstown Flood Auditorium. By 1930, the property was primarily developed with the Tilyou Theater, storefronts, and an automobile repair facility on the eastern part of the property. Site conditions appear generally the same by 1950 except a machine shop is identified on the eastern part of the property and a manufacturing facility is identified on the northwestern part of the property. By 1966, the manufacturing facility and the machine shop are no longer identified although the Tilyou Theater remains along with stores, a wholesale produce shop, and automobile parking. Site conditions in 1966 are similar to those depicted in 1968. By 1977, the Tilyou Theater is no longer seen and by 1981 the wholesale produce shop is no longer depicted. Following 2001, the site appears as a vacant lot with automobile parking. Site conditions appear generally the same to 2007. City Directory documents also provide additional prior site usage detail including a photo studio (1934-1970), a printing studio/business (1934-1970), an exterminator (1934-1945), and a machinist/machine works (1928-1970).

Summary of the Remedial Investigation

RI findings and conclusions are as follows:

1. Stratigraphy: The stratigraphy observed during the RI consists of a historic fill layer that extends from surface grade to depths ranging from 2 to 10 feet below grade surface (bgs), although observations of fill extending to 13.5 feet were documented during a previous geotechnical investigation. The historic fill predominantly consists of brown and black, fine-grained sand with varying amounts of gravel, brick, coal, slag, glass, ceramics and/or concrete. Fill material is underlain by a native tan or gray, fine-grained sand layer observed to the bottom of each boring location (approximately el -4.1 to el -8.1 NAVD88), with varying amounts of gravel, silt, and clay. Bedrock was not encountered in any of the soil borings.

2. Hydrogeology: Depth to groundwater was measured between about 5.98 to 6.85 feet bgs, with corresponding groundwater elevations ranging from about el 0.04 to el 0.81 NAVD88. The groundwater elevation is highest in the western part of the site and appears to flow southeast towards Coney Island Beach and the Lower New York Bay.

3. Historic Fill: Historic fill material was identified below surface cover to depths ranging from 2 to 10 feet bgs. Contaminants related to historic fill material were identified up to 12 feet bgs and include semivolatile organic compounds (SVOCs), metals, and pesticides, which were detected at concentrations above the 6 NYCRR Part 375 Unrestricted Use (UU), Restricted Use Restricted-Residential (RURR) and/or Protection of Groundwater (PG) soil cleanup objectives (SCOs) within this layer. The detected concentrations are

generally typical of historic fill material in New York City, with the exception of SVOCs in one soil boring (SB-7), which may be related to the former site use in this location.

4. Groundwater: Concentrations of SVOCs identified above the NYCRR Part 703.5 and Operational Guidance Series (TOGS) 1.1.1 Ambient Water Quality Standards and Guidance Values for Class GA water (collectively known as NYSDEC SGVs) are attributed to historic fill material. Dissolved metals in groundwater samples above SGVs and are characteristic of regional groundwater conditions. Polycyclic aromatic hydrocarbons (PAHs) in groundwater may also be attributed to historical site use as an automobile repair/machine shop facility.

5. Chlorinated Volatile Organic Compound (CVOC)-Impacted Soil, Groundwater, and Soil Vapor: Tetrachloroethylene (PCE) impacts in soil and groundwater have been identified in the northwestern part of the site, and are attributed to potential on-site degreasing operations associated with the former manufacturing building in this area. PCE and its daughter products were also identified in soil vapor at higher concentrations in this area.

Qualitative Human Health Exposure Assessment

Based upon the conceptual site model (CSM) and the review of environmental data, partial on-site exposure pathways appear to be present under current conditions, and in the absence of institutional and engineering controls, complete on-site exposure pathways could potentially exist during construction/remediation and future conditions.

Complete exposure pathways have the following five elements: 1) a contaminant source; 2) a contaminant release and transport mechanism; 3) a point of exposure; 4) a route of exposure; and 5) a receptor population. A discussion of the five elements comprising a complete pathway as they pertain to the site is provided below.

Current Conditions

Contaminant sources include historic fill with varying concentrations of SVOCs, metals, and pesticides, PAH-impacted groundwater and CVOC-impacted soil, groundwater, and soil vapor.

Contaminant release and transport mechanisms include contaminated soil transported as dust (dermal, ingestion, inhalation), and existing soil vapor contaminants (inhalation). Under current conditions, the likelihood of human exposure is limited, as 1) site access is restricted to employees, ownership and authorized visitors; 2) impermeable asphalt-paved surfaces cover the site; 3) the site is an open-air parking lot and impacted soil vapor that migrates vertically would be diluted with ambient air; and 4) the site is not a source of drinking water.

Construction/Remediation Activities

During development and remediation, the contaminant sources are the same as for current conditions. Points of exposure include disturbed and exposed soil during excavation, dust and organic vapors generated during excavation, and contaminated groundwater that will be encountered during excavation. Routes of exposure include ingestion and dermal absorption of contaminated soil and groundwater, inhalation of organic vapors arising from contaminated soil and groundwater, and inhalation of dust arising from contaminated soil. The receptor population includes construction and remediation workers and, to a lesser extent, the public adjacent to the site.

The potential for completed exposure pathways is present since all five elements exist; however, the risk will be minimized by the implementation of appropriate health and safety measures, such as monitoring the air for organic vapors and dust, using vapor and dust suppression measures, cleaning truck undercarriages before they leave the site to prevent off-site soil tracking, maintaining site security, and wearing the appropriate personal protective equipment (PPE).

Proposed Future Conditions

For the proposed future conditions, a Track 1 cleanup is anticipated. If a Track 1 cleanup is not feasible, residual contaminants may remain on-site and would, to a lesser extent include those listed under current conditions. In this scenario, if institutional and/or engineering controls are not implemented, points of exposure include potential cracks in the foundation or slab of the proposed development, and exposure during any future soil-disturbing activities. Routes of exposure would be limited to inhalation of vapors entering the buildings. The receptor population includes potential building tenants and/or employees, visitors and maintenance workers. The possible routes of exposure can be avoided or mitigated by the installation of engineering controls, such as soil vapor mitigation measures and/or a site capping system, and the implementation of institutional controls, such as a Site Management Plan (SMP).

Human Health Exposure Assessment Conclusions

1. Under current conditions, there is a marginal risk for exposure. The primary exposure pathways are dermal contact, ingestion and inhalation of soil, soil vapor, or groundwater by authorized site visitors in instances where the impermeable site cover is compromised or during site investigation. The exposure risks can be avoided or minimized by following the appropriate Health and Safety Plan (HASP) and vapor and dust suppression measures, and by implementing a Community Air Monitoring Plan (CAMP) during intrusive activities.
2. In the absence of engineering controls, there is a moderate risk of exposure during the construction and remediation activities. The primary exposure pathways are:

a. Dermal contact, ingestion and inhalation of contaminated soil, groundwater or soil vapor by construction workers.

b. Dermal contact, ingestion and inhalation of soil (dust) and inhalation of soil vapor by the community in the vicinity of the site.

These can be avoided or minimized by performing community air monitoring and by following the appropriate health and safety, vapor and dust suppression, and site security measures outlined in a site-specific HASP.

3. The existence of a complete exposure pathway for site contaminants to human receptors under future conditions is unlikely, as contaminant sources will be removed during site development, and if any residual soil remains, the building foundation would serve as a cap. Regional groundwater is not used as a potable water source in New York City, so exposure to regional groundwater contaminants is unlikely. The potential pathway for soil vapor intrusion into the building would be eliminated or addressed through the use of soil vapor mitigation measures (e.g., vapor barrier, sub-membrane depressurization system, or ventilated parking garage) if a Track 1 is not achieved, thereby minimizing the risk of exposure to any residual contaminated sub-slab soil vapor. A vapor evaluation will be completed after implementation of the remedy to determine if vapor mitigation is needed.

4. It is unlikely that a complete exposure pathway exists for the migration of site contaminants to off-site human receptors for current, construction phase, or future conditions. The site is currently covered with an asphalt cap and monitoring and control measures would be used during remediation and construction to prevent completion of this pathway. Under future conditions, the site will be remediated and, if necessary, engineering controls may be implemented (e.g. site-wide cap) to prevent completion of this pathway.

Summary of the Remedy

The selected remedy will include the following elements:

- Development and implementation of a Construction Health and Safety Plan (CHASP) and CAMP for the protection of on-site workers, community/residents, and environment during remediation and construction activities
- Design and construction of a support of excavation (SOE) system to facilitate the Track 1 remediation
- Implementation of soil erosion, pollution and sediment control measures in compliance with applicable laws and regulations
- Screening for indications of contamination (by visual means, odor, and monitoring with a photoionization detector [PID]) of excavated material during intrusive site work

- Excavation, stockpiling, off-site transport, and appropriate disposal of about 20,500 cubic yards of historic fill and native soil that exceeds UU SCOs as defined by 6 NYCRR Part 375-6.8
- Dewatering and groundwater treatment, as necessary, to accommodate the removal of material that exceeds UU SCOs
- If encountered, removal of any encountered underground storage tanks (USTs) and/or associated appurtenances (e.g., fill lines, vent line, and electrical conduit) and decommissioning and off-site disposal during redevelopment in accordance with DER-10, 6 NYCRR Part 613.9, NYSDEC Commissioner's Policy (CP)-51, and other applicable NYSDEC UST closure requirements
- Collection and analysis of confirmation soil samples post-excavation in accordance with DER-10 to confirm a Track 1 remedy was achieved; over-excavation will be completed if necessary to meet UU SCOs
- Importation of certified-clean material (i.e., material meeting UU SCOs), virgin stone, or recycled concrete aggregate (RCA), or virgin, native crushed stone to backfill over-excavated areas to construction depth
- Collection of post-excavation groundwater samples
- Completion of a vapor evaluation after implementation of the remedy to determine if vapor mitigation is needed

Remedial activities will be performed in accordance with this RAWP, and the Department-issued Decision Document. Deviations from the RAWP and/or Decision Document will be promptly reported to the NYSDEC for approval and fully explained in the Final Engineering Report (FER).

1.0 INTRODUCTION

This Remedial Action Work Plan (RAWP) was prepared on behalf of Coney Island Associates Phase 2 LLC (the Volunteer) for property identified as 1607 Surf Avenue in the Coney Island neighborhood of Brooklyn, New York (the site). The Volunteer intends to remediate the site in conjunction with a new affordable housing redevelopment under the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP) pursuant to Brownfield Cleanup Agreement (BCA) Index No. C224313-10-20, executed on November 11, 2020, for Site No. C224313.

This RAWP summarizes the nature and extent of contamination as determined from data gathered during the May 2018 Phase II Investigation completed by Hillman Consulting (Hillman), the Remedial Investigation (RI) completed by Langan between February 5, 2020 and February 20, 2020, and supplemental soil vapor investigations completed by Langan on December 3, 2020 and March 2, 2021. This RAWP identifies and evaluates remedial action alternatives, including Track 1 and 2 cleanups, their associated costs, and the recommended and preferred remedy, a Track 1 Unrestricted Use cleanup. The remedy described in this document is consistent with the procedures defined in Title 6 of the New York Codes, Rules and Regulations (6 NYCRR) Part 375-3.8 and the NYSDEC Division of Environmental Remediation (DER) Program Policy: Technical Guidance for Site Investigation and Remediation (DER-10) and complies with applicable federal, state, and local laws, regulations, and requirements. The NYSDEC and New York State Department of Health (NYSDOH) have not yet determined if the site poses a significant threat to human health and the environment. The significant threat determination will be made following the NYSDEC and NYSDOH review of the March 2021 RIR. The RI for this site did not identify fish and wildlife resources.

1.1 Site Location and Description

The site is located at 1607 Surf Avenue in the Coney Island neighborhood of Brooklyn, New York and is identified as Block 7062, Lot 28[3] on the department of Finance Tax Map. A site location map is provided as Figure 1. The site encompasses an area of approximately 59,393 square-feet (1.36 acres), is improved with an asphalt-paved parking lot and is bound by Surf Avenue to the south followed by MCU Park, West 16th Street to the east followed by a vacant parcel and several parking lots, West 17th Street to the west followed by a commercial office building and a parking lot, and a parking lot to the north. A site layout plan is provided in Figure 2.

3 The site was formerly comprised of Block 7062, Lots 25, 28, and 34. All three lots are now merged into Block 7062, Lot 28.

According to the survey prepared by Meridian Layout Inc. on January 28, 2020, site surface elevations (el) range from about el 7.04 (at the northwest corner of the site) to el 7.22 NAVD88 (on the southeast corner)[4]. The topography of the site and surrounding area is generally level. A boundary survey is included as Appendix A.

1.2 Redevelopment Plan

Current plans call for the development of a new ten-story, mixed-use residential and commercial building with a footprint of about 42,500 square feet and approximately 23,600 square feet of open-air parking. All of the new residential units will be designated as affordable housing. The proposed development will include a slab-on-grade ground level with about 12,000 square feet of tenant amenity space (i.e. package room, lounge area) and utilities, about 10,900 square feet of commercial space, and an approximately 9,000 square foot community day care. The first floor of the new development will include about 25,150 square feet of residential space as well as amenities (i.e. laundry, children's play area, gym, courtyard) and a utility room. The second through tenth floors of the new development will be occupied by residential units. Proposed development plans are provided in Appendix B.

1.3 Description of Surrounding Property

The site is located in a mixed-use area with commercial and residential uses, vacant properties, parking lots, and public parks. The following is a summary of surrounding property usage:

Direction	Adjoining and Adjacent Properties			Surrounding Properties
	Block No.	Lot No.	Description	
South	7073	101	Surf Avenue followed by MCU/Steeplechase Park	A public park followed by Coney Island Beach and the Lower New York Bay.
North	7062	14	Parking Lot	Residential, commercial, mixed-use residential and commercial properties followed by Mermaid Avenue. Coney Island Creek.
West	7061	16	West 17th Street followed by a one-story commercial office building	Residential, commercial, and mixed-use residential and commercial properties, public facilities and institutions, parking facilities, and vacant land.
		20	West 17th Street followed by a parking lot	
		21	West 17th street followed by a parking lot	
East	7063	12	West 16th Street followed by a parking lot	Residential, commercial, and mixed-use residential and
		41	West 16th Street followed by a parking lot	

4 Elevations refer to North American Vertical Datum of 1988 (NAVD88), which is about 1.1 feet above mean sea level at Sandy Hook, NJ.

Direction	Adjoining and Adjacent Properties			Surrounding Properties
	Block No.	Lot No.	Description	
		40	West 16th Street followed by a vacant lot	commercial properties, vacant land, parking facilities, and an industrial property.
		39	West 16th Street followed by a vacant lot	
		38	West 16th Street followed by a parking lot	
		35	West 16th Street followed by a vacant lot	

Public infrastructure (storm drains, sewers, and underground utility lines) exists within the streets surrounding the site.

Land use within a half-mile radius is urban and includes residential, commercial, institutional, utility/transportation, light industrial buildings and public parks and beaches. The nearest ecological receptor is the Lower New York Bay, located about 1,400 feet south of the site. Sensitive receptors, as defined in DER-10, located within a half mile of the site include those listed below:

Number	Name (Approximate distance from site)	Address
1	MCU/Steeplechase Park (about 100 feet south of the site)	Surf Avenue between West 16th Street and West 21st Street Brooklyn, NY 11224
2	Our Lady of Solace School Day Care Center (about 518 feet northwest of site)	2865 West 19th Street Brooklyn, NY 11224
3	Brooklyn Public Library, Coney Island Branch (about 666 feet northwest of the site)	1901 Mermaid Avenue Brooklyn, NY 11224
4	Abe Stark Skating Rink (about 0.17 miles south of the site)	Surf Avenue between West 19th Street and West 20th Street Brooklyn, NY 11224
5	Coney Island Museum (about 0.21 miles southeast of the site)	1208 Surf Avenue Brooklyn, NY 11224
6	Luna Park Neighborhood Senior Center (about 0.22 miles northeast of the site)	2880 West 12th Street Brooklyn, NY 11224
7	Santos White Garden (about 0.22 miles northwest of the site)	Surf Avenue and West 21st Street Brooklyn, NY 11224
8	PAL La Puerta Abierta Pre-K and Day Care Center (about 0.24 miles northwest of the site)	2864 West 21st Street Brooklyn, NY 11224

Number	Name (Approximate distance from site)	Address
9	Neptune Playground (about 0.24 miles northeast of the site)	West 12th Street between Neptune Avenue and Surf Avenue Brooklyn, NY 11224
10	National Association of Family Development Centers, Inc. (about 0.24 miles northeast of the site)	2840 West 12th Street Brooklyn, NY 11224
11	PS 90 Edna Cohen School and Pre-K (about 0.24 miles northeast of the site)	2840 West 12th Street Brooklyn, NY 11224
12	Luna Playground (about 0.30 miles east of the site)	Surf Avenue between West 12th Street and West 8th Street Brooklyn, NY 11224
13	Dvora, Inc. Day Care Center (about 0.35 miles northeast of the site)	2817 West 12th Street Brooklyn, NY 11224
14	PAL Carey Gardens Day Care Center (about 0.36 miles southwest of the site)	2964 West 23rd Street Brooklyn, NY 11224
15	Police Athletic League Day Care Center (about 0.36 miles west of the site)	2964 West 23rd Street Brooklyn, NY 11224
16	The Cyclone at Coney Island (about 0.37 miles southeast of the site)	Surf Avenue and West 10th Street Brooklyn, NY 11224
17	Carey Gardens Boys and Girls Club (about 0.38 miles southwest of the site)	2315 Surf Avenue Brooklyn, NY 11224
18	Harbour House Neighborhood Senior Center (about 0.43 miles southwest of the site)	3024 West 24th Street Brooklyn, NY 11224
19	Surf Playground (about 0.47 miles southwest of the site)	Surf Avenue between West 25th Street and West 27th Street Brooklyn, NY 11224
20	P.S. 288 The Shirley Tanyhill Universal Pre-K (about 0.47 miles southwest of the site)	2950 West 25th Street Brooklyn, NY 11224
21	Coney Island Beach and Boardwalk (about 0.48 miles west of the site)	Corbin Place to W 37th Street
22	I.S 239 Mark Twain School (about 0.48 miles northwest of the site)	2401 Neptune Avenue Brooklyn, NY 11224

Number	Name (Approximate distance from site)	Address
24	Poseidon Playground (about 0.49 miles southwest of the site)	Surf Avenue between West 25th Street and West 27th Street Brooklyn, NY 11224

2.0 DESCRIPTION OF REMEDIAL INVESTIGATION FINDINGS

The RI and supplemental soil vapor investigations were completed in accordance with 6 NYCRR Part 375, DER-10, and the NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York (October 2006 and subsequent updates). The RI was completed from February 5, 2020 to February 20, 2020 to investigate potential Areas of Concern (AOCs) and to determine, to the extent practical, the nature and extent of contamination in soil, groundwater, and soil vapor. Supplemental soil vapor investigations were completed on December 3, 2020 and March 2, 2021 at the request of the NYSDEC and NYSDOH to determine if impacted soil vapor is potentially emanating beyond the site boundary and is impacting surrounding properties.

2.1 Field Investigation

The RI consisted of the following:

- A geophysical survey to identify potential underground storage tanks (USTs), underground structures, and utilities
- Advancement of 20 soil borings to depths between 10 and 15 feet below grade surface (bgs), from which 62 soil samples (including 3 quality assurance/quality control [QA/QC] duplicate samples) were collected
- Installation of 12 groundwater monitoring wells and collection of 13 groundwater samples (including one QA/QC duplicate sample), one from each well location
- Survey and gauging of monitoring wells to evaluate groundwater elevation and flow direction
- Installation of 25 temporary soil vapor probes and collection of 27 soil vapor samples (including two QA/QC duplicate samples) and 4 ambient air samples

2.1.1 Geophysical Investigation

On February 5, 2020, NOVA Geophysical Services Inc. (NOVA) of Douglaston, New York completed a geophysical survey under the supervision of a Langan field geologist. NOVA used ground-penetrating radar (GPR) to identify potential USTs and locate buried utilities near each boring location. Geophysical anomalies consistent with utilities (i.e., gas and electric lines) were identified throughout the site, and borings were relocated as necessary. No anomalies resembling USTs were identified.

2.1.2 Soil Investigation

Twenty soil borings (SB-1 through SB-20) were completed during the RI by Aquifer Drilling & Testing (ADT) of Mineola, New York. Boring locations were selected to evaluate potential AOCs listed in Section 2.4.2 and to supplement the previous environmental investigation. All borings were advanced to between 10 and 15 feet bgs with direct push methodologies using a Geoprobe® 7822DT drill rig. A map showing the boring locations is presented on Figure 3. The following table indicates which borings are associated with each potential AOC.

Potential AOC	Associated Soil Borings
PAOC 1 – Historic Fill	SB-1 through SB-20
PAOC 2 – Historic Manufacturing Facility	SB-1, SB-4, SB-5
PAOC 3 – Historic Automobile Repair and Machine Shop	SB-7, SB-12, SB-13
PAOC 4 – Historic Uses of Adjoining Properties	SB-2, SB-3, SB-4, SB-6, SB-8, SB-10, SB-14

Discrete soil samples were collected from the surface to the final depth of each boring and were visually classified for soil type, grain size, texture, and moisture content. Samples were collected in 4-foot long acetate liners from the direct push Geoprobe® 7822DT.

In general, three grab soil samples were collected for laboratory analysis from each boring location to investigate potential AOCs and to provide vertical and horizontal delineation of identified impacts. In addition, nine QA/QC samples (including three duplicates, three matrix spike/matrix spike duplicate [MS/MSD] samples, and three field blanks) were collected. For AOC 1, samples were collected within the historic fill material. For AOCs 2, 3 and 4, samples were collected from historic fill, from native and/or fill material at the groundwater interface, and/or from native material below the groundwater interface.

The soil was screened for visual, olfactory, and instrumental evidence of environmental impacts and was visually classified for soil type, grain size, texture, and moisture content. Instrument screening for the presence of volatile organic compounds (VOCs) was performed with a photoionization detector (PID) equipped with a 10.6-electron volt (eV) lamp. A Langan engineer documented the work, logged the soil type, screened the soil samples for environmental impacts, and collected environmental samples for laboratory analyses. Soil boring logs are appended to the RIR. Following sample collection, twelve borings were converted to groundwater monitoring wells. Soil cuttings were backfilled into the original boring locations that were not converted into permanent monitoring wells or used to reach appropriate depth for installation of groundwater monitoring wells.

2.1.3 Groundwater Investigation

A Langan field engineer documented conversion of 12 soil borings into permanent groundwater monitoring wells by ADT. One groundwater sample was collected from each monitoring well to characterize groundwater conditions and to investigate potential groundwater impacts associated with the AOCs. One duplicate groundwater sample was also collected. Groundwater monitoring wells were installed to investigate potential impacts to groundwater associated with the identified AOCs and to characterize groundwater conditions. Monitoring well locations are presented on Figure 4.

2.1.4 Soil Vapor Investigation

NYSDEC DER-10 requires an assessment of soil vapor for contaminated sites to evaluate the health risk associated with potential exposure to VOCs through vapor intrusion into occupied spaces. Twenty-five soil vapor points were installed throughout the property to identify impacts potentially associated with historic site use or adjacent site use. Four ambient air samples were collected for QA/QC purposes. Soil vapor sample locations are presented on Figure 5.

2.1.5 Chemical Analytical Work Performed

The laboratory analyses performed on the soil, groundwater, soil vapor, and ambient air samples collected are summarized below by media:

- Soil samples from all of the borings were analyzed for Part 375/Target Compound List (TCL) VOCs and semivolatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), pesticides, herbicides, Part 375/Target Analyte List (TAL) metals including hexavalent chromium, trivalent chromium, and total cyanide, as well as emerging contaminants (including 1,4-dioxane and polyfluoroalkyl substances [PFAS])
- Groundwater samples were analyzed for Part 375/TCL VOCs, SVOCs, and PCBs, Part 375/TAL total and dissolved metals, pesticides, and herbicides, and for emerging contaminants (including 1,4-dioxane and PFAS)
- Soil vapor air samples and ambient air samples were analyzed for VOCs by United States Environmental Protection Agency (EPA) Method TO-15

2.1.6 Summary of Remedial Investigation Findings

The conclusions are based on data collected during the February 2020 RI and December 2020/March 2021 supplemental soil vapor investigations. Soil, groundwater, and soil vapor analytical results are shown on Figures 3, 4, and 5. A cross-sectional diagram showing inferred soil profiles is included as Figure 6. The findings summarized herein are based on qualitative data (field observations and instrumental readings) and laboratory analytical soil, groundwater, and soil vapor sample results. Findings and conclusions are as follows:

1. Stratigraphy: The stratigraphy observed during the RI consists of a historic fill layer that extends from surface grade to depths ranging from 2 to 10 feet bgs, although observations of fill extending down to 13.5 feet were documented during a previous geotechnical investigation. The historic fill predominantly consists of brown and black,

fine-grained sand with varying amounts of gravel, brick, coal, slag, glass, ceramics and/or concrete. Fill material is underlain by a native tan or gray, fine-grained sand layer observed to the bottom of each boring location (approximately el -4.1 to el -8.1 NAVD88), with varying amounts of gravel, silt, and clay. Native material was not observed in the soil boring located in the western-central part of the site, where refusal was encountered at 10 feet bgs. Bedrock was not encountered in any of the soil borings.

2. Hydrogeology: Depth to groundwater was measured between about 5.98 to 6.85 feet bgs, with corresponding groundwater elevations ranging from about el 0.04 to el 0.81 NAVD88. The groundwater elevation is highest in the western part of the site and appears to flow southeast towards Coney Island Beach and the Lower New York Bay.

3. Historic Fill: Historic fill material was identified below surface cover to depths ranging from 2 to 10 feet bgs. Contaminants related to historic fill material were identified up to 12 feet bgs and include SVOCs, metals, and pesticides, which were detected at concentrations above the 6 NYCRR Part 375 Unrestricted Use (UU), Restricted Use Restricted-Residential (RURR) and/or Protection of Groundwater (PG) soil cleanup objectives (SCOs) in this layer. The detected concentrations are generally typical of historic fill material in New York City, with the exception of SVOCs in one soil boring (SB-7), which may be related to the former site use in this location.

4. Groundwater: Concentrations of SVOCs identified above the above the NYCRR Part 703.5 and Operational Guidance Series (TOGS) 1.1.1 Ambient Water Quality Standards and Guidance Values for Class GA water (collectively known as NYSDEC SGVs) are attributed to historic fill material. Dissolved metals in groundwater samples above SGVs and are characteristic of regional groundwater conditions. Polycyclic aromatic hydrocarbons (PAHs) in groundwater may also be attributed to historical site use as an automobile repair/machine shop facility.

5. Chlorinated Volatile Organic Compound (CVOC)-Impacted Soil, Groundwater, and Soil Vapor: Tetrachloroethylene (PCE) impacts in soil and groundwater have been identified in the northwestern part of the site, and are attributed to potential on-site degreasing operations associated with the former manufacturing building in this area. PCE and its daughter products were also identified in soil vapor at higher concentrations in this area.

2.1.7 Significant Threat

NYSDEC and NYSDOH have not yet determined whether this site poses a significant threat to human health and the environment.

2.2 Site History

2.2.1 Historical Site Use

Historical Sanborn Fire Insurance Maps indicate that the site was largely undeveloped with the southeastern part developed with residential dwellings, a shed, and a store in 1895. By 1906, the southern part of the site was developed with stores, sheds, and Johnstown Flood Auditorium. By 1930, the property was primarily developed with the Tilyou Theater, storefronts, and an automobile repair facility on the eastern part of the property. Site conditions appear generally the same by 1950 except a machine shop is identified on the eastern part of the property and a manufacturing facility is identified on the northwestern part of the property. By 1966, the manufacturing facility and the machine shop are no longer identified although the Tilyou Theater remains along with stores, a wholesale produce shop, and automobile parking. Site conditions in 1966 are similar to those depicted in 1968. By 1977, the Tilyou Theater is no longer seen and by 1981 the wholesale produce shop is no longer depicted. Following 2001, the site appears as a vacant lot with automobile parking. Site conditions appear generally the same to 2007. City Directory documents also provide additional prior site usage detail including a photo studio (1934-1970), a printing studio/business (1934-1970), an exterminator (1934-1945), and a machinist/machine works (1928-1970).

2.2.2 Previous Environmental Reports

Previous environmental reports were reviewed as part of the RIR and are summarized below. The reports are included in Appendix C.

- *Phase I Environmental Site Assessment (ESA), prepared by Hillman, Dated May 31, 2018*
- *Phase II Investigation Report prepared by Hillman, Dated June 13, 2018*
- *Geotechnical Memorandum, prepared by GeoDesign, Inc. (GeoDesign), Dated August 6, 2018*

Phase I Environmental Site Assessment, prepared by Hillman, Dated May 31, 2018

The Phase I ESA was completed in accordance with the American Society for Testing Materials International (ASTM) Standard E1527-13 and the USEPA All Appropriate Inquiries (AAI) Rule. The following recognized environmental conditions (REC) were identified:

- REC 1 - Historical On-Site Operations: The site historically operated as an automobile repair facility in 1930, a manufacturing facility in 1950, and a machine shop between 1928 and 1970. Additionally, operations identified on the property from city directories include a photo studio, print and publishing business, exterminator, machinist, and iron/machine works. Two 1,000-gallon tanks associated with the Tilyou Theatre, operating from 1926 to 1973, were also identified; however, it should be noted that the tanks appear to be water tanks and not petroleum storage tanks. Hillman also identified the potential for buried petroleum tanks associated with former business operations on the property, though evidence of these tanks were not identified during the Phase I ESA. Leaks or spills of petroleum products, solvents, and/or other hazardous materials associated with former business operations may have adversely affected soil, groundwater and/or soil vapor at the site.

Adjacent and surrounding site uses of concern were also identified including dry cleaners to the north (1950-2007) and west (1965-2006) and a railroad (1895-1906) to the north.

Phase II Investigation Report, prepared by Hillman Consulting LLC, Dated May 31, 2018

Hillman completed a Phase II Investigation in May 2018 to determine if soil, groundwater, and soil vapor conditions were impacted as a result of the historical site use as an automobile repair facility, manufacturing facility, and machine shop. The Phase II was completed at the site and at the adjoining site to the west located at Block 7061 Lots 14, 20, and 27; however, only the investigation scope and results for the site are discussed herein. The investigation included advancement of five soil borings, installation of one temporary groundwater monitoring well, installation of two temporary soil vapor sample probes, and collection of soil, groundwater, and soil vapor samples. Field observations and laboratory analytical results are summarized below:

- Geology/Hydrogeology: Historic fill was encountered between 3 and 6 feet bgs. Fill was underlain by native sands to the termination depth of borings at 10 feet bgs. Groundwater was encountered between 6 and 8 feet bgs.
- Soil: Five soil borings were advanced up to 10 feet bgs using a track-mounted GeoProbe© rig in the northeastern, northwestern, southeastern, southwestern, and central parts of the site. One boring was installed in the vicinity of the former manufacturing building and one boring was installed in the vicinity of the former automobile repair and machine shop. No evidence of petroleum impacts (e.g., staining, odors or PID readings above background) was observed during the soil boring investigation. Soil samples were analyzed for VOCs, SVOCs, pesticides, PCBs, and metals. No VOCs or PCBs were detected above NYSDEC Part 375 SCOs. PAHs, a subset of SVOCs, and metals were identified in exceedance of the NYSDEC Part 375 UU RURR SCOs. Pesticides were detected in exceedance of the UU SCOs but below the RURR SCOs. Hillman attributed the elevated concentrations of PAHs and metals with the presence of historic fill.
- Groundwater: The temporary groundwater monitoring well was installed in the northeastern corner of the site in the vicinity of the former automobile repair and machine shop. The groundwater sample was analyzed for VOCs, SVOCs, pesticides, PCBs, and metals (total and dissolved). No VOCs, PCBs, or pesticides were detected in exceedance above NYCRR Part 703.5 NYSDEC SGVs. PAHs and one metal (sodium, both total and

dissolved) were detected in exceedance of the SGVs. Hillman attributed the elevated concentrations of PAHs in groundwater to the presence of suspended solids (presumably, from the historic fill layer). Hillman also attributed the elevated concentrations of total and dissolved sodium to regional groundwater conditions as the site is located in close proximity to the Lower New York Bay.

- Soil Vapor: Two temporary soil vapor points were installed in the northwestern and southeastern parts of the site. A soil vapor point installed in the vicinity of the former manufacturing building contained PCE at 27,000 µg/m³, trichloroethylene (TCE) at 620 µg/m³, and cis-1,2-dichloroethylene (cis-1,2DCE) at 32 µg/m³. A conservative comparison of the PCE and TCE concentrations to the Decision Matrices recommends mitigation. As these compounds were not detected in exceedance of the regulatory criteria in soil or groundwater, Hillman attributed these elevated soil vapor concentrations to a non-sampled part of the site or an off-site source.

Geotechnical Memorandum, prepared by GeoDesign, Dated 6 August 2018

GeoDesign completed a geotechnical investigation to determine subsurface conditions and provide geotechnical recommendations. The investigation included advancement of 20 soil borings and installation of two temporary groundwater monitoring wells. The investigation revealed that the site stratigraphy generally consists of an approximately 3.5 to 13.5 feet thick historic fill layer underlain by loose to dense sands to a depth of at least 150 feet. Groundwater was measured at approximately 6.5 feet bgs. GeoDesign recommended either a shallow mat foundation or a pile-supported deep foundation.

2.3 Geological Conditions

Geologic and hydrogeologic observations are described below. Subsurface profiles are included as Figures 6. Soil boring logs, a groundwater contour map, and groundwater monitoring well construction logs are appended to the RIR.

2.3.1 Historic Fill Material

The asphalt-paved surfaces are underlain by a historic fill layer that extends from surface grade to between about 2 to 10 feet bgs. The fill layer was most shallow in the southeastern part of the site and deepest in the northern part of the site. The historic fill predominantly consists of brown and black, fine-grained sand with varying amounts of gravel, brick, coal, slag, glass, ceramics and/or concrete.

2.3.2 Native Soil Layers

Fill material is underlain by a native tan or gray, fine-grained sand layer observed to the bottom of each boring location (approximately el -4.1 to el -8.1 NAVD88), with varying amounts of gravel, silt, and clay.

2.3.3 Bedrock

Bedrock was not encountered during the RI. According to a geotechnical investigation completed by Langan in the vicinity of the site, the minimum depth of bedrock is expected to be at depths greater than 600 feet bgs.

2.3.4 Hydrogeology

Synoptic groundwater level measurements were collected on February 20, 2020. Depth to groundwater was measured between about 5.98 to 6.85 feet bgs, with corresponding groundwater elevations ranging from about el 0.04 to el 0.81 NAVD88. The groundwater elevation is highest in the western region of the site and appears to flow southeast towards Coney Island Beach and the Lower New York Bay. The relative progression of the contours demonstrates a horizontal flow pattern across the site, with a downward vertical gradient toward the southeast. A groundwater elevation contour map is provided as Figure 4 of the RIR that is included in Appendix C.

2.4 Contamination Conditions

2.4.1 Conceptual Site Model

A conceptual site model (CSM) was developed based on the findings of the RI and previous investigations to produce a simplified framework for understanding the distribution of impacted materials, potential migration pathways, and potentially complete exposure pathways.

Potential Sources of Contamination

Potential sources of contamination have been identified and include historic fill and historical site manufacturing and automobile repair/machine shop usage.

Historic fill material encountered beneath surface cover to depths ranging from about 2 to 10 feet bgs originated from unidentified source areas and was placed as backfill at an unknown time, prior to the current site use as a parking lot. SVOCs and metals detected at concentrations above the Part 375 UU, PG and RURR SCOs are related to the nature of the historic fill.

CVOCs were detected in soil vapor, and PCE was detected in soil and groundwater above the applicable soil and groundwater standards. In addition, PAHs were detected in soil and groundwater above applicable soil and groundwater standards near the eastern part of the site. These impacts are likely related to an on-site release from the former manufacturing building in the northwestern part of the site and the historical automobile repair/machine shop within the eastern part of the site.

Exposure Media

Impacted media include soil, groundwater, and soil vapor. Analytical data suggests that historic fill and native soil contains SVOCs, metals and pesticides up to about 12 feet bgs in exceedance of UU SCOs. Historic fill-related PAHs and metals were detected across the site. Groundwater was observed at depths ranging from 5.98 to 6.85 feet bgs, and impacts include VOCs, SVOCs, and metals. Soil vapor is impacted with CVOCs including PCE and daughter products, with the highest concentrations detected in the northwestern part of the site.

Receptor Populations

The site is currently an asphalt-paved parking lot. Under future conditions, human receptors may include construction and remediation workers, authorized guests visiting the site, and the public adjacent to the site, as well as potential future building occupants.

2.4.2 Description of Areas of Concern

Based on the site observations, the site development history, and the findings of previous environmental investigations, potential AOCs were identified and investigated during the RI and are described below. The AOCs are shown in Figures 3, 4, and 5.

2.4.2.1 Potential AOC-1: Historic Fill

Material from unknown sources may have been used as backfill during various phases of the site development history. According to boring logs from the 2018 Geotechnical Memorandum prepared by GeoDesign, the fill layer extends between 3.5 and 13.5 feet bgs across the site. According to boring logs from the 2018 Phase II Investigation Report performed by Hillman, the fill layer extends between 3 and 6 feet bgs across the site. Soil samples collected during the investigation identified PAHs and metals, including lead and mercury, in fill exceeding the RURR SCOs.

2.4.2.2 Potential AOC-2: Historical Manufacturing Facility

The northwestern part of the site historically operated as a manufacturer (1950). During the 2018 Phase II Investigation by Hillman, chlorinated solvents, including PCE and TCE, were detected in soil vapor in the northwestern part of the site at concentrations that would typically warrant mitigation. Chlorinated solvents associated with this former use may also be present in soil and groundwater. In addition, releases of petroleum products and/or other hazardous materials associated with manufacturing during the on-site operations may have adversely affected soil, groundwater and/or soil vapor.

2.4.2.3 Potential AOC-3: Historical Automobile Repair Shop and Machine Shop

The eastern part of the site historically operated as an automobile repair facility (1930) and a machine shop (1928-1970). In advertent releases of petroleum products, solvents, and/or other hazardous materials associated with automobile repair and machinery during the on-site operations may have adversely affected soil, groundwater and/or soil vapor.

2.4.2.4 Potential AOC-4: Historical Use of Adjoining Properties

Historic uses of adjoining and surrounding properties included dry cleaners to the north (1950-2007) and west (1965-2006) of the site. Undocumented spills or releases of chlorinated solvents or hazardous substances associated with those uses may have adversely affected groundwater or soil vapor beneath the site.

2.4.3 Identification of Standards, Criteria and Guidance

The following standards, criteria, and guidance are typically applicable to remedial action projects in New York State, and were consulted and adhered to as applicable:

- 29 Code of Federal Regulations (CFR) Part 1910.120 – Hazardous Waste Operations and Emergency Response
- 6 NYCRR Part 371 – Identification and Listing of Hazardous Wastes
- 6 NYCRR Part 372 – Hazardous Waste Manifest System and Related Standards for Generators, Transporters and Facilities
- 6 NYCRR Subpart 373-4 – Facility Standards for the Collection of Household Hazardous Waste and Hazardous Waste from Conditionally Exempt Small Quantity Generators
- 6 NYCRR Subpart 374-1 – Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities
- 6 NYCRR Subpart 374-3 – Standards for Universal Waste
- 6 NYCRR Part 375 – Environmental Remediation Programs
- 6 NYCRR Part 376 – Land Disposal Restrictions
- 6 NYCRR Part 750 – State Pollutant Discharge Elimination System (SPDES) Permits
- 12 NYCRR Part 56 – Industrial Code Rule 56 (Asbestos)
- CP-43 – Commissioner Policy (CP) on Groundwater Monitoring Well Decommissioning (December 2009)

- CP-51 – Soil Cleanup Guidance (2010)
- DER-10 – Technical Guidance for Site Investigation and Remediation (May 3, 2010)
- DER-23 – Citizen Participation Handbook for Remedial Programs (March, 2010)
- NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York (October 2006)
- TOGS 1.1.1 – Ambient Water Quality Standards & Guidance Values and Groundwater Effluent Limitations
- USEPA OSWER Directive 9200.4-17 – Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites (December 1997)
- Screening and Assessment of Contaminated Sediment (Division of Fish, Wildlife and Marine Resources, June 2014)
- NYSDEC – Sampling, Analysis, and Assessment of PFAS Under NYSDEC Part 375 Remedial Programs (2021)

2.4.4 Soil/Fill Contamination

Historic fill predominantly consisting of brown and black, fine-grained sand with varying amounts of gravel, brick, coal, slag, glass, ceramics and/or concrete was encountered at depths ranging from about 2 to 10 feet bgs. SVOCs, metals, and pesticides detected at concentrations above the Part 375 UU, PG, and/or RURR SCOs are likely related to the quality of historic fill, with the exception of SVOCs in the eastern part of the site, which may be related to the former auto repair facility.

PCE was detected above the Part 375 UU, PG, and RURR SCOs in the location of the former manufacturing building in the northwestern part of the site. PCE impacts in soil have been attributed to potential degreasing operations associated with this historical site use.

2.4.5 On-Site and Off-Site Groundwater Contamination

Evaluation of the groundwater analytical results identified VOCs, SVOCs, and naturally occurring metals above the SGVs. SVOCs were detected across the site at concentrations above TOGS SGVs; the source of SVOCs is historic fill. Metals, including antimony, iron, manganese, and sodium were also detected across the site but are naturally occurring and present in groundwater throughout New York City.

PCE was detected above the NYSDEC SGV in the groundwater sample collected within the former manufacturing building. Similar to soil, the presence of PCE in groundwater at this location is attributed to historical degreasing operations associated with historical manufacturing use.

2.4.6 Soil Vapor Contamination

PCE and daughter products (including TCE, cis-1,2-DCE, and vinyl chloride) were identified in soil vapor, primarily in the northwestern part of the site. The corresponding elevated concentrations of PCE in soil and groundwater in this area are the source of CVOCs in soil vapor.

2.5 Environmental and Public Health Assessments

2.5.1 Qualitative Human Exposure Assessment

Based upon the CSM and the review of environmental data, partial on-site exposure pathways appear to be present under current conditions, and in the absence of institutional and engineering controls, complete on-site exposure pathways could potentially exist in construction/remediation and future conditions.

Complete exposure pathways have the following five elements: 1) a contaminant source; 2) a contaminant release and transport mechanism; 3) a point of exposure; 4) a route of exposure; and 5) a receptor population. A discussion of the five elements comprising a complete pathway as they pertain to the site is provided below.

2.5.1.1 Current Conditions

Contaminant sources include historic fill with varying concentrations of SVOCs, metals, and pesticides, PAH-impacted groundwater and CVOC-impacted soil, groundwater, and soil vapor.

Contaminant release and transport mechanisms include contaminated soil transported as dust (dermal, ingestion, inhalation), and existing soil vapor contaminants (inhalation). Under current conditions, the likelihood of human exposure is limited, as 1) site access is restricted to employees, ownership and authorized visitors; 2) impermeable asphalt-paved surfaces cover the site; 3) the site is an open-air parking lot and impacted soil vapor that migrates vertically would be diluted with ambient air; and 4) the site is not a source of drinking water.

2.5.1.2 Construction/Remediation Activities

During development and remediation, the contaminant sources are the same as for current conditions. Points of exposure include disturbed and exposed soil during excavation, dust and organic vapors generated during excavation, and contaminated groundwater that will be encountered during excavation. Routes of exposure include ingestion and dermal absorption of contaminated soil and groundwater, inhalation of organic vapors arising from contaminated soil and groundwater, and inhalation of dust arising from contaminated soil. The receptor population includes construction and remediation workers and, to a lesser extent, the public adjacent to the site.

The potential for completed exposure pathways is present since all five elements exist; however, the risk will be minimized by the implementation of appropriate health and safety measures, such as monitoring the air for organic vapors and dust, using vapor and dust suppression measures, cleaning truck undercarriages before they leave the site to prevent off-site soil tracking, maintaining site security, and wearing the appropriate personal protective equipment (PPE).

2.5.1.3 Proposed Future Conditions

For the proposed future conditions a Track 1 cleanup is anticipated. If a Track 1 cleanup is not feasible, residual contaminants may remain on-site and would, to a lesser extent include those listed under current conditions. In this scenario, if institutional and/or engineering controls are not implemented, points of exposure include potential cracks in the foundation or slab of the proposed development, and exposure during any future soil-disturbing activities. Routes of exposure would be limited to inhalation of vapors entering the buildings. The receptor population includes potential building tenants and/or employees, visitors and maintenance workers. The possible routes of exposure can be avoided or mitigated by the installation of engineering controls, such as soil vapor mitigation measures and/or a site capping system, and the implementation of institutional controls, such as a Site Management Plan (SMP).

2.5.1.4 Human Health Exposure Assessment Conclusions

1. Under current conditions, there is a marginal risk for exposure. The primary exposure pathways are dermal contact, ingestion and inhalation of soil, soil vapor, or groundwater by authorized site visitors in instances where the integrity of the impermeable site cover is compromised or during site investigation. The exposure risks can be avoided or minimized by following the appropriate Health and Safety Plan (HASP) and vapor and dust suppression measures, and by implementing a Community Air Monitoring Plan (CAMP) during intrusive activities.
2. In the absence of engineering controls, there is a moderate risk of exposure during the construction and remediation activities. The primary exposure pathways are:
    a. Dermal contact, ingestion and inhalation of contaminated soil, groundwater or soil vapor by construction workers.
    b. Dermal contact, ingestion and inhalation of soil (dust) and inhalation of soil vapor by the community in the vicinity of the site.

    These can be avoided or minimized by performing community air monitoring and by following the appropriate health and safety, vapor and dust suppression, and site security measures outlined in a site-specific HASP.

3. The existence of a complete exposure pathway for site contaminants to human receptors under future conditions is unlikely, as contaminant sources will likely be removed during site development, and if any residual soil remains, the impermeable foundation cover would serve as a cap. Regional groundwater is not used as a potable water source in New York City, so exposure to regional groundwater contaminants is unlikely. The potential pathway for soil vapor intrusion into the building would be eliminated or addressed through the use of soil vapor mitigation measures (e.g., vapor barrier, sub-membrane depressurization system, or ventilated parking garage) if a Track 1 is not achieved, thereby minimizing the risk of exposure to any residual contaminated sub-slab soil vapor. A vapor evaluation will be completed after implementation of the remedy to determine if vapor mitigation is needed.
4. It is unlikely that a complete exposure pathway exists for the migration of site contaminants to off-site human receptors for current, construction phase, or future conditions. The site is currently covered with an asphalt cap and monitoring and control measures would be used during remediation and construction to prevent completion of this pathway. Under future conditions, the site will be remediated and, if necessary, engineering controls may be implemented (e.g. site-wide cap) to prevent completion of this pathway.

2.5.2 Fish and Wildlife Remedial Impact Analysis

The NYSDEC and NYSDOH have not yet determined if this site poses a significant threat to human health and the environment. The RI for this site did not identify fish and wildlife resources.

2.6 Remedial Action Objectives

Based on the results of the RI, the following Remedial Action Objectives (RAO) have been identified:

2.6.1 Soil

RAOs for Public Health Protection:

- Prevent ingestion/direct contact with contaminated soil
- Prevent inhalation exposure to contaminants volatilizing from soil

RAOs for Environmental Protection

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

2.6.2 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

- Remove site source(s) of groundwater contamination
- Restore the groundwater aquifer, to the extent practicable, to pre-disposal/pre-release conditions

2.6.3 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

3.0 DESCRIPTION OF REMEDIAL ACTION PLAN

This section presents an analysis of two proposed remedial alternatives that can potentially be achieved. The proposed SCOs will be the Track 1 Part 375 UU SCOs for Alternative I and Track 2 RURR and/or PG SCOs for Alternative II. Both alternatives are expected to achieve the established RAOs.

Additionally, to incorporate green remediation principles and techniques to the extent feasible in the future development at this site, the future on-site building will include, at a minimum, a 20-mil vapor barrier/waterproofing membrane on the foundation to improve energy efficiency as an element of construction. This will apply to both proposed cleanup alternatives.

3.1 Technical Description of Alternative I – Conditional Track 1

Alternative I, a Track 1 remedy, would include the following tasks:

- Development and implementation of a Construction Health and Safety Plan (CHASP) and CAMP for the protection of on-site workers, community/residents, and environment during remediation and construction activities
- Design and construction of a support of excavation (SOE) system to facilitate the Track 1 remediation
- Implementation of soil erosion, pollution and sediment control measures in compliance with applicable laws and regulations
- Screening for indications of contamination (by visual means, odor, and monitoring with a PID) of excavated material during intrusive site work
- Excavation, stockpiling, off-site transport, and appropriate disposal of about 20,500 cubic yards of historic fill and native soil that exceeds UU SCOs as defined by 6 NYCRR Part 375-6.8
- Dewatering and treatment, as necessary, to accommodate the removal of material that exceeds UU SCOs
- If encountered, removal of any encountered USTs and/or associated appurtenances (e.g., fill lines, vent line, and electrical conduit) and decommissioning and off-site disposal during redevelopment in accordance with DER-10, 6 NYCRR Part 613.9, NYSDEC CP-51, and other applicable NYSDEC UST closure requirements
- Collection and analysis of confirmation post-excavation soil samples in accordance with DER-10 to confirm a Track 1 remedy was achieved; over-excavation will be completed if necessary to meet UU SCOs

- Importation of certified-clean material (i.e., material meeting UU SCOs), virgin stone, or recycled concrete aggregate (RCA), or virgin, native crushed stone to backfill over-excavated areas to development depth
- Collection of post-excavation groundwater samples
- Completion of a vapor evaluation after implementation of the remedy to determine if vapor mitigation is needed

The Alternative I remediation extent is shown on Figure 7 and is based on data presented in the RIR. The proposed, tentative groundwater monitoring locations are shown on Figure 8 and the proposed, tentative sub-slab soil vapor and indoor air sampling locations are shown on Figure 9. UU SCOs are provided in Table 1. The requirements for each of the Alternative I tasks are described below.

3.1.1 On-Site Worker, Public Health, and Environmental Protection

A site-specific CHASP is appended to this RAWP (Appendix D) and will be enforced during excavation and foundation construction to protect site workers from accidents and acute and chronic exposures to the identified contaminated media. Public health will be protected by implementing and enforcing dust, odor, and organic vapor control and monitoring procedures included in the CAMP. The CAMP will include continuous perimeter monitoring of dust and organic vapor using DustTrak aerosol monitors and PIDs capable of recording data and calculating 15-minute averages. Field personnel will monitor site perimeters for visible dust and odors. The environment will be protected by implementing and enforcing the appropriate soil erosion prevention measures.

3.1.2 Excavation, SOE, and Fill and Soil Removal

VOCs, SVOCs, metals, and pesticides were detected in historic fill and native material at concentrations that exceed the UU SCOs, which are shown in Table 1. To achieve Track 1, historic fill and soil excavation will extend from surface grade to between about 5 and 13.5 feet bgs across the 59,393 square-foot site footprint, with specific excavation depths as follows based on soil boring analytical results from the February 2020 RI:

- Excavation to about 5 feet bgs in the areas containing soil borings SB-3, SB-7, SB-12, and SB-13 in the northeastern and east-central part of the site
- Excavation to about 6 feet bgs in the area containing soil borings SB-1, SB-4, SB-5, and SB-8 in the northwestern part of the site
- Excavation to about 12 feet bgs in the area containing soil boring SB-18 near the southwestern part of the site
- Excavation to about 13.5 feet bgs in the area containing soil borings SB-2 and SB-6 in the north-central part of the site

- Excavation to about 10 feet bgs across the remainder of the site footprint, including the locations of soil borings SB-9, SB-10, SB-11, SB-14, SB-15, SB-16, SB-17, SB-19, and SB-20 in the central, southeastern, and southwestern parts of the site

An SOE system (i.e. sheet pile wall) would be constructed to facilitate dewatering and excavation.

The estimated volume of material requiring removal and off-site disposal for a Track 1 cleanup is about 20,500 cubic yards. Soil will be screened for visual, olfactory, and instrumental evidence of environmental impacts during excavation. Before excavation begins, a Stormwater Pollution Prevention Plan (SWPPP) will be prepared to address erosion and sediment controls at the site.

3.1.3 Dewatering

To achieve a Track 1 remedy, dewatering will be required to accommodate excavation of soil that exceeds UU SCOs. The contractor will be responsible for dewatering in accordance with applicable regulations. Treatment of dewatering fluids may be required to reduce contaminant concentrations below New York City Department of Environmental Protection (NYCDEP)/NYSDEC effluent limitations prior to discharge. The dewatering and treatment system would be designed by the contractor's New York State (NYS)-licensed Professional Engineer.

3.1.4 UST Removal

If encountered, any USTs and/or associated appurtenances (e.g., fill lines, vent line, and electrical conduit) would be decommissioned in accordance with applicable NYSDEC tank closure requirements, including DER-10 Section 5.5 and 6 NYCRR Part 613.9, and NYSDEC CP-51. USTs and/or associated appurtenances would be registered and administratively closed with the NYSDEC Petroleum Bulk Storage (PBS) unit. Petroleum-impacted soil would be excavated, stockpiled separately, characterized, and disposed of off-site at a permitted disposal facility in accordance with applicable regulations. Following removal of any UST and associated grossly-impacted soil, if encountered, confirmation soil samples would be collected from the base and sidewalls of the excavation in accordance with DER-10. If the excavation were enlarged horizontally beyond the dimensions of the tank, additional confirmation soil samples would be collected as required. Closure documentation, such as contractor affidavits, bills of lading for sludge disposal, and tank disposal receipts, would be provided as appendices in the Final Engineering Report (FER).

3.1.5 Confirmation Soil Sampling

Per NYSDEC DER-10, confirmation soil samples would be collected from the excavation base at a frequency of one per 900 square feet. Sidewall samples would also be collected at a frequency of one sidewall sample per 30 linear feet of internal sidewall between areas of varied excavation depths. Sidewall samples would not be collected from the site perimeter because excavation would extend across the site footprint and SOE measures (i.e., sheet pile wall) would preclude access to soil sidewalls. An estimated 64 base-of-excavation and 19 sidewall confirmation soil samples, plus QA/QC samples, would be collected post-excavation in compliance with DER-10 and analyzed for the Part 375 list of VOCs, SVOCs, PCBs, pesticides, cyanide, metals including hexavalent and trivalent chromium, per- and PFAS and 1,4-dioxane. A reduced-frequency endpoint sampling plan may be proposed, with supporting rationale, in accordance with DER-10 Section 1.6.

3.1.6 Groundwater Monitoring

One VOC, PCE, was identified at concentrations above the NYSDEC SGVs in monitoring well MW-1 located in the northwestern part of the site during the February 2020 RI. The groundwater contamination will be addressed by removing source material in soil and dewatering. The performance of the treatment will be assessed via monitoring wells installed on site, at the tentative locations shown on Figure 8. Groundwater samples will be collected and analyzed for VOCs following excavation activities.

3.1.7 Soil Vapor Intrusion Evaluation

PCE and daughter products (including TCE, cis-1,2-DCE, and vinyl chloride) were identified in soil vapor, primarily in the northwestern part of the site. The corresponding concentrations of PCE in soil and groundwater in this area are the source of CVOCs in soil vapor. Following source removal, dewatering, and construction of the proposed development, a soil vapor intrusion evaluation will be completed to determine if vapor mitigation measures will be necessary. As such, although the design and installation of a sub-membrane depressurization system (SMDS) is not considered a part of the Track 1 remedy, the SMDS sub-grade components, including a minimum 20-mil vapor barrier that is compatible with CVOCs, and risers will be constructed as part of site redevelopment. The anticipated vacuum monitoring points that will be installed through the ground floor slab will be used to complete the soil vapor intrusion evaluation.

Six anticipated vacuum monitoring points will be utilized to collect sub-slab soil vapor samples, and six indoor air samples will be collected in nearby spaces on the ground floor. Samples will be collected in general accordance with the NYSDOH "Guidance for Evaluating Soil Vapor Intrusion in the State of New York, with updates" (October 2006). Before collecting vapor samples, a minimum of three vapor probe volumes will be purged from each sample point at a rate of less than 0.2 liters per minute using a RAE Systems MultiRAE® meter. Purged soil vapor will be monitored for VOCs and methane with the MultiRAE® during this process. Sub-slab vapor and indoor air sample locations are shown in Figure 9.

A helium tracer gas will be used in accordance with NYSDOH protocols to serve as a quality assurance/quality control (QA/QC) technique to document the integrity of each soil vapor sampling point seal before and after sampling. The tracer gas will be introduced into a container surrounding the vapor point and seal. Helium will be measured from the sampling tube and inside the container. If the sample tubing contains more than 10% of the tracer gas concentration that was introduced into the container, then the seal is considered compromised and should be enhanced or reconstructed to reduce outside air infiltration.

After the integrity of each seal is confirmed, soil vapor samples will be collected into laboratory-supplied, batch-certified clean 6-liter Summa® canisters with calibrated flow controllers. Sub-slab soil vapor samples and indoor air samples will be collected over a 24-hour sampling period. The Summa® canisters will be individually certified.

Prior to indoor air sample collection, a building chemical product inventory on the first floor will be conducted in accordance with NYSDOH protocols. The items identified in the building chemical product inventory as well as the building in general will be screened using a RAE Systems meter capable of detecting VOCs in the parts per billion (ppb) range. Indoor air samples will then be collected (concurrently with the soil vapor samples) at a height above the ground to represent the breathing zone (about 3 to 5 feet) into laboratory-supplied, batch-certified clean 6-liter Summa® canisters with calibrated flow controllers. Indoor air samples will be collected over a 24-hour sampling period.

An ambient air sample will be collected outside of the building at a height above the ground to represent the breathing zone (about 3 to 5 feet). The ambient air sample will be collected into laboratory-supplied, batch-certified clean 6-liter Summa® canisters with calibrated flow controller over a 24-hour sampling period (concurrently with the soil vapor and indoor air samples).

All samples will be analyzed for VOCs by USEPA Method TO-15.

3.1.8 Excavation Backfill

Following excavation to achieve a Track 1 cleanup, the site would be backfilled to development grade (i.e., the grade required to complete construction of the foundation components).

Imported backfill material would consist of clean fill that meets the UU SCOs or other acceptable fill material such as virgin stone from a quarry or RCA, and I would comply with 6 NYCRR Part 375-6.7(d) and NYSDEC DER-10 Section 5.4(e), Table 5.4(e)10, and Appendix 5. If RCA is imported to the site, it would come from a NYSDEC-registered facility in compliance with 6 NYCRR Part 360 registration and permitting requirements for the period of RCA acquisition. RCA imported from compliant facilities would not require chemical testing, unless required by NYSDEC under its terms for operation of the facility. Imported RCA must be derived from recognizable and uncontaminated concrete (less than 10% by weight passing through a No. 80 sieve). RCA is not acceptable for, and would not be used as, site cover or drainage material and will not be used to backfill areas that were over excavated to reach Track 1. An estimated 11,700 cubic yards of backfill would be required to raise the site to development grade upon completion of the Track 1 remediation.

3.2 Technical Description of Alternative II – Track 2

Alternative II, a Track 2 remedy, would include the following tasks:

- Development and implementation of a CHASP and CAMP for the protection of on-site workers, community/residents, and environment during remediation and construction activities
- Design and construction of an SOE system to facilitate the Track 2 remediation
- Implementation of soil erosion, pollution and sediment control measures in compliance with applicable laws and regulations
- Screening for indications of contamination (by visual means, odor, and PID monitoring) of excavated material during intrusive site work
- Excavation, stockpiling, off-site transport, and appropriate disposal of about 8,100 cubic yards of historic fill and native soil that exceeds RURR and/or PG SCOs as defined by 6 NYCRR Part 375-6.8.
- Dewatering and treatment, as necessary, to accommodate the removal of material that exceeds RURR and/or PG SCOs
- If encountered, removal of any USTs and/or associated appurtenances (e.g., fill lines, vent line, and electrical conduit) and decommissioning and off-site disposal during redevelopment in accordance with DER-10, 6 NYCRR Part 613.9, NYSDEC CP-51, and other applicable NYSDEC UST closure requirements
- Collection and analysis of confirmation soil samples post-excavation in accordance with DER-10 to confirm a Track 2 remedy was achieved; over-excavation will be completed if necessary to meet RURR and/or PG SCOs
- Completion of in-situ groundwater treatment via injection of liquid-activated carbon in the northeast corner of the site to treat PCE in groundwater
- Importation of certified-clean material (i.e., material meeting RURR and/or PG SCOs), virgin stone, or RCA, or virgin, native crushed stone to backfill over-excavated areas to construction depth
- Completion of a vapor evaluation after implementation of the remedy to determine if vapor mitigation is needed and if necessary, design and installation of an SMDS
- Establishment of use restrictions including prohibitions on the use of groundwater from the site and prohibitions on sensitive site uses, such as farming or vegetable gardening in residual site soil, to eliminate future exposure pathways

- Recording of an Environmental Easement (EE) to memorialize the remedial action and the and institutional controls to ensure that future owners of the site continue to maintain these controls as required

The Alternative II remediation extent is shown on Figure 10 and is based on data presented in the RIR and the proposed development plans. The lower of the RURR and/or PG SCOs are provided in Table 2. The requirements for each of the Alternative II tasks are described below.

3.2.1 On-Site Worker, Public Health, and Environmental Protection

A site-specific CHASP is appended to this RAWP (Appendix D) and will be enforced during excavation and foundation construction to protect site workers from accidents and acute and chronic exposures to the identified contaminated media. Public health will be protected by implementing and enforcing dust, odor, and organic vapor control and monitoring procedures included in the CAMP. The CAMP will include continuous perimeter monitoring of dust and organic vapor using DustTrak aerosol monitors and PIDs capable of recording data and calculating 15-minute averages. Field personnel will monitor site perimeters for visible dust and odors. The environment will be protected by implementing and enforcing the appropriate soil erosion prevention measures.

3.2.2 Excavation, SOE, and Fill and Soil Removal

VOCs, SVOCs, metals, and pesticides were detected in historic fill and native material at concentrations that exceed the RURR and/or PG SCOs, which are shown in Table 2. To achieve Track 2, soil removal and disposal will extend from surface grade to between about 2 and 12 feet bgs across the 59,393 square-foot site footprint, with excavations as follows based on soil boring analytical results from the February 2020 RI:

- Excavation to about 2 feet bgs across the majority of the site
- Excavation to about 4 feet in the areas containing soil borings SB-1 and SB-19 in the northwestern and south-central parts of the site
- Excavation to about 7 feet bgs in the area containing soil boring SB-17 in the southwestern part of the site
- Excavation to about 8 feet bgs in the areas containing soil borings SB-2, SB-10, and SB-11 in the north-central and west-central parts of the site
- Excavation to about 12 feet bgs in the area containing soil boring SB-18 near the southwestern part of the site

The estimated volume of material requiring removal and off-site disposal for a Track 2 cleanup is about 8,100 cubic yards. The soil will be screened for visual, olfactory, and instrumental evidence of environmental impacts during excavation. An SOE system would be constructed where required to facilitate excavation. A SWPPP will be prepared to address erosion and sediment controls at the site.

3.2.3 Dewatering

Localized dewatering of groundwater may be required to accommodate excavation of soil to reach the Track 2 SCOs. The contractor would be responsible for dewatering in accordance with applicable regulations. Treatment of dewatering fluids may be required to reduce contaminant concentrations below NYCDEP/NYSDEC effluent limitations prior to discharge. The dewatering and treatment system would be designed by the contractor's NYS-licensed Professional Engineer.

3.2.4 UST Removal

If encountered, any USTs and/or associated appurtenances (e.g., fill lines, vent line, and electrical conduit) would be decommissioned in accordance with applicable NYSDEC tank closure requirements, including DER-10 Section 5.5 and 6 NYCRR Part 613.9, and NYSDEC CP-51. USTs and/or associated appurtenances would be registered and administratively closed with the NYSDEC PBS unit. Petroleum-impacted soil would be excavated, stockpiled separately, characterized, and disposed of off-site at a permitted disposal facility in accordance with applicable regulations. Following removal of any UST and associated grossly-impacted soil, if encountered, confirmation soil samples would be collected from the base and sidewalls of the excavation in accordance with DER-10. Closure documentation, such as contractor affidavits, bills of lading for sludge disposal, and tank disposal receipts, would be provided as appendices in the FER.

3.2.5 Confirmation Soil Sampling

Per NYSDEC DER-10, documentation soil samples would be collected from the excavation base and sloping at a frequency of one per 900 square feet. Sidewall samples would also be collected at a frequency of one sidewall sample per 30 linear feet of internal sidewall between areas of varied excavation depths as well as along the sloping. An estimated 64 base-of-excavation and 25 sidewall documentation soil samples, plus QA/QC samples, would be collected post-excavation in compliance with DER-10 and analyzed for the Part 375 list of VOCs, SVOCs, PCBs, pesticides, cyanide, metals including hexavalent and trivalent chromium, per- and PFAS and 1,4-dioxane. A reduced-frequency endpoint sampling plan may be proposed, with supporting rationale, in accordance with DER-10 Section 1.6.

3.2.6 Groundwater Treatment

One VOC, PCE, was identified at concentrations above the NYSDEC SGVs in monitoring well MW-1 located in the northwestern part of the site during the February 2020 RI. The groundwater contamination will be addressed by removing source material in soil and with short-term groundwater treatment consisting of the in-situ injection of PlumeStop®, a liquid-activated carbon produced by Regenesis that will be used to treat the CVOC contamination.

The performance of the treatment will be assessed via monitoring wells installed on site. Groundwater samples will be collected and analyzed for VOCs prior- and post- application in order to provide a baseline for performance monitoring and to gauge the success of the groundwater treatment. Details regarding the injections and performance monitoring will be included in a subsequent treatability memo.

3.2.7 Soil Vapor Intrusion Evaluation

PCE and daughter products (including TCE, cis-1,2-DCE, and vinyl chloride) were identified in soil vapor, primarily in the northwestern part of the site. The corresponding concentrations of PCE in soil and groundwater in this area are the source of CVOCs in soil vapor. Following source removal, dewatering, and construction of the proposed development, a soil vapor intrusion evaluation will be completed to determine if vapor mitigation measures will be necessary. The SMDS sub-grade components, including a minimum 20-mil vapor barrier that is compatible with CVOCs, and risers will be constructed as part of site redevelopment. The anticipated vacuum monitoring points that will be installed through the ground floor slab will be used to complete the soil vapor intrusion evaluation.

Six anticipated vacuum monitoring points will be utilized to collect sub-slab soil vapor samples, and six indoor air samples will be collected in nearby spaces on the ground floor. Samples will be collected in general accordance with the NYSDOH “Guidance for Evaluating Soil Vapor Intrusion in the State of New York, with updates” (October 2006). Before collecting vapor samples, a minimum of three vapor probe volumes will be purged from each sample point at a rate of less than 0.2 liters per minute using a RAE Systems MultiRAE® meter. Purged soil vapor will be monitored for VOCs and methane with the MultiRAE® during this process. Sub-slab vapor and indoor air sample locations are shown in Figure 9.

A helium tracer gas will be used in accordance with NYSDOH protocols to serve as a quality assurance/quality control (QA/QC) technique to document the integrity of each soil vapor sampling point seal before and after sampling. The tracer gas will be introduced into a container surrounding the vapor point and seal. Helium will be measured from the sampling tube and inside the container. If the sample tubing contains more than 10% of the tracer gas concentration that was introduced into the container, then the seal is considered compromised and should be enhanced or reconstructed to reduce outside air infiltration.

After the integrity of each seal is confirmed, soil vapor samples will be collected into laboratory-supplied, batch-certified clean 6-liter Summa® canisters with calibrated flow controllers. Sub-slab soil vapor samples and indoor air samples will be collected over a 24-hour sampling period. The Summa® canisters will be individually certified.

Prior to indoor air sample collection, a building chemical product inventory on the first floor will be conducted in accordance with NYSDOH protocols. The items identified in the building chemical product inventory as well as the building in general will be screened using a RAE Systems meter capable of detecting VOCs in the ppb range. Indoor air samples will then be collected (concurrently with the soil vapor samples) at a height above the ground to represent the breathing zone (about 3 to 5 feet) into laboratory-supplied, batch-certified clean 6-liter Summa® canisters with calibrated flow controllers. Indoor air samples will be collected over a 24-hour sampling period.

An ambient air sample will be collected outside of the building at a height above the ground to represent the breathing zone (about 3 to 5 feet). The ambient air sample will be collected into laboratory-supplied, batch-certified clean 6-liter Summa® canisters with calibrated flow controller over a 24-hour sampling period (concurrently with the soil vapor and indoor air samples).

All samples will be analyzed for VOCs by USEPA Method TO-15. If the results of the evaluation indicate that mitigation is necessary, a SMDS will be installed. The SMDS design will be submitted as part of the remedial design phase.

3.2.8 Excavation Backfill

Following excavation to achieve a Track 2 cleanup, the site would be backfilled to development grade (i.e., the grade required to complete construction of the foundation components).

Imported material would consist of clean fill that meets the RURR and/or PG SCOs or other acceptable fill material such as virgin stone from a quarry or RCA, and would comply with 6 NYCRR Part 375-6.7(d) and NYSDEC DER-10 Section 5.4(e), Table 5.4(e)10, and Appendix 5. If RCA is imported to the site, it would come from a NYSDEC-registered facility in compliance with 6 NYCRR Part 360 registration and permitting requirements for the period of RCA acquisition. RCA imported from compliant facilities would not require chemical testing, unless required by NYSDEC under its terms for operation of the facility. Imported RCA must be derived from recognizable and uncontaminated concrete (less than 10% by weight passing through a No. 80 sieve). RCA is not acceptable for, and would not be used as, site cover or drainage material and will not be used to backfill areas that were excavated to reach Track 2. An estimated 2,300 cubic yards of backfill would be required to raise the site to development grade upon completion of the Track 2 remediation.

3.2.9 Site Management Plan and Environmental Easement

An EE would be recorded referencing institutional controls that are part of the selected remedy, which would be binding upon all subsequent owners and occupants of the property. The institutional controls would: 1) restrict the site's use to restricted-residential, commercial and industrial uses, although land use is subject to local zoning laws; 2) restrict the use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by the NYSDEC or NYSDOH; 3) require the completion and submission to the NYSDEC a periodic certification of institutional controls in accordance with Part 375; and 4) include notice-of-use restrictions of the site's soil. A soil vapor assessment will be completed for the new building. The SMP would identify all use restrictions and long-term monitoring and maintenance requirements to ensure the institutional controls and remain in place and are effective.

3.3 Evaluation of Remedial Alternatives

The following is an evaluation of the proposed remedial alternatives based on the NYSDEC BCP remedy evaluation criteria listed below. The first two criteria are considered "threshold criteria" and the remaining criteria are "balancing criteria". A remedial alternative must meet the threshold criteria in order to be considered and evaluated further under the balancing criteria.

- Protection of human health and the environment
- Compliance with standards, criteria, and guidance (SCG)
- Short-term effectiveness and impacts
- Long-term effectiveness and permanence
- Reduction of toxicity, mobility, or volume of contaminated material
- Implementability
- Cost effectiveness
- Community acceptance
- Land use

3.3.1 Protection of Public Health and the Environment

Alternative I – The Track 1 remedy would eliminate pathways of exposure from on-site contaminated media. Remediating the site to Track 1 standards would result in the removal and off-site disposal of soil with contaminant concentrations above UU SCOs. Any encountered USTs would be decommissioned, removed and disposed off-site, and CVOC-impacted groundwater would be treated via source removal and dewatering to the extent practicable. The RAOs for public health and environmental protection would be met through the removal of contaminated media at the site, which would eliminate possible ingestion, inhalation, or dermal contact.

Since no engineering or institutional controls would be required for this remedy to maintain the site in the future, this remedy is the most protective of human health and the environment.

Alternative II – The Track 2 remedy would provide reduced overall protection to public health and the environment to Alternative I. Remediating the site to Track 2 standards will result in the removal of all site soil that exceeds RURR and/or PG SCOs. Future exposure would need to be limited by the installation and operation of an SMDS and the establishment of an EE, governed by an SMP. The RAOs for public health and environmental protection would be met through the combination of contaminant removal, and institutional controls (including an EE and SMP).

Public health would be protected during remediation under both remedial alternatives by implementing and enforcing dust, odor, and organic vapor control and monitoring procedures when needed.

3.3.2 Compliance with Standards, Criteria, and Guidance

Alternative I – Remediating the site to Track 1 standards would comply with all applicable SCGs listed in Section 4.1.1 because of the removal of all impacted on-site materials.

Alternative II – Remediating the site to Track 2 standards would include removal of site material to achieve Track 2 RURR and/or PG SCOs, as set forth in DER-10, CP-51, and 6 NYCRR Part 375. Alternative II also complies with the restricted SCGs, but requires future site management through an SMP and EE.

Both remedial alternatives would comply with standards, criteria, and guidance that involve protection of human health and the environment by implementing and enforcing a site-specific CHASP and CAMP during the remedy. The Federal Occupational Safety and Health Administration (OSHA) requirements for on-site construction safety would be followed by any site contractors performing work under Alternatives I or II.

3.3.3 Short-Term Effectiveness and Permanence

Alternative I - The most significant short-term adverse impacts and risks to the community would be the potential complications and risk involved with designing and constructing the SOE. Potential impositions on roadway and pedestrian traffic associated with construction may be a result of the remedial excavation to achieve a Track 1 cleanup. Increased truck traffic to haul soil that exceeds UU SCOs and duration of associated construction-related noise may be necessary to achieve Track 1 standards, relative to Alternative II.

The excavated soil and fill would require about 1,025 20-cubic-yard capacity truck trips. Implementing the Alternative I concept would require approximately 6 months of effort (assuming normal work hours). Truck traffic would be routed on the most direct course using major thoroughfares where possible and flaggers would be used to protect pedestrians at site entrances and exits. The effects of these potential adverse impacts to the community, workers, and the environment would be minimized by implementing the respective control plans.

Alternative II - Alternative II will result in similar short-term adverse impacts and risks to the community for a shorter duration than Alternative I. The excavated soil and fill would require approximately 403, 20-cubic-yard truck trips. Implementing the Alternative II concept would require approximately 4 months of effort (assuming normal work hours).

Under both remedial alternatives, dust will be controlled by the on-site application of water spray as needed. Engineering controls, such as slowing the pace of work, applying foam and/or dust suppressant, and/or covering parts of the excavation will be used to suppress odors/dust when required. Work will be modified or stopped according to the action levels defined in the CAMP. There would be fewer short-term impacts for Alternative II than Alternative I, although generally the impacts are similar.

3.3.4 Long-Term Effectiveness and Permanence

Alternative I – A Track 1 remedy would remove all contaminated media exceeding UU SCOs from the site and would have the greater long-term effectiveness. PCE-impacted groundwater in the northwest corner of the site would be treated via source removal and dewatering, and would be monitored following excavation activities. Future site use would be unrestricted; therefore, the long-term effectiveness of this remedy would eliminate environmental risks and satisfy the objectives of this criterion.

Alternative II – Contaminants in soil may remain at concentrations above UU and/or PG SCOs. Contaminated groundwater would be treated via injection of liquid activated carbon. Contaminated soil vapor intrusion would be mitigated via installation and operation of an SMDS. Long-term effectiveness and permanence of this alternative would need to be achieved through the implementation of the SMP and through enforcement of an EE, which would require annual inspections and reporting in perpetuity.

3.3.5 Reduction of Toxicity, Mobility, and Volume

Alternative I – The Track 1 remedy would permanently and significantly reduce the toxicity, mobility, and volume of contamination through excavation and off-site disposal of all soil exceeding UU SCOs, and treatment of any impacted groundwater. Therefore, this remedy provides the highest level of toxicity, mobility and volume reduction of contaminated material.

Alternative II – The Track 2 remedy would reduce the toxicity, mobility, and volume of contaminated material by removing contaminated soil exceeding the RURR and/or PG SCOs. CVOC-impacted groundwater will be treated via injection of liquid activated carbon. An EE will be implemented to address soil that exceeds the UU SCOs. However, soil exceeding UU and/or PG SCOs would remain below the development depth.

An SMDS, which includes vapor monitoring points, will be designed in the event that a Track 1 cleanup is not achieved. A vapor evaluation will be completed after implementation of the remedy to determine if vapor mitigation is needed to address potential exposure pathways for soil vapor. The SMDS design will be submitted as part of the remedial design phase.

3.3.6 Implementability

Alternative I – Although implementing a Track 1 remedy will be technically challenging because of SOE and dewatering requirements, the location in Coney Island allows for a much easier installation of these measures than in other more densely occupied areas of the city due to the methods of SOE installation. Following installation of the SOE and dewatering system, this remedy will consist primarily of excavation with standard bucket excavators. The availability of local contractors, personnel, and equipment suitable to working in a structurally challenging environment is high due to the frequency of this type of remediation and construction in the region. Although there is increased time and construction costs associated with achieving an unrestricted use remediation, this alternative will eliminate the need for long-term engineering and institutional controls. This alternative is considered feasible.

Alternative II – The technical feasibility of implementing the Alternative II remedy is similar to Alternative I as excavation and dewatering is still required to achieve the Track 2 RURR and/or PG SCOs. This alternative will consist mostly of excavation with standard bucket excavators and groundwater treatment via liquid activated carbon in the northwest corner of the site. The availability of local contractors, personnel, and equipment suitable to working in a structurally challenging environment is high due to the frequency of this type of remediation in the region. This alternative is also considered feasible, but will be less protective of human health and the environment and will require the installation and operation of a SMDS and a long-term IC in the form of an EE.

3.3.7 Cost Effectiveness

Alternative I – Based on the assumptions detailed for Alternative I, the estimated remediation cost of a Track 1 cleanup is approximately $7.1 million. Because the site will be remediated to UU SCOs, there are no long-term operation, maintenance, or monitoring costs associated with the proposed remedy. Table 3 details the individual cost components used to arrive at this cost estimate.

Alternative II – Based on the assumptions detailed for Alternative II, the estimated remediation cost to achieve a Track 2 cleanup is approximately $5.1 million. Although Alternative II is more cost effective for remediation, the site will only be remediated to RURR and/or PG SCOs, and institutional controls in the form of an EE will be required for Alternative II. Table 4 outlines the individual cost-components used to arrive at this cost estimate.

3.3.8 Community Acceptance

Both remedial alternatives are expected to be acceptable to the community because the potential exposure pathways to on-site contamination would be addressed upon completion of the respective remedies and the site will be remediated to allow for a higher use. The selected remedy would be subject to a 45-day public comment period. Any substantive public comments received would be addressed before the remedy is approved.

3.3.9 Land Use

The current, intended, and reasonably anticipated future land use of the site and its surroundings are compatible with both remedial alternatives. The site is located in a Medium-Density Contextual Residence District (R7X) and the Special Coney Island District (CI). The proposed development will include a new ten-story, mixed-use residential and commercial building, with a footprint of about 42,500 square feet and approximately 23,600 square feet of open-air parking. The proposed development is consistent with zoning and land use in the area.

3.4 Selection of Preferred Remedy

Both alternatives will be protective of human health and the environment and meet the remedy selection criteria. Alternative I achieves all of the remedial action goals established for the redevelopment project, and is effective in the short- and long-term. Alternative I effectively reduces contaminant mobility and toxicity and is a superior alternative in the reduction of contaminant toxicity and volume. Alternative I is more effective in the long-term because it achieves unrestricted land use that is free of long-term site management, engineering controls, institutional controls, an EE, and associated future costs that would be required under Alternative II. Although the estimated remedial costs under Alternative II are less than Alternative I, the excavation depths for both remedial alternatives are comparable.

Alternative I is preferred over Alternative II if it can be feasibly and practically implemented while providing greater overall protection to human health and the environment. Therefore, Alternative I is the recommended remedial alternative for this site. However, if this Alternative is not achievable, Alternative II is similarly protective of human health and the environment.

Figure 7 depicts the Alternative I cleanup plan. Figure 10 depicts the Alternative II cleanup plan.

3.4.1 Zoning

According to the New York City Planning Commission Zoning Map 28d, the site is located within a Medium-Density Contextual Residence District (R7X) and the Special Coney Island District (CI). According to the New York City Planning Commission, the "R7 districts are medium-density apartment house districts mapped in much of the Bronx as well as the Upper West Side in Manhattan and Brighton Beach in Brooklyn. The height factor regulations for R7 districts encourage lower apartment buildings on smaller zoning lots and, on larger lots, taller buildings with less lot coverage". The proposed use is consistent with the current zoning. The surrounding area primarily consists of public parks, vacant properties, parking lots, and commercial, residential, and public buildings. A copy of the zoning map is included in Appendix E.

3.4.2 Surrounding Property Uses

The current, intended, and reasonably anticipated future land use of the site and its surroundings are compatible with the selected remedy. Surrounding land uses include public parks, and commercial, residential, and public buildings.

3.4.3 Environmental Justice Concerns

Per the "Potential Environmental Justice Areas in Southwest Brooklyn, Kings County, New York" map and the NYS Department of Labor's mapped boundaries for NYS Environmental Zones (En-Zones), the site is in a potential Environmental Justice area. The entire site footprint is located within Census Tract 326, a designated En-Zone that has a poverty rate of 42.8% and an unemployment rate of 26.90%. NYSDEC's Office of Environmental Justice acts as an advocate on behalf of these areas, which are disproportionately affected by environmental burdens.

3.4.4 Land Use Designations

There are no federal or state land use designations.

3.4.5 Population Growth Patterns

The population growth patterns and projections support the current and reasonably anticipated future land use.

3.4.6 Accessibility to Existing Infrastructure

To construct the proposed development, the asphalt-paved parking lot will be removed. Upon completion of the proposed development, water and sewer service will be provided by NYC water and sewer utilities, and electric and natural gas services will be supplied by Consolidated Edison. The property is close to New York City subway and bus routes.

3.4.7 Proximity to Cultural Resources

There are six sites listed as City Landmarks (L) within ½-mile of the site, summarized in the table below. Four properties in the National Register (NR) of Historic Places within approximately ½-mile of the site are listed below as a resource type Building (B) or Structure (S). The proposed remedy is not anticipated to adversely impact these cultural resources.

Property/Site	Status	Address
Coney Island Theater Building	L	1301 Surf Avenue Brooklyn, NY
Child's Restaurant Building	L	1208 Surf Avenue Brooklyn, NY
Child's Restaurant Building	L	2101 Boardwalk at West 21st Street, Brooklyn, NY
Wonder Wheel (Ferris Wheel)	L	3059 West 12th Street Brooklyn, NY
The Cyclone (Roller Coaster)	L/S	834 Surf Avenue Brooklyn, NY
Parachute Jump (Amusement Park Ride)	L/S	Riegelmann Boardwalk at West 16th Street, Brooklyn, NY
B and B Carousel	S	1615 Boardwalk, Brooklyn, NY
Coney Island Fire Station Pumping Station	B	2301 Neptune Avenue, Brooklyn, NY
Sources: NYS Historic Preservation Office, New York City Landmark's Preservation Commission https://nyclpc.maps.arcgis.com/apps/webappviewer/index.html?id=93a88691cace4067828b1eede432022b, and National Park Service Database of Listed properties on the National Register, https://www.nps.gov/maps/full.html?mapId=7ad17cc9-b808-4ff8-a2f9-a99909164466		

3.4.8 Proximity to Natural Resources

The site is not located close to important federal, state, or local natural resources including waterways, wildlife refuges, wetlands, and critical habitats of endangered or threatened species. The nearest ecological receptor is the Lower New York Bay, located about 1,400 feet south of the site.

3.4.9 Off Site Groundwater Impacts

Municipal water supply wells are not present in this area of New York City; therefore, groundwater from the site cannot affect municipal water supply wells or recharge areas.

3.4.10 Proximity to Flood Plains

According to the Federal Emergency Management Agency (FEMA) Flood Map Service Center (Map Number 3604970353F, dated September 05, 2007), the site is located in Zone AE, which is designated for areas subject to inundation by the 1% annual chance flood event.

3.4.11 Geography and Geology of the Site

The site is located in the southern part of the Brooklyn neighborhood of Coney Island, a peninsula on the southwestern end of Long Island, New York. Soil and bedrock stratigraphy throughout this part of Brooklyn typically consist of a layer of historic fill that overlies glacial till, decomposed bedrock, and bedrock. The glacial till deposits, also known as ground moraine, are a widespread dense layer of till material that typically consists of clay, silt, sand, gravel and boulders.

Historic fill consisting of predominantly brown and black, fine-grained sand with varying amounts of gravel, brick, coal, slag, glass, ceramics and/or concrete was encountered across the site beneath an asphalt paved surface to depths ranging from about 2 to 13.5 feet bgs. Fill material is underlain by a native tan or gray, fine-grained sand layer observed to the bottom of each boring location with varying amounts of gravel, silt, and clay. Depth to groundwater was measured between about 5.98 to 6.85 feet bgs, with corresponding groundwater elevations ranging from about el 0.04 to el 0.81 NAVD88. The groundwater elevation is highest in the western region of the site and appears to flow southeast towards Coney Island Beach and the Lower New York Bay.

3.4.12 Current Institutional Controls

The site was assigned an E-Designation for hazardous materials, air quality, and noise (E-229) as part of the May 2009 Coney Island Rezoning, pursuant to a City Environmental Quality Review (CEQR No. 08DME007K). The New York City Mayor's Office of Environmental Remediation (NYCOER) is aware of the project's proposed development plans and involvement in the BCP.

3.5 Summary of Selected Remedial Actions

Alternative I, a Conditional Track 1 remedy, will include the following tasks:

- Development and implementation of a CHASP and CAMP for the protection of on-site workers, community/residents, and environment during remediation and construction activities
- Design and construction of a SOE system to facilitate the Track 1 remediation
- Implementation of soil erosion, pollution and sediment control measures in compliance with applicable laws and regulations
- Screening for indications of contamination (by visual means, odor, and monitoring with a PID) of excavated material during intrusive site work
- Excavation, stockpiling, off-site transport, and appropriate disposal of about 20,500 cubic yards of historic fill and native soil that exceeds UU SCOs as defined by 6 NYCRR Part 375-6.8
- Dewatering and treatment, as necessary, to accommodate the removal of material that exceeds UU SCOs
- If encountered, removal of any encountered USTs and/or associated appurtenances (e.g., fill lines, vent line, and electrical conduit) and decommissioning and off-site disposal

during redevelopment in accordance with DER-10, 6 NYCRR Part 613.9, NYSDEC CP-51, and other applicable NYSDEC UST closure requirements

- Collection and analysis of confirmation soil samples post-excavation in accordance with DER-10 to confirm a Track 1 remedy was achieved
- Importation of certified-clean material (i.e., material meeting UU SCOs), virgin stone, or RCA, or virgin, native crushed stone to backfill excavated areas to development depth
- Collection of post-excavation groundwater samples
- Completion of a vapor evaluation after implementation of the remedy to determine if vapor mitigation is needed

Remedial activities will be performed in accordance with this RAWP, and the Department-issued Decision Document. Deviations from the RAWP and/or Decision Document will be promptly reported to the NYSDEC for approval and fully explained in the FER.

4.0 REMEDIAL ACTION PROGRAM

4.1 Governing Documents

The primary documents governing the remedial action are summarized in this section.

4.1.1 Standards, Criteria, and Guidance

The following standards, criteria, and guidance are typically applicable to Remedial Action projects in New York State, and will be consulted and adhered to as applicable:

- 29 CFR Part 1910.120 – Hazardous Waste Operations and Emergency Response
- 6 NYCRR Part 371 – Identification and Listing of Hazardous Wastes
- 6 NYCRR Part 372 – Hazardous Waste Manifest System and Related Standards for Generators, Transporters and Facilities
- 6 NYCRR Subpart 373-4 – Facility Standards for the Collection of Household Hazardous Waste and Hazardous Waste from Conditionally Exempt Small Quantity Generators
- 6 NYCRR Subpart 374-1 – Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities
- 6 NYCRR Subpart 374-3 – Standards for Universal Waste
- 6 NYCRR Part 375 – Environmental Remediation Programs
- 6 NYCRR Part 376 – Land Disposal Restrictions
- 6 NYCRR Part 750 –SPDES Permits
- CP-43 – CP on Groundwater Monitoring Well Decommissioning (December 2009)
- CP-51 – Soil Cleanup Guidance (2010)
- DER-10 – Technical Guidance for Site Investigation and Remediation (May 3, 2010)
- DER-23 – Citizen Participation Handbook for Remedial Programs (March, 2010)
- NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York (October 2006)
- TOGS 1.1.1 – Ambient Water Quality Standards & Guidance Values and Groundwater Effluent Limitations
- USEPA OSWER Directive 9200.4-17 – Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites (December 1997)

- Screening and Assessment of Contaminated Sediment (Division of Fish, Wildlife and Marine Resources, June 2014)

4.1.2 Site Specific Health & Safety Plan

The Remediation Engineer (RE) prepared a site-specific CHASP (Appendix D). The CHASP will address site-specific contaminants and will apply only to remedial and construction-related work on-site. Contractors operating on the site are required to adhere to their own plans that, at a minimum, meet the requirements of the CHASP. Remedial work performed under this plan will be in compliance with governmental requirements, including site and worker safety requirements mandated by OSHA. The CHASP provides a mechanism for establishing on-site safe working conditions, safety organization, procedures, and PPE requirements during implementation of the remedy. The CHASP meets the requirements of 29 CFR 1910 and 29 CFR 1926 (which includes 29 CFR 1910.120 and 29 CFR 1926.65). The CHASP includes, but is not limited to, the following components:

- Organization and identification of key personnel
- Training requirements
- Medical surveillance requirements
- List of site hazards
- Excavation safety
- Drill rig safety
- Work zone descriptions and monitoring procedures
- Personal safety equipment and PPE requirements
- Decontamination requirements
- Standard operating procedures
- Protective measure plan
- CAMP
- Safety Data Sheets (SDS)

The Volunteer and associated parties preparing the remedial documents submitted to the State and those performing the construction work are responsible for the preparation of an appropriate HASP and for the appropriate performance of work according to that plan and applicable laws.

The CHASP and requirements defined in this RAWP pertain to all remedial and invasive work performed at the site until the issuance of a Certificate of Completion. The Langan Site Safety Coordinator will be William Bohrer. If required for site workers, confined space entry will comply with all OSHA requirements to address the potential risk posed by combustible and toxic gasses. Langan personnel will not enter confined spaces.

4.1.3 Quality Assurance Project Plan

The RE prepared a Quality Assurance Project Plan (QAPP) that describes the quality control components that will ensure that the proposed remedy accomplishes the remedial goals, remedial action objectives, and is completed in accordance with the design specifications. The QAPP is provided as Appendix F and includes:

- Responsibilities of key personnel and their organizations for the proposed remedy
- Qualifications of the quality assurance officer
- Sampling requirements including methodologies, quantity, volume, locations, frequency, acceptance and rejection criteria
- Description of the reporting requirements for quality assurance activities including weekly quality assurance review reports, periodic quality assurance and quality control audits, and other report and data submissions

4.1.4 Construction Quality Assurance Plan

The RE prepared a Construction Quality Assurance Plan (CQAP) that describes the quality control components that will ensure that the proposed remedy accomplishes the remedial goals and RAOs, and is completed in accordance with the design specifications. Because the remedy is being accomplished concurrent with building construction, the Contractor and Construction Manager will have the primary responsibility to provide construction quality. A list of engineering personnel involved in implementation of the CQAP and procedures that will be carried out by the remedial engineering team are identified below. Project personnel resumes are provided in Appendix G.

The following project personnel are anticipated to implement the RAWP.

Remediation Engineer (RE):	Jason Hayes, P.E., LEED AP
Project Manager:	Brian Gochenaur, QEP
Langan Health & Safety Officer:	Tony Moffa, ASP, CHMM, COSS
Langan Site Safety Coordinator:	William Bohrer, P.G.
Qualified Environmental Professional (QEP):	Michael Burke, P.G., CHMM
Field Team Leader:	Jessica Friscia, P.E.
Quality Assurance Officer:	Emily Strake, CEP

Langan personnel under the direct supervision of the Qualified Environmental Professional (QEP) and the RE will be on-site during implementation of the RAWP to document soil excavation and disposal and to monitor particulates and organic vapor in accordance with the CAMP. CAMP results that exceed specified action levels will be reported to the NYSDEC and NYSDOH in daily reports.

Langan personnel will meet with the Construction Superintendent on a daily basis to discuss the plans for that day and schedule upcoming activities. Langan personnel will document remedial activities in the daily report. This document will be forwarded to the Field Team Leader on a daily basis and to the Qualified Environmental Professional, Project Manager, and the RE on a weekly basis.

Langan personnel will screen excavations with a PID during ground-intrusive work. PID readings, including specifically elevated readings above the CAMP action levels, will be recorded in the project field book (or on separate logs) and reported to the NYSDEC and NYSDOH in the daily reports. Langan personnel under the direct supervision of the RE and Qualified Environmental Professional will collect confirmation samples from the base of excavation in accordance with this RAWP.

The project field book will be used to document sampling activities and how they correspond to this RAWP. Field observations and laboratory tests will be recorded in the project field book or on separate logs. Recorded field observations may take the form of notes, charts, sketches, and/or photographs. A photo log will be kept to document construction activities during remediation. The photo log may also be used to document those activities recorded in the daily reports.

The Field Team Leader will maintain the current field book and original field paperwork during performance of the remedy. Remedial activities will be documented in the monthly BCP progress reports. The Project Manager will maintain the field paperwork after completion and will maintain submittal document files.

4.1.5 Soil/Materials Management Plan

The RE prepared a Soil/Materials Management Plan (SMMP) that includes detailed plans for managing soil/materials that are disturbed at the site, including excavation, handling, storage, transport and disposal. The SMMP also includes controls that will be applied to these efforts to facilitate effective, nuisance-free performance in compliance with applicable federal, state and local laws and regulations (see Section 5.4).

4.1.6 Stormwater Pollution Prevention Plan

A SWPPP will be required because the project will disturb greater than one acre. Erosion and sediment controls will be implemented as necessary in conformance with requirements presented in the New York State Guidelines for Urban Erosion and Sediment Control. Best Management Practices (BMP) for soil erosion will be selected to minimize erosion and sedimentation off site from the start of the remediation to the completion of development.

Erosion and sediment control measures will be implemented as described in Section 5.4.9. If required, dewatering fluids will be removed from the site and will be treated in accordance with a NYSDEC-approved SPDES permit prior to discharge into a combined sewer.

4.1.7 Community Air Monitoring Program

Community air monitoring will be conducted in accordance with the CAMP discussed in the HASP (Appendix D of this RAWP) and in accordance with the NYSDOH Generic CAMP included as Appendix 1A in DER-10. NYSDEC and NYSDOH will be notified immediately (within 24 hours) of any CAMP exceedances and corrective actions taken. In addition, notification of corrective actions to NYSDEC and NYSDOH will also occur independently of Daily Reports.

4.1.8 Contractor's Site Operations Plan

Prior to remediation, the RE will review plans and submittals for this remedial project (including those listed above and contractor and sub-contractor document submittals) and confirm that the plans and submittals are in compliance with this RAWP. The RE is responsible to ensure that later document submittals for this remedial project, including contractor and sub-contractor document submittals, are in compliance with this RAWP. Remedial documents, including contractor and subcontractor document submittals, will be submitted to NYSDEC and NYSDOH in a timely manner and prior to the start of work associated with the remedial document.

4.1.9 Fact Sheets

Fact Sheets describing the Remedial Action proposed in the RAWP will be distributed through DEC Delivers, the NYSDEC's email listserv service. Additional Fact Sheets will be distributed to announce 1) the issuance of the Decision Document prior to the start of the Remedial Action, 2) the completion of the Remedial Action with a summary of the FER, and 3) the issuance of the Certificate of Completion for the site.

No changes will be made to the approved Fact Sheets authorized for release by the NYSDEC without written consent of the NYSDEC. Other information, such as brochures and flyers, will not be included with the Fact Sheet mailing.

Document repositories have been established at the following locations and will contain all applicable project documents:

Brooklyn Community Board 13
Attn: Eddie Mark, District Manager
1201 Surf Avenue, 3rd Floor
Brooklyn, New York 11224
Phone: (718) 266-3001
Email: edmark@cb.nyc.gov

Office Hours: 9:00 a.m. to 5:00 p.m.

Brooklyn Public Library – Coney Island Branch
1901 Mermaid Avenue
Brooklyn, New York 11224
Phone: (718) 265-3220
Hours (call to verify)

4.1.10 Green Remediation Principles

Green remediation principles and techniques will be implemented to the extent feasible in the design, implementation, and site management of the remedy as per DER-31. The major green remediation components are as follows:

- Considering the environmental impacts of treatment technologies and remedy stewardship over the long term
- Reducing direct and indirect greenhouse gases and other emissions
- Increasing energy efficiency and minimizing use of non-renewable energy
- Conserving and efficiently managing resources and materials
- Reducing waste, increasing recycling and increasing reuse of materials that would otherwise be considered a waste
- Maximizing habitat value and creating habitat when possible
- Fostering green and healthy communities and working landscapes which balance ecological, economic and social goals
- Integrating the remedy with the end use where possible and encouraging green and sustainable re-development
- Additionally, to incorporate green remediation principles and techniques to the extent feasible in the future development at this site, any future on-site buildings will include, at a minimum, a 20-mil vapor barrier/waterproofing membrane on the foundation to improve energy efficiency as an element of construction

4.2 General Remedial Construction Information

4.2.1 Project Organization

Section 4.1.4 presents the anticipated project organization and associated roles, including key personnel, descriptions of duties, and lines of authority in the management of the RAWP. Information regarding the organization/personnel and their associated responsibilities is provided below. Resumes of key personnel involved in the Remedial Action are included in Appendix G.

4.2.2 Remedial Engineer

The RE for this project will be Jason Hayes, P.E. The RE is a registered professional engineer licensed by New York State. The RE will have primary direct responsibility for implementation of the remedial program for the site. The RE will certify in the FER that the remedial activities were observed by qualified environmental professionals under his supervision and that the remediation requirements set forth in the RAWP and any other relevant provisions of ECL 27-1419 have been achieved in full conformance with the RAWP. Other RE certification requirements are listed later in this RAWP.

The RE will document the work of other contractors and subcontractors involved in aspects of remedial construction, including groundwater treatment, soil excavation, stockpiling, characterization, removal and disposal, air monitoring, dewatering treatment system installation and implementation, emergency spill response services, import of backfill material, and management of waste transport and disposal. The RE will be responsible for all appropriate communication with NYSDEC and NYSDOH.

The RE will review the pre-remedial plans submitted by contractors and subcontractors for compliance with this RAWP and will certify compliance in the FER. The RE will provide the certifications listed in Section 8.1.

4.2.3 Remedial Action Construction Schedule

The remedial action construction schedule is discussed below in Section 9 and is provided in Appendix H. The NYSDEC will be promptly notified of proposed changes, delays and/or deviations to the schedule.

4.2.4 Work Hours

The hours for operation of remedial construction will conform to the New York City Department of Buildings (NYCDOB) construction code requirements or according to specific variances issued by the NYCDOB. The NYSDEC will be notified by the Volunteer of any variances issued by the NYCDOB. The NYSDEC reserves the right to deny alternate remedial construction hours.

4.2.5 Site Security

The site perimeter will be secured with gated, signed, plywood fencing with points of entry and exit in accordance with NYCDOB and New York City Department of Transportation (NYCDOT) permits and requirements. The purpose of the fencing is to limit site access to authorized personnel, protect pedestrians from site activities, and maintain site security.

4.2.6 Traffic Control

Site traffic will be controlled through designated points of access on Surf Avenue, West 16th Street, or West 17th Street. Access points will be continuously monitored and if necessary, a flagging system will be used to protect workers, pedestrians and authorized guests. Traffic will also adhere to applicable local, state, and federal laws.

4.2.7 Contingency Plan

Contingency plans, as described below, have been developed to effectively address unexpected discoveries of additional USTs or contaminated media.

4.2.7.1 Discovery of USTs

Historical records identified potential evidence of USTs at the site. As a contingency, if USTs are discovered during remediation, they will be decommissioned in accordance with 6 NYCRR Part 612.2 and 613.9, and DER-10 section 5.5. Once the tank, its contents, and associated piping are removed, post-excavation soil samples will be collected per the NYSDEC DER-10 requirements. Post-excavation soil sampling is not expected where the excavation will extend below the UST to the development depth. If encountered, petroleum-contaminated soil will be removed. UST closure documentation, such as contractor affidavits, bills of lading for sludge disposal, and tank disposal receipts, will be provided as appendices in the FER. The NYSDEC PBS registration will be updated as necessary, depending on the type, number, and capacity of discovered tanks.

If USTs are encountered during ground-intrusive site work, the findings will be promptly communicated by phone to the NYSDEC Project Manager, as well as, detailed in the appropriate daily report. These findings will also be included in the monthly BCP progress reports.

4.2.7.2 Discovery of Additional Contaminated Soil

During remediation and construction activities, the soil will be continuously monitored by the RE's field representatives using a PID as well as visual and olfactory field screening techniques to identify additional soil that may not be suitable for disposal at the NYSDEC-approved disposal facilities. If discovered, this material will be segregated and sampled in accordance with disposal facility requirements. If the facility is not permitted to receive the suspect materials, the material will be excavated to the extent practicable and disposed of off-site at a permitted facility able to receive the material based on the characterization data.

Identification of unknown or unexpected contaminated media identified by screening during ground-intrusive site work will be promptly communicated by phone and email to the NYSDEC Project Manager. These findings will be detailed in the daily reports and the subsequent monthly BCP progress report.

4.2.8 Worker Training and Monitoring

Worker training and monitoring will be conducted in accordance with the site-specific CHASP, included as Appendix D.

4.2.9 Agency Approvals

The site has an E-Designation (E-229) for hazardous materials, air quality, and noise (CEQR Number 08DME007K). The scope of work proposed in this RAWP fulfills requirements with the NYCOER for hazardous materials. A NYCDOB New Building permit and NYCDOT permits are required for remedial construction and will be obtained prior to the start of remedial construction.

The planned end use for the site conforms to current zoning for the property as determined by New York City Department of Planning. A Certificate of Completion will not be issued for the project unless conformance with zoning designation is demonstrated.

4.2.10 NYSDEC BCP Signage

Signs are optional for BCP sites and are not planned to be displayed. If a sign is to be displayed, it must follow NYSDEC specifications for design and content. The NYSDEC Project Manager can provide details on signage protocol.

4.2.11 Pre-Construction Meeting with NYSDEC

Prior to the onset of construction, a meeting will be held between the NYSDEC, RE, Volunteer, Construction Manager, and Contractor to discuss project roles, responsibilities, and expectations associated with the NYSDEC-approved RAWP.

4.2.12 Emergency Contact Information

An emergency contact sheet with names and phone numbers is included in the CHASP (Appendix D). That document will define the specific project contacts for use by NYSDEC and NYSDOH in the case of a day or night emergency.

4.2.13 Remedial Action Costs

The total estimated engineering and contractor costs for the Remedial Action is $7.3 million. An itemized and detailed summary of estimated costs for all remedial activity is attached as Table 3.

4.3 Site Preparation

4.3.1 Mobilization

Prior to commencing the remedial construction, the Remediation Contractor will mobilize to the site and prepare for remedial activities. Descriptions of mobilization and site preparation activities may include the following:

- Identifying the location of all aboveground and underground utilities (e.g., power, gas, water, sewer, communications), equipment, and structures as necessary to implement the remediation
- Mobilizing necessary remediation personnel, equipment, and materials to the site
- Constructing one or more stabilized construction entrances consisting of non-hazardous material capped with a gravel roadway at or near the site exit, which takes into consideration the site setting and site perimeter
- Constructing an equipment decontamination pad for trucks, equipment, and personnel that come into contact with impacted materials during remediation
- Installing erosion and sedimentation control measures, as necessary
- Installing temporary fencing or other temporary barriers to limit unauthorized access to areas where remediation will be conducted

4.3.2 Erosion and Sedimentation Controls

Based on the size of the site and the planned excavation, a SWPPP will be necessary. BMPs for soil erosion will be selected and implemented, including use of the NYS Standards and Specifications for Erosion and Sediment Control (August 2005); as needed, to minimize erosion and sedimentation off site. Silt fencing or hay bales will be installed around the perimeter of the remedial construction area, as required. Accumulated sediments will be removed as required to keep the barrier and hay bale check functional. All undercutting or erosion of the silt fence toe anchor shall be repaired immediately with appropriate backfill materials. Manufacturer's recommendations will be followed for replacing silt fencing damaged due to weathering.

4.3.3 Monitoring Well and Soil Vapor Point Decommissioning

Existing groundwater monitoring wells will be properly decommissioned in accordance with NYSDEC policy CP-43 Groundwater Monitoring Well Decommissioning Policy. The exception is if the full length of the well is to be excavated during remediation and development. If required, well decommissioning will be performed by an experienced driller and logged by the driller and a Langan field representative. If conducted, decommissioning documentation will be provided in the FER. Soil vapor points were installed temporarily during the RI and supplemental soil vapor investigations and were removed at the end of each sampling event.

4.3.4 Temporary Stabilized Construction Entrance(s)

Temporary stabilized entrances will be constructed along Surf Avenue, West 16th Street, or West 17th Street. The entrances will be covered with gravel or RCA and graded so that runoff water will be directed to the site. Vehicles exiting construction areas will be cleaned using clean water or dry brushing to remove site soil from the tires and undercarriages. The Contractor will protect and maintain the existing sidewalks and roadways at both site access points.

4.3.5 Utility Marker and Easements Layout

The Volunteer and its contractors are solely responsible for identifying utilities and easements that might be affected by the remedial work under this RAWP and implementation of the required, appropriate, or necessary health and safety measures during performance of the work under this RAWP. The Volunteer and its contractors are solely responsible for safe execution of all invasive and other work performed under this RAWP. The Volunteer and its contractors must obtain any local, state, and/or federal permits or approvals pertinent to such work that may be required to implement this RAWP. Approval of this RAWP by the NYSDEC does not constitute satisfaction of these requirements.

The presence of utilities and easements on the site will be investigated by the Volunteer and its contractors. The Volunteer and its contractors are responsible for safe implementation of the planned work under this RAWP.

4.3.6 Sheeting and Shoring

Appropriate management of structural stability of on-site or off-site structures during remediation, including excavation, is the responsibility of the Volunteer and its contractors. The Volunteer and its contractors are responsible for safe execution of all invasive and other work performed under this RAWP. The Volunteer and its contractors must obtain any local, state, and/or federal permits or approvals that may be required to perform work under this RAWP. Further, the Volunteer and its contractors are responsible for the implementation of all required, appropriate, or necessary health and safety measures during performance of work under the approved RAWP.

4.3.7 Equipment and Material Staging

The Contractor will notify the RE and the Volunteer, in writing with receipt confirmed, at least 30 calendar days in advance of pending site mobilization. During mobilization, construction equipment will be delivered to the site, temporary facilities constructed, and temporary utilities installed. The Contractor will place and maintain temporary toilet facilities within the work areas for use by all site personnel.

4.3.8 Decontamination Area

The Contractor will construct decontamination pads at each site entrance/exit planned for construction vehicle usage. The location of decontamination pads may change periodically to accommodate the Contractor’s sequencing of work. Where required, the pads will be constructed by the Contractor to collect wastewater for off-site disposal or treatment and discharge, if generated during decontamination activities. The design will consider adequate space to decontaminate equipment and vehicles, and sloping and liners to facilitate collection of wastewater. Collected decontamination wastewater shall be either discharged in accordance with the Contractor's NYCDEP permit or tested and transported to an off-site disposal facility that is permitted to accept this waste, in accordance with applicable local, state and federal regulations. The Contractor will maintain the decontamination pad(s) throughout the duration of site work. Prior to demobilization, the Contractor will deconstruct the pads and dispose of materials as required.

If the Contractor uses high pressure washing methods, the Contractor shall provide splash protection around the vehicle decontamination facility to prevent splatter and mist migrating off-site during the vehicle decontamination process. Splash protection shall be temporary and stable and capable of being dismantled in the event of high winds.

4.3.9 Site Fencing

The site perimeter will be secured with gated, signed, plywood fencing with restricted points of entry in accordance with the NYCDOB and NYCDOT maintained by the Contractor. The purpose of the fencing is to limit site access to authorized personnel, protect pedestrians from site activities, and maintain site security.

4.3.10 Demobilization

After remediation and construction is completed, the Contractor will be responsible for demobilizing labor, equipment, and materials not designated for off-site disposal. The RE will document that the Contractor performs follow-up coordination and maintenance for the following activities:

- Removal of sediment and erosion control measures and disposal of materials in accordance with applicable rules and regulations
- Removal of remaining contaminated material or waste
- Equipment decontamination
- General refuse disposal

4.4 Reporting

Daily and monthly reports and an FER will be submitted to the NYSDEC as required to document the remedial action. Copies of daily and monthly reports will be included in the FER. The Project RE responsible for certifying all reports will be an individual licensed to practice engineering in New York State; Jason Hayes, P.E. of Langan, will have this responsibility. Should Mr. Hayes become unable to fulfill this responsibility, another suitably qualified Professional Engineer will take his place. In addition to the periodic reports and the FER, copies of all relevant contractor documents will be submitted to the NYSDEC.

4.4.1 Daily Reports

Daily reports will be submitted to NYSDEC and NYSDOH Project Managers during on-site remedial construction by noon on the following business day and will include:

- The NYSDEC assigned project number
- An update of progress made during the reporting day including a photograph log
- Locations of work and quantities of material imported and exported from the site
- References to an alpha-numeric map for site activities
- A summary of complaints with relevant details (names, phone numbers)
- A summary of CAMP findings, including exceedances, wind direction, work areas, location of CAMP monitoring stations and other relevant site information
- An explanation of notable site conditions

Daily Reports will include a description of daily activities keyed to an alpha-numeric map for the site that identifies work areas. These reports will include a summary of air sampling results, odor and dust problems and corrective actions, and all complaints received from the public.

Daily reports are not intended to be the mode of communication for notification to the NYSDEC of emergencies (accident, spill), requests for changes to the RAWP, or other sensitive or time critical information; however, such conditions must also be included in the daily reports. Emergency conditions and changes to the RAWP will be addressed directly to NYSDEC Project Manager via personal communication.

4.4.2 Monthly Reports

Monthly reports will be submitted to NYSDEC and NYSDOH Project Managers by the 10th day of the month following the reporting period. The monthly reports will include the following information, as well as, any additional information required by BCA:

- Activities relative to the site during the previous reporting period and those anticipated for the next reporting period, including a quantitative presentation of work performed (i.e. tons of material exported and imported, etc.)
- Description of approved activity modifications, including changes of work scope and/or schedule
- Sampling results received following internal data review and validation, as applicable
- An update of the remedial schedule including the percentage of project completion, unresolved delays encountered or anticipated that may affect the future schedule, and efforts made to mitigate such delays

- An appendix containing all daily reports for the reporting period

4.4.3 Other Reporting

Photographs of remedial activities will be taken and submitted to the NYSDEC in digital (JPEG) format. Photographs will illustrate the remedial program elements and will be of acceptable quality. Representative photographs of the site will be provided. Field photographs will be included in daily and monthly reports, as necessary, and a comprehensive photograph log will be included in the FER. Upon request, photographs will be submitted to the NYSDEC and NYSDOH Project Managers on CD or other acceptable electronic media. CDs will have a label and a general file inventory structure that separates photographs into directories and sub-directories according to logical Remedial Action components. A photograph log keyed to photo file ID numbers will be prepared to provide explanation for all representative photographs.

Site record keeping for all remedial work will be appropriately documented. These records will be maintained on site at all times during the project and will be available for inspection by NYSDEC and NYSDOH staff.

4.4.4 Complaint Management Plan

The management plan for documenting complaints is detailed below.

Item	Description
Approach	Complaints regarding remediation or construction activities/operations to be minimized and mitigation measures implemented to reduce the incidence of complaints.
Objective	To manage environmental complaints from the community regarding construction or remediation.
Implementation Strategy/Mitigation Measures	All complaints will be documented on a complaint register. The register will be maintained as an ongoing record. The entry will include following information: • Time, date and nature of complaint; • Type of communication (telephone, letter, personal, etc.); • Name, contact address and contact number; • Response and investigation undertaken as a result of the complaint; and action taken and signature of responsible person. Each complaint will be investigated as soon as practical in relation to requirements.
Monitoring	A representative of the Volunteer will follow up on the complaint within two weeks of receipt to ensure it is resolved.
Reporting	Upon receipt and following the complaint investigation and resolution, the NYSDEC will be notified. Complaint resolutions will be documented in daily reports and the monthly BCP progress report.
Corrective Action	Should an incident or failure to comply occur in relation to the management of environmental complaints, one or more of the following corrective actions will be undertaken as appropriate: • Conduct additional training of staff to handle environmental complaints • Investigate why the environmental complaint was not addressed within the specified time frame • Investigate complaint and action follow-up to results of investigation

4.4.5 Deviations from the RAWP

Necessary deviations from the RAWP will be coordinated with the NYSDEC in advance and will be documented in the FER. Notification will be provided to the NYSDEC by telephone/email for conditions requiring immediate action (e.g., conditions judged to be a danger to the surrounding community). Based on the significance of the deviation, an addendum to this RAWP may be necessary and will include:

- Reasons for deviating from the approved RAWP
- Approval process to be followed for changes/editions to the RAWP
- Effect of the deviations on the overall remedy

5.0 REMEDIAL ACTION: MATERIAL REMOVAL FROM SITE

Remediation will include the following material removal tasks:

1. Excavation of historic fill and native soil that exceeds UU SCOs will be required from surface grade to depths between about 5 feet bgs and 13.5 feet bgs across the 59,393 square-foot site footprint to achieve a Track 1 remediation. Excavations are as follows based on soil boring analytical results from the February 2020 RI:
   - Excavation to about 5 feet bgs in the areas containing soil borings SB-3, SB-7, SB-12, and SB-13 in the northeastern and east-central parts of the site
   - Excavation to about 6 feet bgs in the area containing soil borings SB-1, SB-4, SB-5, and SB-8 in the northwestern part of the site
   - Excavation to about 12 feet bgs in the area containing soil boring SB-18 near the southeastern part of the site
   - Excavation to about 13.5 feet bgs in the area containing soil borings SB-2 and SB-6 in the north-central part of the site
   - Excavation to about 10 feet bgs in the remainder of the site footprint, including the locations of soil borings SB-9, SB-10, SB-11, SB-14, SB-15, SB-16, SB-17, SB-19, and SB-20 in the central, southeastern, and southwestern parts of the site

2. Decommissioning and removal of any USTs or contaminant sources identified during earthwork.

5.1 Soil Cleanup Objectives

SCOs for the site will be the UU SCO concentrations listed in Table 1. Soil and materials management will be conducted in accordance with the SMMP as described below. Soil sample locations and results that exceed the UU SCOs are shown on Figure 3. UST closures (if necessary) will, at a minimum, conform to criteria defined in DER-10.

5.2 Remedial Performance Evaluation (Confirmation Sampling)

5.2.1 Soil Sampling Frequency

One confirmation soil sample will be collected for every 900 square feet of excavation base site-wide in accordance with NYSDEC DER-10, or at an alternative frequency approved by NYSDEC. Sidewall samples will be collected at a frequency of one sidewall sample per 30 linear feet of internal sidewall between areas of varied excavation. Sidewall samples will not be collected from the excavation perimeter because support of excavation measures (e.g., sheeting) will preclude collection of sidewall samples. An estimated 64 base-of-excavation and 19 sidewall confirmation soil samples, plus QA/QC samples, will be collected to document remedial performance.

In the event over-excavation or hotspot removal is required, one sidewall soil sample will be collected for every 30 linear feet of sidewall in those areas and additional base samples will be collected. A proposed endpoint sample location plan is provided as Figure 11.

5.2.2 Methodology

Confirmation soil samples will be collected post-excavation from the base and internal sidewalls of the excavations in accordance with NYSDEC DER-10 to document remedial performance and will be analyzed for the Part 375 list of VOCs, SVOCs, PCBs, pesticides, cyanide, metals including hexavalent and trivalent chromium, PFAS and 1,4-dioxane. Should additional soil sampling be deemed necessary (e.g., additional tank closure, unknown environmental conditions through visual evidence of a remaining source, over-excavation of failed documentation sample), documentation sampling will be conducted in accordance with NYSDEC DER-10.

5.2.3 QA/QC

Quality control procedures for documentation soil sampling are included in the QAPP (refer to Appendix F). Documentation sample analytical results will be provided in the NYSDEC's electronic data deliverable (EDD) format for EQuIS™. Guidance on the sampling frequency is presented in NYSDEC DER-10 Section 5.4.

The QA/QC procedures required by the NYSDEC Analytical Services Protocol (ASP) and SW-846 methods will be followed. This will include instrument calibration, standard compound spikes, surrogate compound spikes, and analysis of quality control samples. The laboratory will provide sample bottles, which will be pre-cleaned and preserved. Where there are differences in the SW-846 and NYSDEC ASP requirements, the NYSDEC ASP will take precedence.

5.2.4 DUSR

ASP Category B deliverables will be prepared for all remedial performance samples collected during implementation of this RAWP. Data Usability Summary Reports (DUSR) will be prepared by a qualified data validator and the findings will be reported in the FER.

5.2.5 Reporting

Analytical laboratories that analyze documentation soil samples, prepare results, and perform contingency sampling will be NYSDOH Environmental Laboratory Approval Program (ELAP)-certified laboratories. The FER will provide a tabular and map summary of all endpoint sample results and exceedances of SCOs.

5.3 Estimated Material Removal and Backfill Quantities

The estimated volume of soil requiring removal and off-site disposal for the Track 1 remedy is about 20,500 cubic yards. An estimated 11,700 cubic yards of backfill will be required to return the site to the desired grade for development. Structural fill will be virgin stone, RCA, or soil that meets UU SCOs will be imported to the site as backfill.

5.4 Soil/Materials Management Plan

This section presents the approach to management, disposal, and reuse of soil, fill, and materials excavated from the site. This plan is based on the current knowledge of site conditions and will be augmented, as necessary, using additional data collected during remediation. Langan personnel, under the direction of the RE will monitor and document the handling and transport of contaminated material removed from the site for disposal as a regulated solid waste. Langan personnel, under the direction of the RE, will assist the remediation contractor in identifying impacted materials during remediation, determining materials suitable for direct load out versus temporary on-site stockpiling, selection of samples for waste characterization, if necessary, and determining the proper off-site disposal facility. Separate stockpile areas will be constructed as needed for the various materials to be excavated or generated, with the intent to most efficiently manage and characterize the materials and to avoid comingling impacted materials with non-impacted soil.

Excavated material has been identified as non-hazardous historic fill material. This material, which contains contaminants above the UU SCOs, will be excavated across the footprint of the site to depths ranging between 5 and 13.5 feet bgs, and will not be reused on-site. This material will be transported off-site and disposed of at a facility permitted to accept the material. Characterization sampling will be completed in conformance with the requirements of the disposal facility. Confirmation samples will be collected from the base of the excavation to document remedial performance. A proposed endpoint sample location plan is provided as Figure 11.

5.4.1 Soil Screening Methods

Visual, olfactory and PID soil screening and assessment will be performed by Langan field representative under the direct supervision of the RE or QEP during all remedial and development excavations into known or potentially contaminated material. Soil screening is performed regardless of when the invasive work is done and will include all excavation and invasive work performed during the remedy and during development phase, such as excavations for foundations and utility work, prior to issuance of the Certificate of Completion.

Screening will be performed by Langan personnel under the supervision of the RE or QEP. Resumes will be provided for all personnel responsible for field screening (i.e. those representing the RE) of invasive work for unknown contaminant sources during remediation and development work.

5.4.2 Stockpile Methods

Stockpiles will be constructed as necessary to separate and stage excavated material pending loading or characterization sampling. Separate stockpile areas will be constructed to avoid comingling materials of differing waste types. Stockpile areas will meet the following minimum requirements:

- Excavated soil will be placed onto a minimum thickness of 8-mil low-permeability liner of sufficient strength to prevent puncture during use; separate stockpiles will be created where material types are different (e.g., petroleum-impacted material stockpiled in a contaminated soil area). The use of multiple layers of thinner liners is permissible.
- Equipment and procedures will be used to place and remove the soil that will minimize the potential to jeopardize the integrity of the liner.
- Stockpiles will be covered at the designated times (see below) with minimum 6-mil plastic sheeting or tarps which will be securely anchored to the ground. Stockpiles will be routinely inspected and broken sheeting covers will be promptly replaced.
- Stockpiles will be covered upon reaching their capacity (i.e., about 1,000 cubic yards) until ready for loading. Stockpiles that have not reached their capacity, whether active or inactive, will be covered at the end of each workday.
- Each stockpile will be encircled with silt fences and hay bales, as needed, to contain and filter particulates from rainwater that has drained off the soils and to mitigate the potential for surface water run-off.
- Stockpiles will be inspected at a minimum of once daily and after every storm event. Results of inspections will be recorded in a logbook, maintained at the site, and made available for inspection by the NYSDEC.

5.4.3 Materials Excavation and Load Out

A Langan field representative under the supervision of the RE or QEP will monitor ground-intrusive work and the excavation and load-out of excavated material.

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

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

[NYSDOT] and NYCDOT requirements). Trucks hauling historic fill material will not be lined unless free liquids are present or the material is grossly impacted.

A truck wash/cleaning area will be operated on-site (see Section 4.3.8). The RE will be responsible for documenting that outbound trucks will be washed/cleaned at the truck wash area before leaving the site until the remedial construction is complete. Locations where vehicles enter or exit the site will be inspected daily for evidence of off-site sediment tracking.

The RE will be responsible for documenting that egress points for truck and equipment transport from the site will be clean of dirt and other materials derived from the site during remediation and development. The remediation contractor will clean adjacent streets as necessary to maintain a clean condition with respect to site-derived materials.

The presence of utilities and easements on the site will be investigated by the Volunteer and its contractors. The Volunteer and its contractors are responsible for safe implementation of the planned work under this RAWP.

Vehicles leaving the site will not be overloaded. The RE's representative will make reasonable efforts to observe that vehicles are not loaded beyond their NYSDOT weight rating and that material is secured beneath the truck bed cover.

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

The Volunteer and associated parties will ensure that site development activities will not interfere with, or otherwise impair or compromise, remedial activities proposed in this RAWP.

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

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

Primary contaminant sources identified during site characterization, the RI, and implementation of the remedy will be surveyed by a surveyor licensed to practice in the State of New York. The survey information will be shown on maps to be included with the FER. No survey will be required if a Track 1 remedy is achieved. If the site fails to meet Track 1 cleanup requirements, the final excavation subgrade will be surveyed under the Track 2 cleanup requirements.

5.4.4 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 either Surf Avenue, West 16th Street, or West 17th Street.

Trucks loaded with site materials will exit the vicinity of the site using approved truck routes shown in Figure 12. These routes are the most appropriate routes to and from the site and take into account:

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

Trucks will be prohibited from excessive stopping and idling in the neighborhood outside of the site.

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

Trucks will be washed prior to leaving the site until the remediation is complete. Truck wash waters will be collected and disposed of off-site in an appropriate manner.

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

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

5.4.5 Materials Disposal Off-Site

Disposal facilities will be determined at a later date and will be reported to the NYSDEC Project Manager prior to off-site transport and disposal of excavated material. About 20,500 cubic yards of historic fill and native soil that exceeds UU SCOs is expected to be disposed off-site. Soil/fill excavated and removed from the site will be handled, transported and disposed in accordance with local, state (including 6 NYCRR Part 360) and federal regulations. If disposal of soil/fill from this site is proposed for unregulated disposal (i.e. clean soil removed for development purposes), a formal request with an associated plan will be made to NYSDEC's Project Manager. Unregulated off-site management of materials from this site is prohibited without formal NYSDEC approval. Material that does not meet UU SCOs is prohibited from being taken to a New York State recycling facility (6 NYCRR Part 360-16 Registration Facility).

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

(1) A letter from the RE or BCP 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 RE. The letter will include as an attachment a summary of all chemical data for the material being transported (including waste characterization and RI data).

(2) A letter from each receiving facility stating that it is in receipt of the correspondence (above) and acceptance of the material is approved.

These documents will be included in the FER.

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

Soil that is contaminated but non-hazardous and is removed from the site is considered by the NYSDEC Division of Materials Management (DMM) to be construction and demolition (C&D) materials with contamination not typical of virgin soils. Soil not meeting UU SCOs will be considered a solid waste unless a beneficial use determination (BUD) is processed stating otherwise. This soil may be sent to a permitted Part 360 landfill in New York or other appropriate out-of-state disposal facility permitted to accept contaminated soil from a brownfield site. This soil may be sent to a permitted C&D processing facility without permit modifications only upon prior notification of NYSDEC Region 2. This material is prohibited from being sent or redirected to a New York Part 361.5 or 360-15 Registration Facility. In this case, as dictated by DMM, special procedures will include, at a minimum, a letter to the C&D facility that provides a detailed explanation that the material is derived from an NYSDEC DER remediation site, that the material is contaminated, and that the material must not be redirected to on-site or off-site Soil Recycling

Facilities. The letter will provide the project identity and the name and phone number of the RE. The letter will include as an attachment a summary of chemical data for the material being transported.

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

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

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

A waste characterization study will be performed for soil intended for off-site disposal in a manner suitable to the receiving facility and in conformance with applicable permits. Sampling and analytical methods, sampling frequency, analytical results, and QA/QC results will be reported in the FER. Data available for excavated material to be disposed of at a given facility must be submitted to the disposal facility with suitable explanation prior to shipment and receipt.

5.4.6 Materials Reuse On-Site

Reuse of site soil is not anticipated as part of the Track 1 remedy. Soil excavated during the remedy may be reused on site if the requirements in this section are met. Grossly-impacted soil will not be reused. Reused soil must be non-hazardous and must meet the Track 1 SCOs (shown in Table 1). Soil will be analyzed in accordance with DER-10 Table 5.4(e) and analytical data will be provided to NYSDEC for review and approval prior to reuse on-site. Soil removed during implementation of the remedy or removed for grading or other purposes will not be reused within a cover soil layer, within landscaping berms, or as backfill for subsurface utility lines. The RE will follow the procedures defined for materials reuse in this RAWP and unacceptable material will not remain on-site. Concrete crushing or processing on-site is prohibited.

Organic matter (wood, roots, stumps, etc.) or other solid waste derived from clearing and grubbing of the site is prohibited for reuse on-site. Reuse of soil will be coordinated in advance with the NYSDEC Project Manager. Material deemed unfit for reuse will be transported for off-site disposal.

5.4.7 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. Liquids discharged into the New York City sewer system will be addressed through approval by NYCDEP. Based on depth-to-groundwater observed during the RI, localized dewatering will be required to facilitate excavation of material that exceeds Track 1 SCOs. PCE-impacted groundwater will be treated in the northeast corner of the site through injection of liquid-activated carbon. If necessary, a dewatering and treatment system will be designed by the Remediation Contractor's NYS-licensed Professional Engineer. For the remedy, dewatering is considered a remedial component inasmuch as it is necessary to facilitate excavation of contaminated material.

Dewatered fluids will not be recharged back to the land surface or subsurface. Dewatering fluids will be managed off-site. Discharge of water generated during remedial construction to surface waters (i.e., a local pond, stream, and/or river) is prohibited without a SPDES permit.

5.4.8 Backfill from Off-Site Sources

Materials proposed for import onto the site will be approved by the RE and will be in compliance with the provisions in this RAWP prior to receipt at the site. Imported soil for backfill must meet the UU SCOs (as set forth in Table 375-6.7(d) of 6 NYCRR Part 375 and listed in Table 1), or other acceptable fill material such as virgin, native stone from a quarry or RCA. Non-compliant soils will not be imported onto the site without prior approval by NYSDEC. Nothing in the approved RAWP or its approval by NYSDEC should be construed as an approval for this purpose. 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.

The FER will include the following certification by the RE: "I certify that all import of soils from off-site, including source evaluation, approval, and sampling, has been performed in a manner that is consistent with the methodology defined in the RAWP".

Backfill material will consist of clean fill (as described in the following paragraph) or other acceptable fill material such as virgin stone from a quarry or RCA. If RCA is imported to the site, it will be from a NYSDEC-registered facility in compliance with 6 NYCRR Part 360 registration and permitting requirements for the period of acquisition of RCA. RCA imported from compliant facilities will not require chemical testing, unless required by the NYSDEC under the terms for operation of the facility. RCA imported to the site must be derived from recognizable and uncontaminated concrete, with no more than 10% by weight passing through a No. 10 sieve. RCA is not acceptable for and will not be used as cover or drainage material and shall not be used to backfill areas that are over-excavated to achieve Track 1. If required, a site-specific BUD will be obtained by the NYSDEC for import of RCA for use as backfill in over-excavated areas.

Imported soil (i.e., clean fill) will meet the lower of PGW or RURR SCOs. Non-compliant soils will not be imported to the site. Clean fill will be segregated at a source/facility that is free of environmental contaminants. Qualified environmental personnel will collect representative samples at a frequency consistent with NYSDEC CP-51. The samples will be analyzed for Part 375 VOCs, SVOCs, pesticides/herbicides, PCBs, cyanide, metals including trivalent and hexavalent chromium, PFAS and 1,4-dioxane by a NYSDOH ELAP-certified laboratory. Upon meeting these criteria, the certified-clean fill will be transported to the site and segregated from impacted material, as necessary, on plastic sheeting until it is used as backfill.

Soils that meet 'exempt' fill requirements under 6 NYCRR Part 360, but do not meet backfill or cover soil objectives for this site, will not be imported onto the site without prior approval by the NYSDEC. The contents of this RAWP and NYSDEC approval of this RAWP should not be construed as an approval for this purpose.

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

5.4.9 Stormwater Pollution Prevention

A SWPPP will be required because the project will disturb greater than one acre. Silt fencing or hay bales will be installed around the perimeter of the remedial construction area, as required. Barriers and hay bale checks will be installed and inspected once a week and after every storm event. Results of inspections will be recorded in a logbook and maintained at the site and available for inspection by NYSDEC. All necessary repairs to silt fence and/or hay bales shall be made immediately. Accumulated sediments will be removed as required to keep the barrier and hay bale check functional. All undercutting or erosion of the silt fence toe anchor shall be repaired immediately with appropriate backfill materials. Manufacturer's recommendations will be followed for replacing silt fencing damaged due to weathering. Erosion and sediment control measures identified in the RAWP shall be observed to ensure that they are operating correctly. Where discharge locations or points are accessible, they shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to the sewer system.

5.4.10 Contingency Plan

If USTs or other previously unidentified contaminant sources are found during on-site remedial excavation or development-related construction, sampling will be performed on product, if encountered, and surrounding subsurface materials (e.g., soil, stone, etc.). Chemical analyses will be for full scan parameters (Part 375 TCL VOCs, SVOCs, PCBs, pesticides, TAL metals, 1,4-dioxane and PFAS). Analyses will not be otherwise limited without NYSDEC approval.

Identification of unknown or unexpected contaminated media identified by screening during ground-intrusive work will be promptly communicated by phone to the NYSDEC Project Manager.

These findings will also be detailed in the daily reports and the subsequent monthly BCP progress report.

5.4.11 Community Air Monitoring Plan

Community air monitoring will be conducted in compliance with the NYSDOH Generic CAMP outlined below. Exceedances observed in the CAMP will be reported to NYSDEC and NYSDOH Project Managers and included in the Daily Report.

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

CAMP monitoring of total VOC levels will be conducted using PIDs, and monitoring for particulates will be conducted using particulate sensors equipped with filters that can detect airborne particulates less than 10 microns in diameter (PM10). Monitoring for particulates and odors will be conducted during ground-intrusive work by a Langan field representative under the supervision of the RE. The work zone is defined as the general area in which machinery is operating in support of remediation. A portable PID will be used to monitor the work zone and for periodic monitoring of total VOC levels during work such as soil sampling. The site perimeter will be visually monitored for fugitive dust emissions.

The following actions will be taken based on total VOC measurements:

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

The following actions will be taken based on PM10 measurements and visual dust observations:

- If the downwind PM10 level is 100 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.

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

5.4.12 Odor, Dust and Nuisance Control Plan

Dust, odor, and nuisance control will be accomplished by the remediation contractor as described in this section. The FER will include the following certification by the RE: "I certify that ground-intrusive work during remediation and development-related construction was conducted in accordance with dust and odor suppression methodology defined in the RAWP."

5.4.12.1 Odor Control Plan

This odor control plan is capable of controlling emissions of nuisance odors off-site. Specific odor control methods to be used as needed will include application of foam suppressants or tarps over the odor or VOC source areas, if encountered. If nuisance odors are identified, work will be halted and the source of odors will be identified and corrected. Work will not resume until all nuisance odors have been abated. NYSDEC and NYSDOH will be notified of all odor events and of all other complaints about the project. Implementation of site perimeter odor monitoring, including notifying the Contractor and NYSDEC of exceedances, will be the responsibility of the Volunteers' RE, who is responsible for certifying the FER. Application of odor controls is the responsibility of the Contractor.

All necessary means will be employed to prevent on- and off-site nuisances. At a minimum, procedures may 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. 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, (b) 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.

5.4.12.2 Dust Control Plan

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

- Dust suppression will be achieved through the use of a dedicated water distribution system or on-site water truck for road wetting, or an alternate source with suitable supply and pressure for use in dust control. Where required, the truck will be equipped with a water cannon capable of spraying water directly onto off-road areas including excavations and stockpiles
- Gravel will be used on roadways to provide a clean and dust-free road surface
- On-site roads will be limited in total area to minimize the area required for water truck sprinkling

5.4.12.3 Other Nuisances

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

A plan for noise control will be developed and used by the remediation contractor during site preparation and remedial work and will conform, at a minimum, to the NYCDEP noise control standards.

5.5 Groundwater Monitoring

One VOC, PCE, was identified at concentrations above the NYSDEC SGVs in monitoring well MW-1 located in the northwestern part of the site during the February 2020 RI. The groundwater contamination will be addressed by removing source material in soil and dewatering. The performance of the treatment will be assessed via monitoring wells installed on site, at the tentative locations shown on Figure 8. Groundwater samples will be collected and analyzed for VOCs following excavation.

5.6 Soil Vapor Intrusion Evaluation

PCE and daughter products (including TCE, cis-1,2-DCE, and vinyl chloride) were identified in soil vapor, primarily in the northwestern part of the site. The corresponding concentrations of PCE in soil and groundwater in this area are the source of CVOCs in soil vapor. Following source removal, dewatering, and construction of the proposed development, a soil vapor intrusion evaluation will be completed to determine if vapor mitigation measures will be necessary. As such, although the design and installation of a SMDS is not considered a part of the Track 1 remedy, the SMDS sub-grade components, including a minimum 20-mil vapor barrier that is compatible with CVOCs, and risers will be constructed as part of site redevelopment. The anticipated vacuum monitoring points that will be installed through the ground floor slab will be used to complete the soil vapor intrusion evaluation.

Six anticipated vacuum monitoring points will be utilized to collect sub-slab soil vapor samples, and six indoor air samples will be collected in nearby spaces on the ground floor. Samples will be collected in general accordance with the NYSDOH "Guidance for Evaluating Soil Vapor Intrusion in the State of New York, with updates" (October 2006). Before collecting vapor samples, a minimum of three vapor probe volumes will be purged from each sample point at a rate of less than 0.2 liters per minute using a RAE Systems MultiRAE® meter. Purged soil vapor will be monitored for VOCs and methane with the MultiRAE® during this process. Sub-slab vapor and indoor air sample locations are shown in Figure 9.

A helium tracer gas will be used in accordance with NYSDOH protocols to serve as a quality assurance/quality control (QA/QC) technique to document the integrity of each soil vapor sampling point seal before and after sampling. The tracer gas will be introduced into a container surrounding the vapor point and seal. Helium will be measured from the sampling tube and inside the container. If the sample tubing contains more than 10% of the tracer gas concentration that was introduced into the container, then the seal is considered compromised and should be enhanced or reconstructed to reduce outside air infiltration.

After the integrity of each seal is confirmed, soil vapor samples will be collected into laboratory-supplied, batch-certified clean 6-liter Summa® canisters with calibrated flow controllers. Sub-slab soil vapor samples and indoor air samples will be collected over a 24-hour sampling period. The Summa® canisters will be individually certified.

Prior to indoor air sample collection, a building chemical product inventory on the first floor will be conducted in accordance with NYSDOH protocols. The items identified in the building chemical product inventory as well as the building in general will be screened using a RAE Systems meter capable of detecting VOCs in the ppb range. Indoor air samples will then be collected (concurrently with the soil vapor samples) at a height above the ground to represent the breathing zone (about 3 to 5 feet) into laboratory-supplied, batch-certified clean 6-liter

Summa® canisters with calibrated flow controllers. Indoor air samples will be collected over a 24-hour sampling period.

An ambient air sample will be collected outside of the building at a height above the ground to represent the breathing zone (about 3 to 5 feet). The ambient air sample will be collected into laboratory-supplied, batch-certified clean 6-liter Summa® canisters with calibrated flow controller over a 24-hour sampling period (concurrently with the soil vapor and indoor air samples).

All samples will be analyzed for VOCs by USEPA Method TO-15.

6.0 CONTAMINATION TO REMAIN ON-SITE

Residual contaminated soil and groundwater will not exist beneath the development footprint after the Track 1 remedy is complete; therefore, engineering and institutional controls will not be required to protect human health and the environment. Should a Track 2 cleanup be achieved, then an SMP and EE may need to be prepared.

7.0 ENGINEERING CONTROLS

Following completion of the remedy, it is anticipated that the site will meet Track 1 SCOs; therefore, neither engineering controls (e.g., sub-membrane depressurization system) nor institutional controls (e.g., EE, SMP) will be required as part of the remedial action. In the event that a Track 1 cleanup is not achieved, but a Track 2 cleanup is achieved, it will be determined if implementation of engineering controls is required.

8.0 FINAL ENGINEERING REPORT

A FER will be submitted to NYSDEC following implementation of the Remedial Action defined in this RAWP. The FER will be prepared in conformance with NYSDEC DER-10 and will include the following:

- Documentation that the remedial work required under this RAWP has been completed and performed in compliance with this plan.
- A comprehensive account of the locations and characteristics of material removed from the Site including the surveyed map(s) of each source, as necessary.
- As-built drawings for all constructed elements, manufacturer documentation for groundwater treatment applications, certifications, manifests, and bills of lading
- A description of the changes in the remedy from the elements provided in the RAWP and associated design documents, if any
- A tabular summary of performance evaluation sampling results and material characterization results and other sampling and chemical analyses performed as part of the remedy
- Written and photographic documentation of remedial work performed under this remedy
- A description of the documentation groundwater analytical results post-excavation.
- Sufficient information to show that remaining soil left on-site meets the Track 1 SCOs.
- If necessary, a thorough summary of all residual contamination that exceeds the Track 1 UU SCOs in 6NYCRR Part 375-6, and an explanation for why the material was not removed as part of the remedy. A table and a map that shows remaining contamination in excess of the Track 1 UU SCOs will also be included.
- An accounting of the destination of material removed from the site, including excavated contaminated soil, historic fill, solid waste, hazardous waste, non-regulated material, and fluids. Documentation associated with the disposal of material must also include records and approvals for receipt of the material.
- An accounting of the origin and chemical quality of each material type imported onto the site.
- An itemized tabular description of actual costs incurred during all aspects of the remedy.

Before approval of the FER and issuance of a Certificate of Completion, the daily reports and monthly BCP progress reports must be submitted in digital form on electronic media (i.e., PDF).

8.1 Certifications

The following certification will appear in front of the FER Executive Summary. The certification will be signed by the RE, Jason J. Hayes, who is a NYS-licensed Professional Engineer. The certification will be appropriately signed and stamped. The certification will include the following statements:

I, ________________________, am currently a registered professional engineer licensed by the State of New York. I had primary direct responsibility for implementation of the remedial program for the 1607 Surf Avenue Site.

I certify that the site description presented in this Final Engineering Report is identical to the site descriptions presented in the Brownfield Cleanup Agreement for the 1607 Surf Avenue site and related amendments.

I certify that the Remedial Action Work Plan dated [month day year] and Stipulations [if any] in a letter dated [month day year] and approved by the NYSDEC were implemented and that all requirements in those documents have been substantively complied with.

I certify that the remedial activities were observed by Langan personnel under my supervision and that the remediation requirements set forth in the Remedial Action Work Plan and any other relevant provisions of ECL 27-1419 have been achieved.

I certify that the export of contaminated soil, fill, water, or other material from the property was performed in accordance with the Remedial Action Work Plan, and were taken to facilities licensed to accept this material in full compliance with all federal, state, and local laws.

I certify that import of soils from off-site, including source approval and sampling, has been performed in a manner that is consistent with the methodology defined in the Remedial Action Work Plan.

I certify that ground-intrusive work during remediation and development-related construction was conducted in accordance with dust and odor suppression methodology defined in the Remedial Action Work Plan.

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

It is a violation of Article 130 of New York State Education Law for any person to alter this document in any way without the express written verification of adoption by any New York State licensed engineer in accordance with Section 7209(2), Article 130, New York State Education Law.

9.0 SCHEDULE

Mobilization for implementation of the RAWP is expected to take about one to two weeks. Once mobilization is complete, remediation of the site will proceed. The remedy, which will be implemented in accordance with the RAWP, is anticipated to take about 6 months to complete. Within 90 days of completion of all remedial activities at the site, an FER will be submitted to NYSDEC as detailed in Section 8.0. The project is anticipated to start in April 2021. A Gantt chart showing a detailed project schedule is included in Appendix H.

10.0 REFERENCES

1. Hillman Consulting, Phase I Environmental Site Assessment, dated May 31, 2018
2. Hillman Consulting, Phase II Investigation Report, dated June 13, 2018
3. GeoDesign, Inc., Geotechnical Evaluation Report, dated November, 2018
4. Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, DPC., Remedial Investigation Report, dated March 2021.
5. Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, DPC., Supplemental Soil Vapor Investigation Work Plan, dated November 17, 2020.
6. Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, DPC., Supplemental Soil Vapor Investigation Work Plan, dated February 24, 2021.
7. New York State Department of Health, Final Guidance for the Evaluation of Soil Vapor Intrusion in the State of New York, dated October 2006.
8. New York State Department of Environmental Conservation, Division of Environmental Remediation, Draft Brownfield Cleanup Program Guide, dated May 2004.
9. New York State Department of Environmental Conservation, Division of Environmental Remediation, Technical and Administrative Guidance Memorandum No. 4031 Fugitive Dust Suppression and Particulate Monitoring Program at Inactive Waste Sites, dated October 27, 1989.
10. New York State Department of Environmental Conservation, Draft DER-10 Technical Guidance for Site Investigation and Remediation, dated May 3, 2010; effective June 18, 2010.
11. New York State Department of Environmental Conservation, Part 375 of Title 6 of the New York Compilation of Codes, Rules, and Regulations, Effective December 14, 2006.
12. New York State Division of Water Technical and Operational Guidance Series (TOGS) (1.1.1) dated June 1998.
13. New York State Division of Water Technical and Operational Guidance Series (TOGS) 5.1.8 New York State Stormwater Management Design Manual, dated June 2008.
14. United States Environmental Protection Agency, Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedures, EPA/540/S-95/504, April 1996.
15. NYSDEC Environmental Resource Mapper, accessed April 2020
16. New York City Planning Commission, New York City’s Zoning & Land Use Map (ZoLa), accessed April 2020.

17. New York State Department of Environmental Conservation, Potential Justice Areas in Southwest Brooklyn, Kings County, New York, accessed April 2020.

18. Federal Emergency Management Agency, FEMA Flood Map Service Center (Map Number 3604970353F, dated September 05, 2007), accessed April 2020

TABLES

TABLE 1
PART 375 UNRESTRICTED USE SOIL CLEANUP OBJECTIVES
1607 SURF AVENUE
BROOKLYN, NEW YORK
LANGAN PROJECT NO. 170599501

VOCs (mg/kg)	
1,1,1-Trichloroethane	0.68
1,1-Dichloroethane	0.27
1,1-Dichloroethylene	0.33
1,2,4-Trimethylbenzene	3.6
1,2-Dichlorobenzene	1.1
1,2-Dichloroethane	0.02
1,3,5-Trimethylbenzene	8.4
1,3-Dichlorobenzene	2.4
1,4-Dichlorobenzene	1.8
1,4-Dioxane	0.1
Acetone	0.05
Benzene	0.06
Carbon tetrachloride	0.76
Chlorobenzene	1.1
Chloroform	0.37
Cis-1,2-Dichloroethene	0.25
Ethyl Benzene	1
Hexachlorobenzene	0.33
Methyl Ethyl Ketone (2-Butanone)	0.12
Methyl tert-butyl ether (MTBE)	0.93
Methylene chloride	0.05
n-Butylbenzene	12
n-Propylbenzene	3.9
sec-Butylbenzene	11
tert-Butylbenzene	5.9
Tetrachloroethene	1.3
Toluene	0.7
trans-1,2-Dichloroethene	0.19
Trichloroethene	0.47
Vinyl Chloride	0.02
Xylenes, Total	0.26

Metals (mg/kg)	
Arsenic	13
Barium	350
Beryllium	7.2
Cadmium	2.5
Chromium, hexavalent	1
Copper	50
Cyanide	27
Lead	63
Manganese	1,600
Mercury	0.18
Nickel	30
Selenium	3.9
Silver	2
Zinc	109

SVOCs (mg/kg)	
Acenaphthene	20
Acenaphthylene	100
Anthracene	100
Benzo(a)anthracene	1
Benzo(a)pyrene	1
Benzo(b)fluoranthene	1
Benzo(g,h,i)perylene	100
Benzo(k)fluoranthene	0.8
Chrysene	1
Dibenzo(a,h)anthracene	0.33
Fluoranthene	100
Fluorene	30
Indeno(1,2,3-cd)pyrene	0.5
m-Cresol	0.33
Naphthalene	12
o-Cresol	0.33
p-Cresol	0.33
Pentachlorophenol	0.8
Phenanthrene	100
Phenol	0.33
Pyrene	100

PCBs/Pesticides (mg/kg)	
2,4,5-TP Acid (Silvex)	3.8
4,4'-DDE	0.0033
4,4'-DDT	0.0033
4,4'-DDD	0.0033
Aldrin	0.005
alpha-BHC	0.02
beta-BHC	0.036
Chlordane (alpha)	0.094
delta-BHC	0.04
Dibenzofuran	7
Dieldrin	0.005
Endosulfan I	2.4
Endosulfan II	2.4
Endosulfan sulfate	2.4
Endrin	0.014
Heptachlor	0.042
Lindane	0.1
Polychlorinated biphenyls	0.1

Notes:
1. The above criteria are the Title 6 of the New York Codes, Rules and Regulations (6 NYCRR) Part 375 Unrestricted Use Soil Cleanup Objectives (i.e., the Track 1 soil cleanup objectives).
2. VOC: volatile organic compound
3. SVOC: semivolatile organic compound
4. PCBs: polychlorinated biphenyls
5. mg/kg: milligram per kilogram

TABLE 2
PART 375 RESTRICTED USE RESTRICTED-RESIDENTIAL SOIL CLEANUP OBJECTIVES
1607 SURF AVENUE
BROOKLYN, NEW YORK
LANGAN PROJECT NO. 170599501

VOCs (mg/kg)	
1,1,1-Trichloroethane	0.68
1,1-Dichloroethane	0.27
1,1-Dichloroethylene	0.33
1,2,4-Trimethylbenzene	3.6
1,2-Dichlorobenzene	1.1
1,2-Dichloroethane	0.02
1,3,5-Trimethylbenzene	8.4
1,3-Dichlorobenzene	2.4
1,4-Dichlorobenzene	1.8
1,4-Dioxane	0.1
Acetone	0.05
Benzene	0.06
Carbon tetrachloride	0.76
Chlorobenzene	1.1
Chloroform	0.37
Cis-1,2-Dichloroethene	0.25
Ethyl Benzene	1
Hexachlorobenzene	1.2
Methyl Ethyl Ketone (2-Butanone)	0.12
Methyl tert-butyl ether (MTBE)	0.93
Methylene chloride	0.05
n-Butylbenzene	12
n-Propylbenzene	3.9
sec-Butylbenzene	11
tert-Butylbenzene	5.9
Tetrachloroethene	1.3
Toluene	0.7
trans-1,2-Dichloroethene	0.19
Trichloroethene	0.47
Vinyl Chloride	0.02
Xylenes, Total	1.6

Metals (mg/kg)	
Arsenic	16
Barium	400
Beryllium	47
Cadmium	4.3
Chromium, hexavalent	19
Copper	270
Cyanide	27
Lead	400
Manganese	2,000
Mercury	0.73
Nickel	130
Selenium	4
Silver	8.3
Zinc	2480

SVOCs (mg/kg)	
Acenaphthene	98
Acenaphthylene	100
Anthracene	100
Benzo(a)anthracene	1
Benzo(a)pyrene	1
Benzo(b)fluoranthene	1
Benzo(g,h,i)perylene	100
Benzo(k)fluoranthene	1.7
Chrysene	1
Dibenzo(a,h)anthracene	0.33
Fluoranthene	100
Fluorene	30
Indeno(1,2,3-cd)pyrene	0.5
m-Cresol	0.33
Naphthalene	12
o-Cresol	0.33
p-Cresol	0.33
Pentachlorophenol	0.8
Phenanthrene	100
Phenol	0.33
Pyrene	100

PCBs/Pesticides (mg/kg)	
2,4,5-TP Acid (Silvex)	3.8
4,4'-DDE	8.9
4,4'-DDT	7.9
4,4'-DDD	13
Aldrin	0.097
alpha-BHC	0.02
beta-BHC	0.09
Chlordane (alpha)	2.9
delta-BHC	0.25
Dibenzofuran	59
Dieldrin	0.1
Endosulfan I	24
Endosulfan II	24
Endosulfan sulfate	24
Endrin	0.06
Heptachlor	0.38
Lindane	0.1
Polychlorinated biphenyls	1

Notes:
1. The above criteria are the lower of the Title 6 of the New York Codes, Rules and Regulations (6 NYCRR) Part 375 Restricted Use - Restricted-Residential and the Protection of Groundwater Soil Cleanup Objectives (i.e., the Track 2 soil cleanup objectives)
2. VOC: volatile organic compound
3. SVOC: semivolatile organic compound
4. PCBs: polychlorinated biphenyls
5. mg/kg: milligram per kilogram

Table 3
Remedial Action Work Plan
Track 1 Remedial Cost Estimate

1607 Surf Avenue
Brooklyn, New York
Langan Project No. 170599501

ITEM NO.	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	ABSOLUTE COST
CONTRACTOR FEES					
1	Remediation Facilities, Mobilization, Demobilization, and Site Maintenance - Remediation and decontamination facilities, site fencing, trailer, truck cleaning facilities, etc.		Lump Sum		$ 75,000
2	Management and Handling of Excavated Materials	20,500	CY	$ 25	$ 512,500
3	Perimeter Support of Excavation ([SOE] Sheet Pile Wall)		Lump Sum		$ 2,000,000
4	Off-Site Transport and Disposal of Historic Fill Material and Impacted Soil	30,750	Ton	$ 50	$ 1,537,500
5	Vapor Barrier/Waterproofing Installation	65,000	SF	$ 12	$ 780,000
6	Underground Storage Tank (UST) contingency (assumes registration, cleaning, removal and disposal)	2	Each	$ 10,000	$ 20,000
7	Dust, Odor, and Vapor Control	6	Month	$ 10,000	$ 60,000
8	Waste Characterization Subcontractors (Drilling Contractor, Laboratory Contractor, etc.)		Lump Sum		$ 100,000
9	Management and Handling of Backfilled Materials	11,700	CY	$ 35	$ 409,500
10	Import and Placement of Clean Fill Material to Development Grade	11,700	CY	$ 25	$ 292,500
				CONTRACTOR FEES	*$ 5,085,000*
				(20% CONTINGENCY OF CONTRACTOR FEE SUBTOTAL)	*$ 1,017,000*
ENGINEERING FEES					
11	Waste Characterization		Lump Sum		$ 50,000
12	Bid and Engineering Support, Construction Administration, and Agency Coordination (During Remediation)	6	Month	$ 20,000	$ 120,000
13	Construction Environmental Monitoring (includes community air monitoring program [CAMP] equipment rental)	6	Month	$ 40,000	$ 240,000
14	Engineering Special Inspection of Support of Excavation	6	Month	$ 35,000	$ 210,000
15	Endpoint Sampling (to document residual site conditions following source material removal)	83	Sample	$ 1,500	$ 124,500
16	Regulatory Agency Required Reporting (Final Engineering Report [FER], Data Validation & EQuIS Submittals, and fact sheets)		Lump Sum		$ 100,000
				ENGINEERING FEE SUBTOTAL:	*$ 844,500*
				(20% CONTINGENCY OF CONTRACTOR FEE SUBTOTAL):	*$ 168,900*
				ESTIMATED ABSOLUTE COSTS (rounded):	**$ 7,120,000**

GENERAL NOTES AND ASSUMPTIONS

General Assumptions

- The density used for conversion from cubic yards (CY) to tons is 1.5 tons/CY.
- The site has a footprint of about 59,393 square feet. Assumes site-wide excavation ranging between about 5 and 13.5 feet below grade surface (bgs) for a total of about 20,500 cubic yards (30,750 tons) of soil/fill/native material removal.
- Assumes soil remaining in place meets the Track 1 Unrestricted Use (UU) Soil Cleanup Objectives (SCOs).
- Costs do not include dewatering fees.
- Costs provided are estimates.
- This estimate has been prepared for the purposes of comparing potential remedial alternatives. The information in this cost estimate is based on the available information regarding the site and the anticipated scope of the remedial alternative. Changes in cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. This cost estimate is expected to be within -30% to +50% of the actual cost. Utilization of this cost estimate information beyond the stated purpose is not recommended. Langan is not licensed to provide financial or legal consulting services; as such, this cost estimate information is not intended to be utilized for complying with financial reporting requirements associated with liability services.
- Costs do not include new building construction.
- Estimate excludes soft costs, legal fees, insurance, general consulting, etc.
- Assumes duration of remediation oversight will be 6 months.

Item No.

1 Includes mobilization and demobilization of equipment and materials necessary to excavate, transport, and dispose the targeted soil per the Remedial Action Work Plan (RAWP). Also includes labor and any project related permit or regulation fees (excludes potential hazardous waste fees).

2 Management and handling of contaminated and potentially hazardous material assumes 15% increase in labor costs for Occupational Safety and Health Administration (OSHA) trained labor. Baseline labor fees assumes $25 per cubic yard. Soil handling includes excavation for off-site disposal. Assumes excavation of historic fill and native material to depths ranging between 5 and 13.5 feet bgs.

3 Perimeter support assumes that sheetpiles and lagging will be necessary along the site extents where applicable. Square footage based on depth of remedial cut between 5 and 13.5 feet bgs to achieve a Track 1 Unrestricted Use Cleanup. Remedial excavations along site boundaries cannot be sloped and thus require excavation support.

4 The estimated volumes for the differing types of materials are based on the sampling results of the February 2020 Remedial Investigation performed by Langan. Assumes excavation of historic fill and native material to remedial excavation grade.

5 Assumes a continuous waterproofing membrane will be installed below the foundation slab and along vertical foundation walls up to the proposed finished development grade.

6 Based on experience in the surrounding area, there may be unknown USTs at the site. For this estimate, we assume that up to two USTs will be decommissioned.

7 Dust, odor and vapor control will be required throughout the duration of soil excavation. This cost estimate includes incremental costs associated with equipment and material necessary to monitor and mitigate vapor/odor emission.

8 Includes estimated contractor fees associated with performing the Waste Characterization: Drilling, laboratory.

9 Accounts for placement and compaction of backfilled materials to development grade.

10 Backfill will be required to bring the site up to development grade. Backfill placement and compaction assumes soil handling and management fees for the New York City area. Backfill will meet Track 1 UU SCOs.

11 Includes reporting of waste characterization results for disposal-related requirements.

12 Includes bid support; the Remediation Engineer will answer field contractor questions related to remediation during the bidding process and support the current site owner, as necessary, during the bid leveling process. Includes submittal review, responses to Requests for Information (RFI), and coordination with development team and the architect.

13 Estimate includes, but is not limited to, implementation of a CAMP as required by the New York State Department of Environmental Conservation (NYSDEC), the presence of an on-site engineer throughout remediation, remediation health and safety including purchase and maintenance of appropriate personal protective equipment (PPE), periodic office reporting to the regulatory agency and attendance of at least two site meetings per month.

14 Sampling frequency based on total square footage of the building area at a rate of one sample per 900 square feet of base, and one sidewall sample per 30 linear feet of internal sidewall between areas of varied excavation (plus Quality Assurance/Quality Control (QA/QC) samples) in accordance with NYSDEC Division of Environmental Remediation (DER) Program Policy: Technical Guidance for Site Investigation and Remediation (DER-10) requirements.

15 Costs are based on Langan's experience with regulatory programs and includes the preparation of a Final Engineering Report (FER) and periodic daily and monthly reporting.

Table 4
Remedial Action Work Plan
Track 2 Remedial Cost Estimate

1607 Surf Avenue
Brooklyn, New York
Langan Project No. 170599501

ITEM NO.	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	ABSOLUTE COST
CONTRACTOR FEES					
1	Remediation Facilities, Mobilization, Demobilization, and Site Maintenance - Remediation and decontamination facilities, site fencing, trailer, truck cleaning facilities, etc.		Lump Sum		$ 75,000
2	In-situ Groundwater Treatment of PCE-impacted Groundwater		Lump Sum		$ 100,000
3	Management and Handling of Excavated Materials	8,100	CY	$ 37	$ 299,700
4	Perimeter Support of Excavation ([SOE] Sheeting and Lagging)		Lump Sum		$ 1,500,000
5	Off-Site Transport and Disposal of Historic Fill Material	12,150	Ton	$ 50	$ 607,500
6	Vapor Barrier/Waterproofing Installation	65,000	SF	$ 12	$ 780,000
7	Underground Storage Tank (UST) contingency (assumes registration, cleaning, removal and disposal)	2	Each	$ 10,000	$ 20,000
8	Dust, Odor, and Vapor Control	4	Month	$ 10,000	$ 40,000
9	Waste Characterization Subcontractors (Drilling Contractor, Laboratory Contractor, etc.)		Lump Sum		$ 100,000
10	Management and Handling of Backfilled Materials	2,300	CY	$ 35	$ 80,500
11	Import and Placement of Clean Fill Material to Development Grade	2,300	CY	$ 25	$ 57,500
				CONTRACTOR FEES	*$ 3,522,200*
				(20% CONTINGENCY OF CONTRACTOR FEE SUBTOTAL)	*$ 704,440*
ENGINEERING FEES					
12	Waste Characterization		Lump Sum		$ 60,000
13	Bid and Engineering Support, Construction Administration, and Agency Coordination (During Remediation)	4	Month	$ 20,000	$ 120,000
14	Construction Environmental Monitoring (includes community air monitoring program [CAMP] equipment rental)	4	Month	$ 40,000	$ 160,000
15	Engineering Special Inspection of Support of Excavation	4	Month	$ 35,000	$ 140,000
16	Groundwater Treatment System Design		Lump Sum		$ 50,000
17	Endpoint Sampling (to document residual site conditions following source material removal)	89	Sample	$ 1,500	$ 133,500
18	Regulatory Agency Required Reporting (Final Engineering Report [FER], Data Validation & EQuIS Submittals, and fact sheets)		Lump Sum		$ 100,000
				ENGINEERING FEE SUBTOTAL:	*$ 763,500*
				(20% CONTINGENCY OF CONTRACTOR FEE SUBTOTAL):	*$ 152,700*
				ESTIMATED ABSOLUTE COSTS (rounded):	**$ 5,150,000**

GENERAL NOTES AND ASSUMPTIONS

General Assumptions

- The density used for conversion from cubic yards (CY) to tons is 1.5 tons/CY.
- The site has a footprint of about 59,393 square feet. Assumes site-wide excavation ranging between 2 and 12 feet below grade surface (bgs) for a total of about 8,100 cubic yards (12,150 tons) of soil/fill/native material removal.
- Assumes soil remaining in place meets the Track 2 Restricted-Use Restricted-Residential (RURR) Soil Cleanup Objectives (SCOs).
- Costs do not include dewatering fees.
- Costs provided are estimates.
- This estimate has been prepared for the purposes of comparing potential remedial alternatives. The information in this cost estimate is based on the available information regarding the site and the anticipated scope of the remedial alternative. Changes in cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. This cost estimate is expected to be within -30% to +50% of the actual cost. Utilization of this cost estimate information beyond the stated purpose is not recommended. Langan is not licensed to provide financial or legal consulting services; as such, this cost estimate information is not intended to be utilized for complying with financial reporting requirements associated with liability services.
- Costs do not include new building construction.
- Estimate excludes soft costs, legal fees, insurance, general consulting, etc.
- Assumes duration of remediation oversight will be 6 months.

Item No.

1 Includes mobilization and demobilization of equipment and materials necessary to excavate, transport, and dispose the targeted soil per the Remedial Action Work Plan (RAWP). Also includes labor and any project related permit or regulation fees (excludes potential hazardous waste fees).

2 Accounts for the mobilization of the remediation contractor, installation of injection points, application of chemicals, chemical product costs, and implementation. The cost assumes an allowance for treatment of groundwater impacts in the northeast corner of the site via injection of liquid-activated carbon.

3 Management and handling of contaminated and potentially hazardous material assumes 15% increase in labor costs for Occupational Safety and Health Administration (OSHA) trained labor. Baseline labor fees assumes $25 per cubic yard. Soil handling includes excavation for off-site disposal. Assumes excavation of historic fill and native material to depths ranging between 2 and 12 feet bgs.

4 Perimeter support assumes that sheetpiles and lagging will be necessary along the site extents where applicable. Square footage based on depth of remedial cut between 2 and 12 feet bgs to achieve a Track 2 cleanup. Remedial excavations along site boundaries cannot be sloped and thus require excavation support.

5 The estimated volumes for the differing types of materials are based on the sampling results of the February 2020 Remedial Investigation performed by Langan. Assumes excavation of historic fill and native material to remedial excavation grade.

6 Assumes a continuous waterproofing membrane will be installed below the foundation slab and along vertical foundation walls up to the proposed finished development grade.

7 Based on experience in the surrounding area, there may be unknown USTs at the site. For this estimate, we assume that up to two USTs will be decommissioned.

8 Dust, odor and vapor control will be required throughout the duration of soil excavation. This cost estimate includes incremental costs associated with equipment and material necessary to monitor and mitigate vapor/odor emission.

9 Includes estimated contractor fees associated with performing the Waste Characterization: Drilling, laboratory.

10 Accounts for placement and compaction of backfilled materials to development grade.

11 Backfill will be required to bring the site up to development grade. Backfill placement and compaction assumes soil handling and management fees for the New York City area. Backfill will meet Track 2 RURR SCOs.

12 Includes reporting of waste characterization results for disposal-related requirements.

13 Includes bid support; the Remediation Engineer will answer field contractor questions related to remediation during the bidding process and support the current site owner, as necessary, during the bid leveling process. Includes submittal review, responses to Requests for Information (RFI), and coordination with development team and the architect.

14 Estimate includes, but is not limited to, implementation of a CAMP as required by the New York State Department of Environmental Conservation (NYSDEC), the presence of an on-site engineer throughout remediation, remediation health and safety including purchase and maintenance of appropriate personal protective equipment (PPE), periodic office reporting to the regulatory agency and attendance of at least two site meetings per month.

16 Estimate includes cost to design short-term groundwater treatment system and post-remediation groundwater monitoring wells.

17 Sampling frequency based on total square footage of the building area at a rate of one sample per 900 square feet of base, and one sidewall sample per 30 linear feet of internal sidewall between areas of varied excavation (plus Quality Assurance/Quality Control (QA/QC) samples) in accordance with NYSDEC Division of Environmental Remediation (DER) Program Policy: Technical Guidance for Site Investigation and Remediation (DER-10) requirements.

18 Costs are based on Langan's experience with regulatory programs and includes the preparation of a Final Engineering Report (FER) and periodic daily and monthly reporting.

FIGURES

Notes:
1. World topographic basemap provided through Langan's subscription to Esri's ArcGIS software licensing.
2. Parcel information from MapPLUTO 20v1 copyrighted by the New York City Department of Planning.

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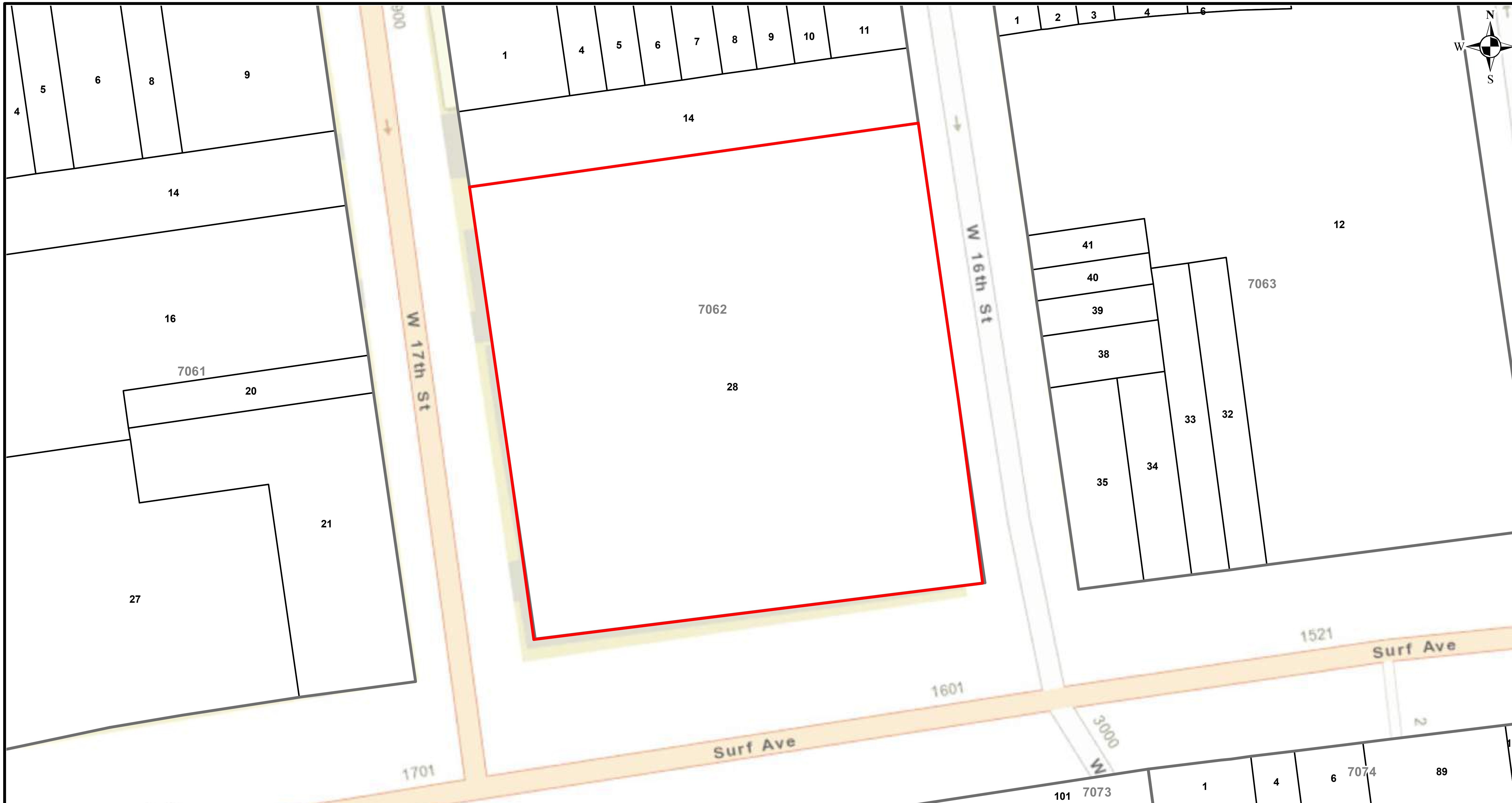
Project	Drawing Title	Project No.	Figure
1607 SURF AVE BLOCK No. 7062, LOT No. 28 CONEY ISLAND BROOKLYN NEW YORK	SITE LOCATION MAP	170599501 Date: 5/5/2020 Scale: 1"=2000' Drawn By: IHB	1

Path: \\langan.com\data\NYC\data5\170599501\Project Data\ArcGIS\MXD\Environmental_Figures\2020-04 - RAWP\Figure 1 - Site Location Map.mxd Date: 5/5/2020 User: aruane Time: 11:01:44 AM



Legend

- Brownfield Cleanup Program Site Boundary
- Tax Block
- Tax Parcel

50 0 50
SCALE IN FEET

Notes:
1. World street basemap is provided through Langan's Esri ArcGIS software licensing and ArcGIS online.
2. Parcel boundaries provided through the New York City Department of Planning's MapPLUTO 20v1, last updated 2020.

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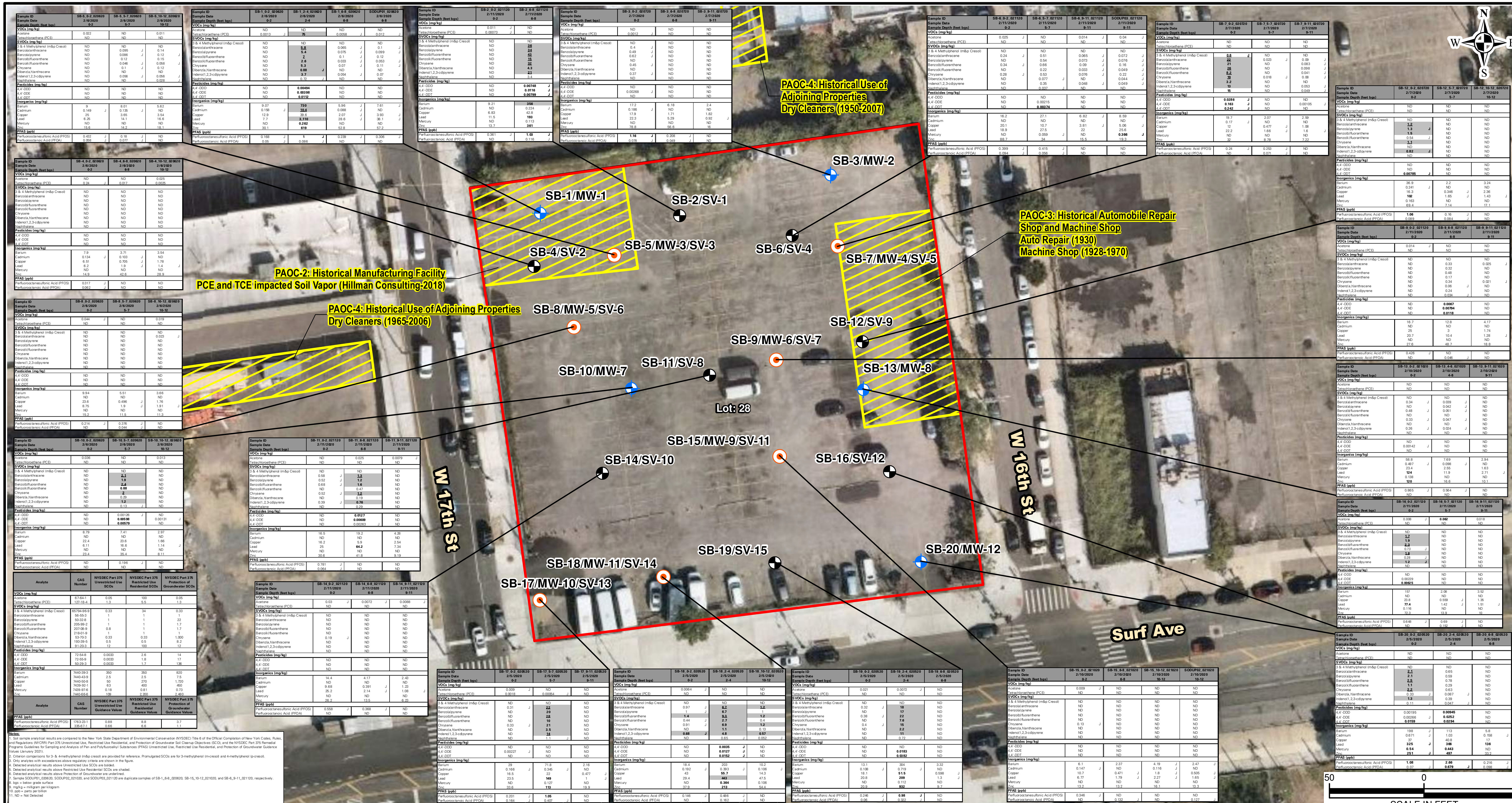
Project	Figure Title	Project No.	Figure
1607 SURF AVENUE BLOCK No. 7062, LOT No. 28 CONEY ISLAND BROOKLYN NEW YORK	SITE LAYOUT PLAN	170599501 Date: 5/18/2021 Scale: 1 " = 50 ' Drawn By: JR Submission Date:	2

Path: \\langan.com\data\NYC\data5\170599501\Project Data\ArcGIS\MXD\Environmental_Figures\2020-04 - RAWP\Figure 2 – Site Layout Plan.mxd Date: 5/18/2021 User: aruane Time: 1:49:16 PM



Analyte	CAS Number	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Restricted Use Residential SCOs	NYSDEC Part 375 Protection of Groundwater SCOs
VOCs (mg/kg)				
Acetone	67-64-1	0.05	100	0.05
Tetrachloroethene (PCE)	127-18-4	1.3	5.5	1.3
SVOCs (mg/kg)				
3 & 4 Methylphenol (m&p Cresol)	65794-96-9	0.33	34	0.33
Benzo(a)anthracene	56-55-3	1	1	1
Benzo(a)pyrene	50-32-8	1	1	22
Benzo(b)fluoranthene	205-99-2	1	1	1.7
Benzo(k)fluoranthene	207-08-9	0.8	1	1.7
Chrysene	218-01-9	1	1	1
Dibenz(a,h)anthracene	53-70-3	0.33	0.33	1,000
Indeno(1,2,3-cd)pyrene	193-39-5	0.5	0.5	8.2
Naphthalene	91-20-3	12	100	12
Pesticides (mg/kg)				
4,4'-DDD	72-54-8	0.0033	2.6	14
4,4'-DDE	72-55-9	0.0033	1.8	17
4,4'-DDT	50-29-3	0.0033	1.7	136
Inorganics (mg/kg)				
Barium	7440-39-3	350	350	820
Cadmium	7440-43-9	2.5	2.5	7.5
Copper	7440-50-8	50	270	1,720
Lead	7439-92-1	63	400	450
Mercury	7439-97-6	0.18	0.81	0.73
Zinc	7440-66-6	109	2,200	2,480
Analyte	**CAS Number**	**NYSDEC Part 375 Unrestricted Use Guidance Values**	**NYSDEC Part 375 Restricted Use Residential Guidance Values**	**NYSDEC Part 375 Protection of Groundwater Guidance Values**
PFAS (ppb)				
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	0.88	8.8	3.7
Perfluorooctanoic Acid (PFOA)	335-67-1	0.66	6.6	1.1

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, Restricted Use Residential, and Protection of Groundwater Soil Cleanup Objectives (SCO), and the NYSDEC Part 375 Remedial Programs Guidelines for Sampling and Analysis of Per- and Polyfluoroalkyl Substances (PFAS) Unrestricted Use, Restricted Use Residential, and Protection of Groundwater Guidance Values (Janurary 2021).
2. Criterion comparisons for 3- & 4-methylphenol (m&p cresol) are provided for reference. Promulgated SCOs are for 3-methylphenol (m-cresol) and 4-methylphenol (p-cresol).
3. Only analytes with exceedances above regulatory criteria are shown in the figure.
4. Detected analytical results above Unrestricted Use SCOs are bolded.
5. Detected analytical results above Restricted Use Residential SCOs are shaded.
6. Detected analytical results above Protection of Groundwater are underlined.
7. Sample SODUP01_020620, SODUP02_021020, and SODUP03_021120 are duplicate samples of SB-1_6-8_020620, SB-15_10-12_021020, and SB-6_9-11_021120, respectively.
8. bgs = below grade surface
9. mg/kg = milligram per kilogram
10. ppb = parts per billion
11. ND = Not Detected

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

Legend

- Site Boundary
- Lot Boundary
- Potential Areas of Concern
- Langan Soil Boring / Soil Vapor Sample Location
- Langan Soil Boring / Monitoring Well Location
- Langan Soil Boring / Monitoring Well/ Soil Vapor Sample Location

Notes:
1. Aerial imagery provided through Langan's subscription to NearMap, imagery dated 21 September 2019.
2. Parcel boundaries provided through the New York City Department of Planning's MapPLUTO 20v1, last updated 2020.
3. AOC-1: Historic Fill encompasses the extent of the site.
4. Langan monitoring well locations are based on locations surveyed by a licensed surveyor.
5. Langan soil boring and soil vapor samples shown are approximate and based on field measurements, except for those converted to monitoring wells.
6. Only analytes with exceedances above regulatory criteria are shown in the figure.

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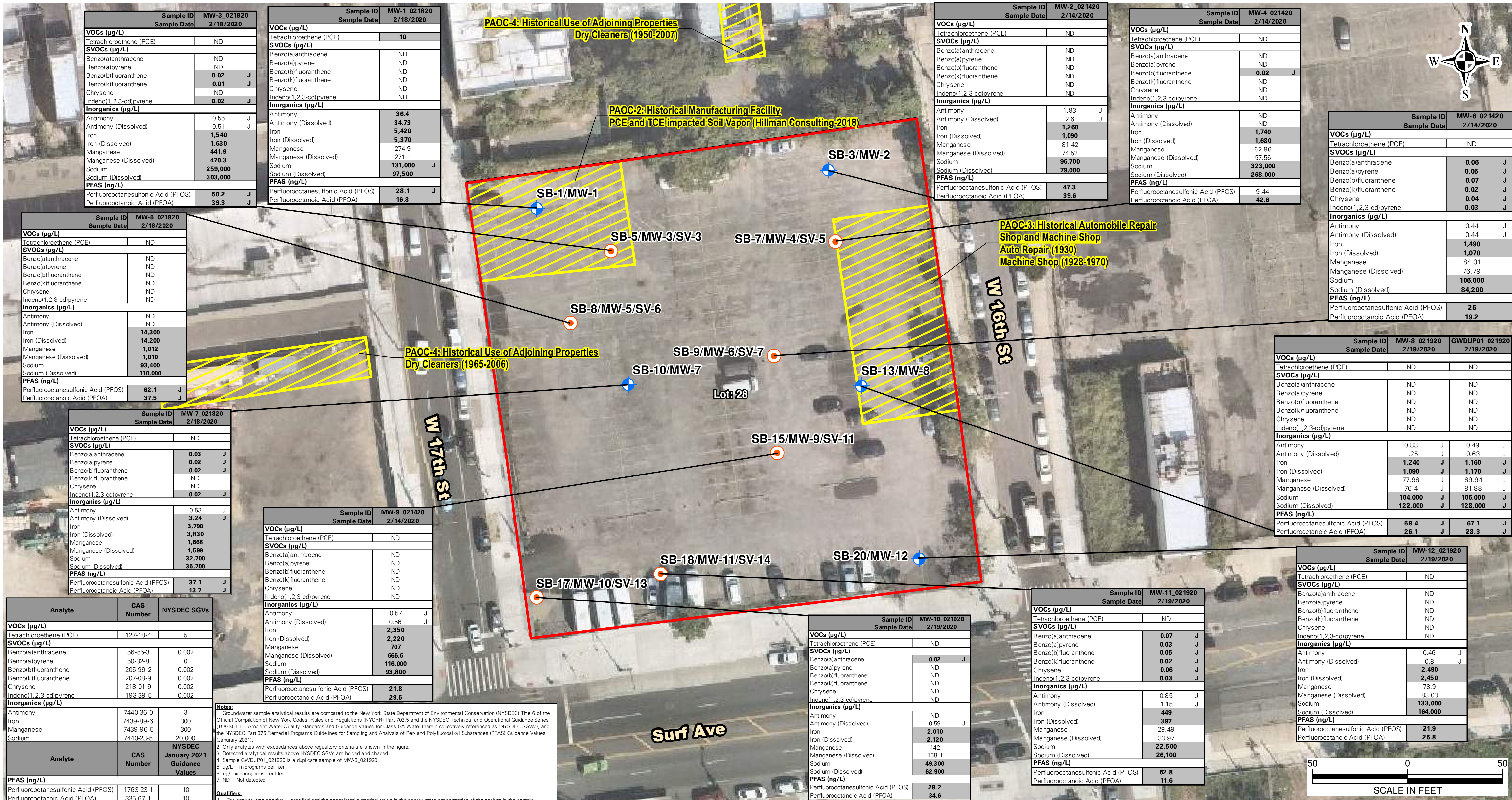
Project
1607 SURF AVENUE
BLOCK No. 7062, LOT No. 28
CONEY ISLAND
BROOKLYN NEW YORK

Figure Title
SOIL SAMPLE ANALYTICAL RESULTS MAP

Project No.	Figure
170599501	3
Date 5/18/2021	
Scale 1 " = 50 '	
Drawn By IHB	
Submission Date	



Sample ID Sample Date	MW-3_021820 2/18/2020	
VOCs (µg/L)		
Tetrachloroethene (PCE)	ND	
SVOCs (µg/L)		
Benzo(a)anthracene	ND	
Benzo(a)pyrene	ND	
Benzo(b)fluoranthene	**0.02**	J
Benzo(k)fluoranthene	**0.01**	J
Chrysene	ND	
Indeno(1,2,3-cd)pyrene	**0.02**	J
Inorganics (µg/L)		
Antimony	0.55	J
Antimony (Dissolved)	0.51	J
Iron	**1,540**	
Iron (Dissolved)	**1,630**	
Manganese	**441.9**	
Manganese (Dissolved)	**470.3**	
Sodium	**259,000**	
Sodium (Dissolved)	**303,000**	
PFAS (ng/L)		
Perfluorooctanesulfonic Acid (PFOS)	**50.2**	J
Perfluorooctanoic Acid (PFOA)	**39.3**	J

Sample ID Sample Date	MW-1_021820 2/18/2020	
VOCs (µg/L)		
Tetrachloroethene (PCE)	**10**	
SVOCs (µg/L)		
Benzo(a)anthracene	ND	
Benzo(a)pyrene	ND	
Benzo(b)fluoranthene	ND	
Benzo(k)fluoranthene	ND	
Chrysene	ND	
Indeno(1,2,3-cd)pyrene	ND	
Inorganics (µg/L)		
Antimony	**36.4**	
Antimony (Dissolved)	**34.73**	
Iron	**5,420**	
Iron (Dissolved)	**5,370**	
Manganese	274.9	
Manganese (Dissolved)	271.1	
Sodium	**131,000**	J
Sodium (Dissolved)	**97,500**	
PFAS (ng/L)		
Perfluorooctanesulfonic Acid (PFOS)	**28.1**	J
Perfluorooctanoic Acid (PFOA)	**16.3**	

Sample ID Sample Date	MW-2_021420 2/14/2020	
VOCs (µg/L)		
Tetrachloroethene (PCE)	ND	
SVOCs (µg/L)		
Benzo(a)anthracene	ND	
Benzo(a)pyrene	ND	
Benzo(b)fluoranthene	ND	
Benzo(k)fluoranthene	ND	
Chrysene	ND	
Indeno(1,2,3-cd)pyrene	ND	
Inorganics (µg/L)		
Antimony	1.83	J
Antimony (Dissolved)	2.6	J
Iron	**1,260**	
Iron (Dissolved)	**1,090**	
Manganese	81.42	
Manganese (Dissolved)	74.52	
Sodium	**96,700**	
Sodium (Dissolved)	**79,000**	
PFAS (ng/L)		
Perfluorooctanesulfonic Acid (PFOS)	**47.3**	
Perfluorooctanoic Acid (PFOA)	**39.6**	

Sample ID Sample Date	MW-4_021420 2/14/2020	
VOCs (µg/L)		
Tetrachloroethene (PCE)	ND	
SVOCs (µg/L)		
Benzo(a)anthracene	ND	
Benzo(a)pyrene	ND	
Benzo(b)fluoranthene	**0.02**	J
Benzo(k)fluoranthene	ND	
Chrysene	ND	
Indeno(1,2,3-cd)pyrene	ND	
Inorganics (µg/L)		
Antimony	ND	
Antimony (Dissolved)	ND	
Iron	**1,740**	
Iron (Dissolved)	**1,680**	
Manganese	62.86	
Manganese (Dissolved)	57.56	
Sodium	**323,000**	
Sodium (Dissolved)	**268,000**	
PFAS (ng/L)		
Perfluorooctanesulfonic Acid (PFOS)	9.44	
Perfluorooctanoic Acid (PFOA)	**42.6**	

Sample ID Sample Date	MW-6_021420 2/14/2020	
VOCs (µg/L)		
Tetrachloroethene (PCE)	ND	
SVOCs (µg/L)		
Benzo(a)anthracene	**0.06**	J
Benzo(a)pyrene	**0.05**	J
Benzo(b)fluoranthene	**0.07**	J
Benzo(k)fluoranthene	**0.02**	J
Chrysene	**0.04**	J
Indeno(1,2,3-cd)pyrene	**0.03**	J
Inorganics (µg/L)		
Antimony	0.44	J
Antimony (Dissolved)	0.44	J
Iron	**1,490**	
Iron (Dissolved)	**1,070**	
Manganese	84.01	
Manganese (Dissolved)	76.79	
Sodium	**106,000**	
Sodium (Dissolved)	**84,200**	
PFAS (ng/L)		
Perfluorooctanesulfonic Acid (PFOS)	**26**	
Perfluorooctanoic Acid (PFOA)	**19.2**	

Sample ID Sample Date	MW-5_021820 2/18/2020	
VOCs (µg/L)		
Tetrachloroethene (PCE)	ND	
SVOCs (µg/L)		
Benzo(a)anthracene	ND	
Benzo(a)pyrene	ND	
Benzo(b)fluoranthene	ND	
Benzo(k)fluoranthene	ND	
Chrysene	ND	
Indeno(1,2,3-cd)pyrene	ND	
Inorganics (µg/L)		
Antimony	ND	
Antimony (Dissolved)	ND	
Iron	**14,300**	
Iron (Dissolved)	**14,200**	
Manganese	**1,012**	
Manganese (Dissolved)	**1,010**	
Sodium	**93,400**	
Sodium (Dissolved)	**110,000**	
PFAS (ng/L)		
Perfluorooctanesulfonic Acid (PFOS)	**62.1**	J
Perfluorooctanoic Acid (PFOA)	**37.5**	J

Sample ID Sample Date	MW-8_021920 2/19/2020		GWDUP01_021920 2/19/2020	
VOCs (µg/L)				
Tetrachloroethene (PCE)	ND		ND	
SVOCs (µg/L)				
Benzo(a)anthracene	ND		ND	
Benzo(a)pyrene	ND		ND	
Benzo(b)fluoranthene	ND		ND	
Benzo(k)fluoranthene	ND		ND	
Chrysene	ND		ND	
Indeno(1,2,3-cd)pyrene	ND		ND	
Inorganics (µg/L)				
Antimony	0.83	J	0.49	J
Antimony (Dissolved)	1.25	J	0.63	J
Iron	**1,240**	J	**1,160**	J
Iron (Dissolved)	**1,090**	J	**1,170**	J
Manganese	77.98	J	69.94	J
Manganese (Dissolved)	76.4	J	81.88	J
Sodium	**104,000**	J	**106,000**	J
Sodium (Dissolved)	**122,000**	J	**128,000**	J
PFAS (ng/L)				
Perfluorooctanesulfonic Acid (PFOS)	**58.4**	J	**67.1**	J
Perfluorooctanoic Acid (PFOA)	**26.1**	J	**28.3**	J

Sample ID Sample Date	MW-7_021820 2/18/2020	
VOCs (µg/L)		
Tetrachloroethene (PCE)	ND	
SVOCs (µg/L)		
Benzo(a)anthracene	**0.03**	J
Benzo(a)pyrene	**0.02**	J
Benzo(b)fluoranthene	**0.02**	J
Benzo(k)fluoranthene	ND	
Chrysene	ND	
Indeno(1,2,3-cd)pyrene	**0.02**	J
Inorganics (µg/L)		
Antimony	0.53	J
Antimony (Dissolved)	**3.24**	J
Iron	**3,790**	
Iron (Dissolved)	**3,830**	
Manganese	**1,668**	
Manganese (Dissolved)	**1,599**	
Sodium	**32,700**	
Sodium (Dissolved)	**35,700**	
PFAS (ng/L)		
Perfluorooctanesulfonic Acid (PFOS)	**37.1**	J
Perfluorooctanoic Acid (PFOA)	**13.7**	J

Sample ID Sample Date	MW-9_021420 2/14/2020	
VOCs (µg/L)		
Tetrachloroethene (PCE)	ND	
SVOCs (µg/L)		
Benzo(a)anthracene	ND	
Benzo(a)pyrene	ND	
Benzo(b)fluoranthene	ND	
Benzo(k)fluoranthene	ND	
Chrysene	ND	
Indeno(1,2,3-cd)pyrene	ND	
Inorganics (µg/L)		
Antimony	0.57	J
Antimony (Dissolved)	0.56	J
Iron	**2,350**	
Iron (Dissolved)	**2,220**	
Manganese	**707**	
Manganese (Dissolved)	**666.6**	
Sodium	**116,000**	
Sodium (Dissolved)	**93,800**	
PFAS (ng/L)		
Perfluorooctanesulfonic Acid (PFOS)	**21.8**	
Perfluorooctanoic Acid (PFOA)	**29.6**	

Sample ID Sample Date	MW-12_021920 2/19/2020	
VOCs (µg/L)		
Tetrachloroethene (PCE)	ND	
SVOCs (µg/L)		
Benzo(a)anthracene	ND	
Benzo(a)pyrene	ND	
Benzo(b)fluoranthene	ND	
Benzo(k)fluoranthene	ND	
Chrysene	ND	
Indeno(1,2,3-cd)pyrene	ND	
Inorganics (µg/L)		
Antimony	0.46	J
Antimony (Dissolved)	0.8	J
Iron	**2,490**	
Iron (Dissolved)	**2,450**	
Manganese	78.9	
Manganese (Dissolved)	83.03	
Sodium	**133,000**	
Sodium (Dissolved)	**164,000**	
PFAS (ng/L)		
Perfluorooctanesulfonic Acid (PFOS)	**21.9**	
Perfluorooctanoic Acid (PFOA)	**25.8**	

Sample ID Sample Date	MW-11_021920 2/19/2020	
VOCs (µg/L)		
Tetrachloroethene (PCE)	ND	
SVOCs (µg/L)		
Benzo(a)anthracene	**0.07**	J
Benzo(a)pyrene	**0.03**	J
Benzo(b)fluoranthene	**0.05**	J
Benzo(k)fluoranthene	**0.02**	J
Chrysene	**0.06**	J
Indeno(1,2,3-cd)pyrene	**0.03**	J
Inorganics (µg/L)		
Antimony	0.85	J
Antimony (Dissolved)	1.15	J
Iron	**449**	
Iron (Dissolved)	**397**	
Manganese	29.49	
Manganese (Dissolved)	33.97	
Sodium	**22,500**	
Sodium (Dissolved)	**26,100**	
PFAS (ng/L)		
Perfluorooctanesulfonic Acid (PFOS)	**62.8**	
Perfluorooctanoic Acid (PFOA)	**11.6**	

Sample ID Sample Date	MW-10_021920 2/19/2020	
VOCs (µg/L)		
Tetrachloroethene (PCE)	ND	
SVOCs (µg/L)		
Benzo(a)anthracene	**0.02**	J
Benzo(a)pyrene	ND	
Benzo(b)fluoranthene	ND	
Benzo(k)fluoranthene	ND	
Chrysene	ND	
Indeno(1,2,3-cd)pyrene	ND	
Inorganics (µg/L)		
Antimony	ND	
Antimony (Dissolved)	0.59	J
Iron	**2,010**	
Iron (Dissolved)	**2,120**	
Manganese	142	
Manganese (Dissolved)	158.1	
Sodium	**49,300**	
Sodium (Dissolved)	**62,900**	
PFAS (ng/L)		
Perfluorooctanesulfonic Acid (PFOS)	**28.2**	
Perfluorooctanoic Acid (PFOA)	**34.6**	

Analyte	CAS Number	NYSDEC SGVs
VOCs (µg/L)		
Tetrachloroethene (PCE)	127-18-4	5
SVOCs (µg/L)		
Benzo(a)anthracene	56-55-3	0.002
Benzo(a)pyrene	50-32-8	0
Benzo(b)fluoranthene	205-99-2	0.002
Benzo(k)fluoranthene	207-08-9	0.002
Chrysene	218-01-9	0.002
Indeno(1,2,3-cd)pyrene	193-39-5	0.002
Inorganics (µg/L)		
Antimony	7440-36-0	3
Iron	7439-89-6	300
Manganese	7439-96-5	300
Sodium	7440-23-5	20,000
Analyte	**CAS Number**	**NYSDEC January 2021 Guidance Values**
PFAS (ng/L)		
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	10
Perfluorooctanoic Acid (PFOA)	335-67-1	10

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 (herein collectively referenced as "NYSDEC SGVs"), and the NYSDEC Part 375 Remedial Programs Guidelines for Sampling and Analysis of Per- and Polyfluoroalkyl Substances (PFAS) Guidance Values (Janurary 2021).
2. Only analytes with exceedances above regualtory criteria are shown in the figure.
3. Detected analytical results above NYSDEC SGVs are bolded and shaded.
4. Sample GWDUP01_021920 is a duplicate sample of MW-8_021920.
5. µg/L = micrograms per liter
6. ng/L = nanograms per liter
7. ND = Not detected

Qualifiers:

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

Legend

- Site Boundary
- Lot Boundary
- Potential Areas of Concern
- Langan Soil Boring / Monitoring Well Location
- Langan Soil Boring / Monitoring Well/ Soil Vapor Sample Location

Notes:

1. Aerial imagery provided through Langan's subscription to NearMap, imagery dated 21 September 2019.
2. Parcel boundaries provided through the New York City Department of Planning's MapPLUTO 20v1, last updated 2020.
3. AOC-1: Historic Fill encompasses the extent of the site
4. Langan monitoring well locations are based on locations surveyed by a licensed surveyor.
5. Only analytes with exceedances above regulatory criteria are shown in the figure.

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Project
1607 SURF AVENUE
BLOCK No. 7062, LOT No. 28
CONEY ISLAND
BROOKLYN NEW YORK

Figure Title
GROUNDWATER SAMPLE ANALYTICAL RESULTS MAP

Project No.	Figure
170599501	4
Date	
5/18/2021	
Scale	
1 " = 50 '	
Drawn By	
IHB	
Submission Date	

Path: \\langan.com\data\NYC\data5\170599501\Project Data\ArcGIS\MXD\Environmental_Figures\2021-03 RAWP\Figure 4 - Groundwater Contours and Analytical Results.mxd Date: 5/18/2021 User: aruane Time: 1:59:06 PM

Analyte	CAS Number	NYSDOH Decision Matrices Minimum Concentrations
VOCs (µg/m³)		
1,1,1-Trichloroethane	71-55-6	100
1,1-Dichloroethane	75-34-3	~
1,1-Dichloroethene	75-35-4	6
1,2,4-Trimethylbenzene	95-63-6	~
1,3,5-Trimethylbenzene (Mesitylene)	108-67-8	~
1,3-Butadiene	106-99-0	~
2,2,4-Trimethylpentane	540-84-1	~
2-Hexanone	591-78-6	~
4-Ethyltoluene	622-96-8	~
Acetone	67-64-1	~
Benzene	71-43-2	~
Carbon Disulfide	75-15-0	~
Carbon Tetrachloride	56-23-5	6
Chloroform	67-66-3	~
Chloromethane	74-87-3	~
Cis-1,2-Dichloroethene	156-59-2	6
Cyclohexane	110-82-7	~
Dichlorodifluoromethane	75-71-8	~
Ethanol	64-17-5	~
Ethyl Acetate	141-78-6	~
Ethylbenzene	100-41-4	~
Isopropanol	67-63-0	~
M,P-Xylene	179601-23-1	~
Methyl Ethyl Ketone (2-Butanone)	78-93-3	~
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	108-10-1	~
Methylene Chloride	75-09-2	100
n-Heptane	142-82-5	~
n-Hexane	110-54-3	~
o-Xylene (1,2-Dimethylbenzene)	95-47-6	~
Styrene	100-42-5	~
Tert-Butyl Alcohol	75-65-0	~
Tetrachloroethene (PCE)	127-18-4	100
Tetrahydrofuran	109-99-9	~
Toluene	108-88-3	~
Total Xylenes	1330-20-7	~
Trichloroethene (TCE)	79-01-6	6
Trichlorofluoromethane	75-69-4	~
Vinyl Chloride	75-01-4	6

Notes:
1. Soil vapor sample analytical results are compared to the minimum soil vapor concentrations at which mitigation is recommended as set forth in the New York State Department of Health (NYSDOH) October 2006 Guidance for Evaluating Soil Vapor Intrusion in the State of New York Decision Matrices for Sub-Slab Vapor and Indoor Air and subsequent updates (2017).
2. Ambient air sample analytical results are shown for reference only.
3. Only detected analytes are shown in the table.
4. Detected analytical results above the minimum soil vapor concentrations recommending mitigation are bolded and shaded.
5. Analytical results with reporting limits (RL) above the minimum soil vapor concentrations recommending mitigation are italicized.
6. Sample DUP01_120320 is a duplicate of parent sample SV-17_120320 and sample DUP-01_030221 is a duplicate sample of SV-24_030221.
7. ~ = Regulatory limit for this analyte does not exist
8. µg/m³ = micrograms per cubic meter
9. AA = Ambient Air
10. 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.
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.

Legend
- Site Boundary
- Lot Boundary
- Potential Areas of Concern
- Langan Soil Vapor Sample Location
- Langan Soil Boring / Soil Vapor Sample Location
- Langan Soil Boring / Monitoring Well/ Soil Vapor Sample Location
- Langan Ambient Air Sample

Notes:
1. Aerial imagery provided through Langan's subscription to NearMap, imagery dated 21 September 2019.
2. Parcel boundaries provided through the New York City Department of Planning's MapPLUTO 20v1, last updated 2020.
3. AOC-1: Historic Fill encompasses the extent of the site
4. Langan soil boring and soil vapor samples shown are approximate and based on field measurements, except for those converted to monitoring wells.

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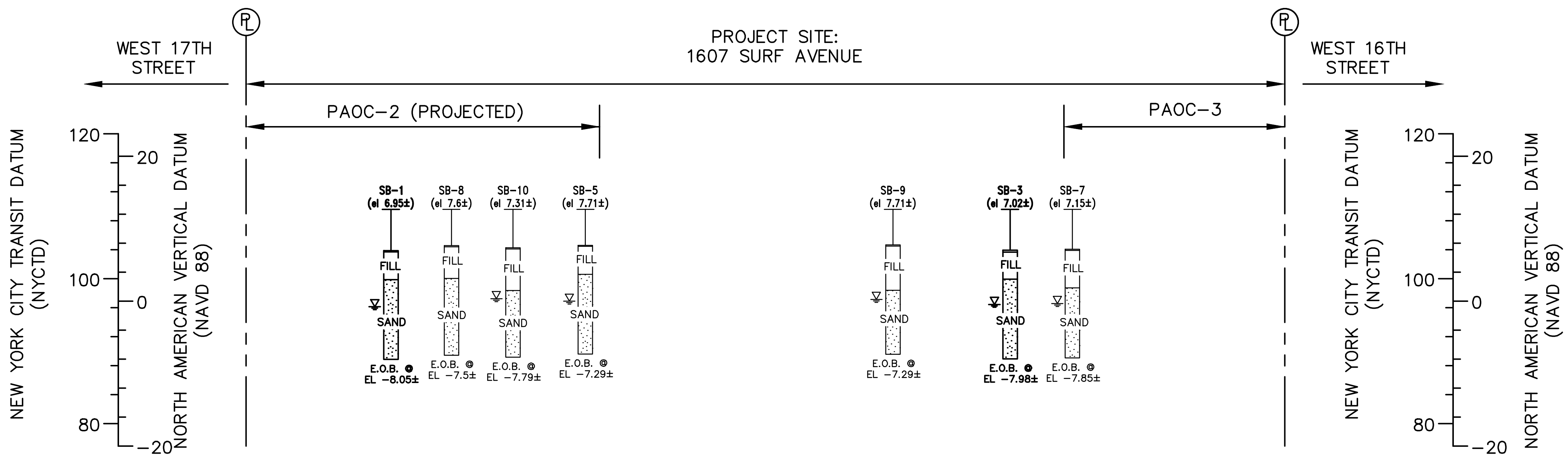
Project
1607 SURF AVENUE
BLOCK No. 7062, LOT No. 28
CONEY ISLAND
BROOKLYN NEW YORK

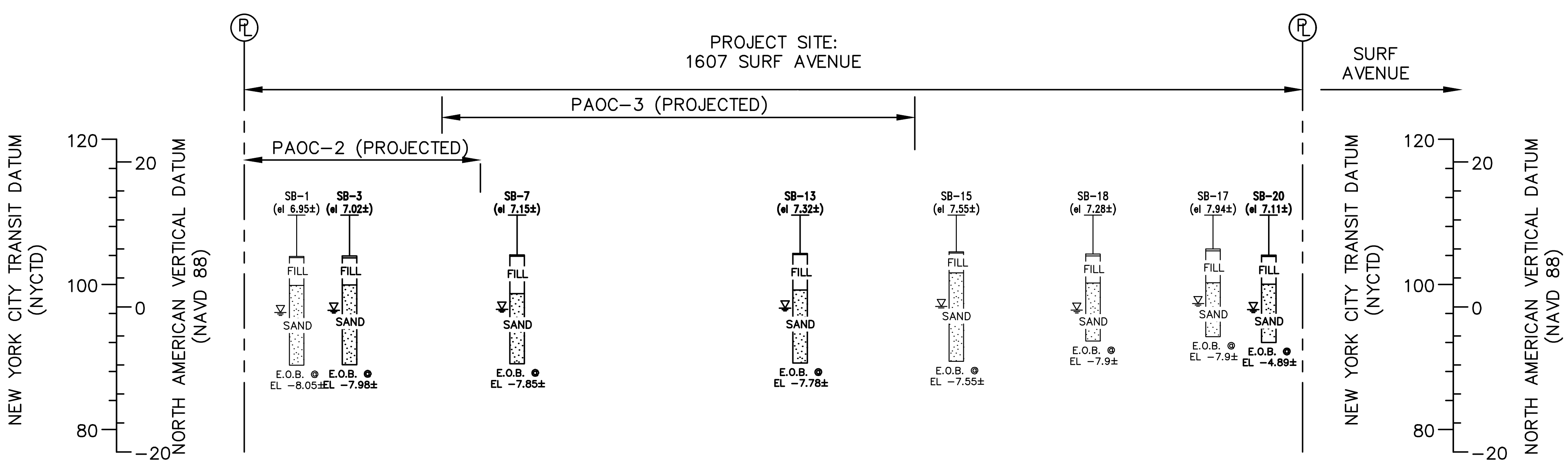
Figure Title
SOIL VAPOR SAMPLE ANALYTICAL RESULTS MAP

Project No.	170599501
Date	5/18/2021
Scale	1 " = 80 '
Drawn By	IHB
Submission Date	
Figure	5

Path: \\langan.com\data\NYC\data5\170599501\Project Data\ArcGIS\MXD\Environmental_Figures\2021-03 RAWP\Figure 5 - Soil Vapor Analytical Results.mxd Date: 5/18/2021 User: aruane Time: 2:11:50 PM



SECTION A - A'
SCALE: 1" = 20'



SECTION B - B'
SCALE: 1" = 20'

SITE MAP
SCALE: 1" = 100'

100 0 50 100
SCALE IN FEET

LEGEND

- 1607 SURF AVENUE SITE BOUNDARY
- POTENTIAL AREAS OF CONCERN
- LANGAN SOIL VAPOR SAMPLE LOCATION
- LANGAN SOIL BORING/SOIL VAPOR SAMPLE LOCATION
- LANGAN SOIL BORING/MONITORING WELL LOCATION
- LANGAN SOIL BORING/MONITORING WELL/SOIL VAPOR SAMPLE LOCATION
- LANGAN AMBIENT AIR SAMPLE LOCATION

NOTE

1. BASEMAP IS REFERENCED FROM A DRAWING TITLED "SAMPLE LOCATION MAP AND POTENTIAL AREAS OF CONCERN", PREPARED BY LANGAN, DATED DECEMBER 22, 2020.
2. SUBSURFACE PROFILES WERE GENERATED BASED ON THE BORING LOGS COLLECTED DURING THE FEBRUARY 2020 REMEDIAL INVESTIGATION.

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.

20 0 5 10 20
SCALE IN FEET

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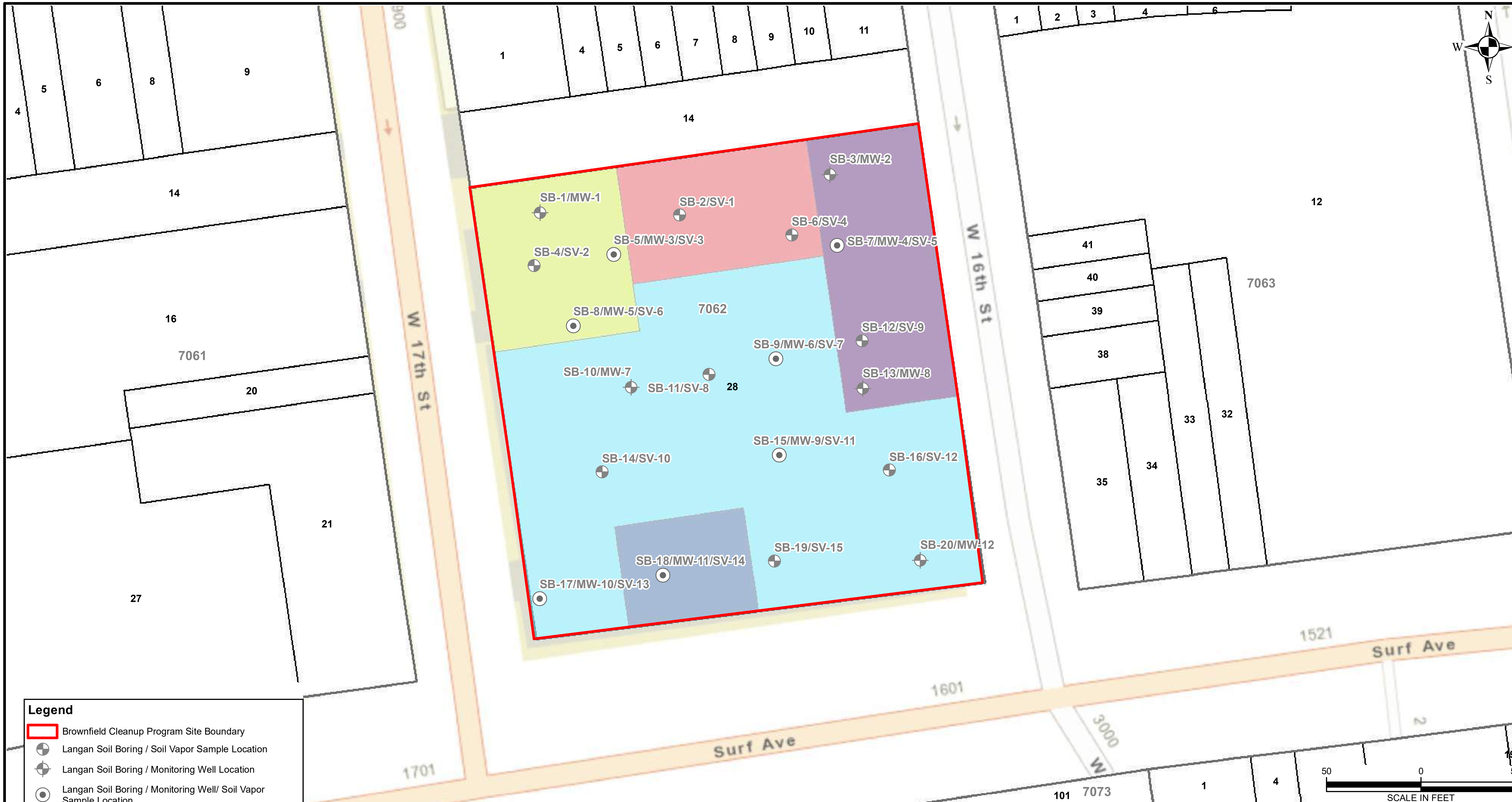
Project	Drawing Title	Project No.	Drawing No.
1607 SURF AVENUE BLOCK No. 7062, LOT 28 CONEY ISLAND BROOKLYN NEW YORK	SUBSURFACE PROFILES	170599501 Date: 3/15/2021 Drawn By: AC Checked By: AK	6

Filename: \\langan.com\data\NYC\data5\170599501\Project Data\CAD\01\SheetFiles\Environmental\170599501-NI201-0102.dwg Date: 3/15/2021 Time: 21:00 User: lesmail Style Table: Langan.stb Layout: Subsurface Profiles



Legend

- Brownfield Cleanup Program Site Boundary
- Langan Soil Boring / Soil Vapor Sample Location
- Langan Soil Boring / Monitoring Well Location
- Langan Soil Boring / Monitoring Well/ Soil Vapor Sample Location
- Excavation to about 5 feet below grade surface
- Excavation to about 6 feet below grade surface
- Excavation to about 10 feet below grade surface
- Excavation to about 12 feet below grade surface
- Excavation to about 13.5 feet below grade surface
- Tax Block
- Tax Parcel

Notes:
1. World street basemap is provided through Langan's Esri ArcGIS software licensing and ArcGIS online.
2. Parcel boundaries provided through the New York City Department of Planning's MapPLUTO 20v1, last updated 2020.
3. Langan monitoring well locations are based on locations surveyed by a licensed surveyor.
4. Langan soil boring and soil vapor samples shown are approximate and based on field measurements, except for those collocated to monitoring wells.
5. bgs: Below grade surface

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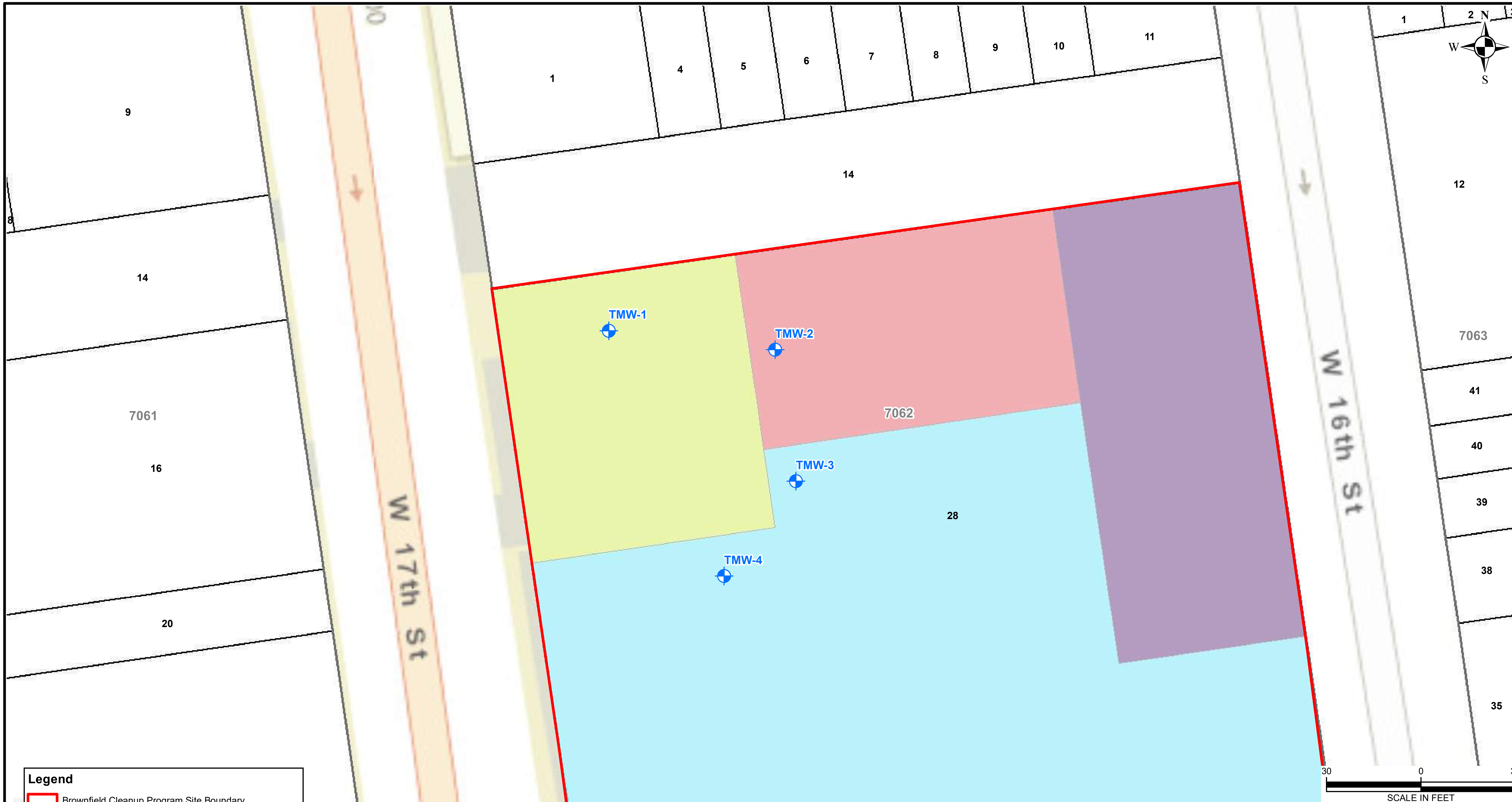
Project	Figure Title	Project No.	Figure
1607 SURF AVENUE BLOCK No. 7062, LOT No. 28 CONEY ISLAND BROOKLYN NEW YORK	ALTERNATIVE I - TRACK 1 CLEANUP	170599501 Date: 6/17/2021 Scale: 1 " = 50 ' Drawn By: JR Submission Date:	7

Path: \\langan.com\data\NYC\data5\170599501\Project Data\ArcGIS\MXD\Environmental_Figures\2021-03 RAWP\Figure 7 – Alternative I – Track 1 Cleanup.mxd Date: 6/17/2021 User: aruane Time: 4:21:30 PM



Legend

- Brownfield Cleanup Program Site Boundary
- Post-Remedial Groundwater Monitoring Well Location
- Excavation to about 5 feet below grade surface
- Excavation to about 6 feet below grade surface
- Excavation to about 10 feet below grade surface
- Excavation to about 13.5 feet below grade surface
- Tax Block
- Tax Parcel

Notes:
1. World street basemap is provided through Langan's Esri ArcGIS software licensing and ArcGIS online.
2. Parcel boundaries provided through the New York City Department of Planning's MapPLUTO 20v1, last updated 2020.

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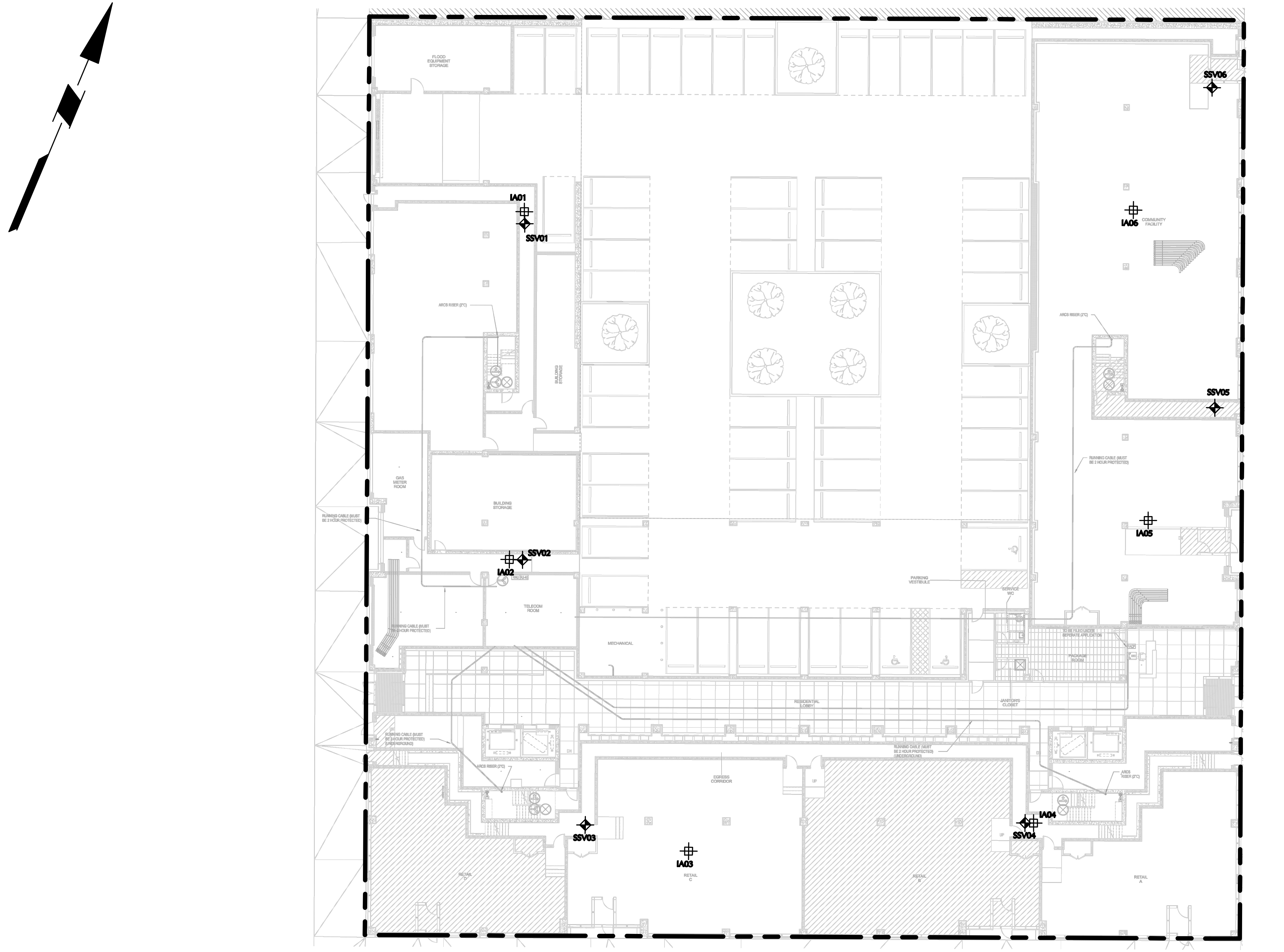
Project	Figure Title	Project No.	Figure
1607 SURF AVENUE BLOCK No. 7062, LOT No. 28 CONEY ISLAND BROOKLYN NEW YORK	TENTATIVE GROUNDWATER MONITORING PLAN	170599501	8
		Date: 6/17/2021	
		Scale: 1 " = 30 '	
		Drawn By: JR	
		Submission Date	



LEGEND:

APPROXIMATE BUILDING FOOTPRINT AND EXTENT OF VAPOR BARRIER

SSV01 PROPOSED SUB-SLAB VAPOR SAMPLING LOCATION

IA01 PROPOSED INDOOR AIR SAMPLING LOCATION

GENERAL NOTES:

1. BASE MAP REFERENCED FROM DRAWING FA-201, "CELLAR ARCS PLAN", PREPARED BY S9 ARCHITECTURE AND ENGINEERING, PC., DATED, DECEMBER 10, 2018.

PLAN VIEW

SCALE: 1" TO 30'

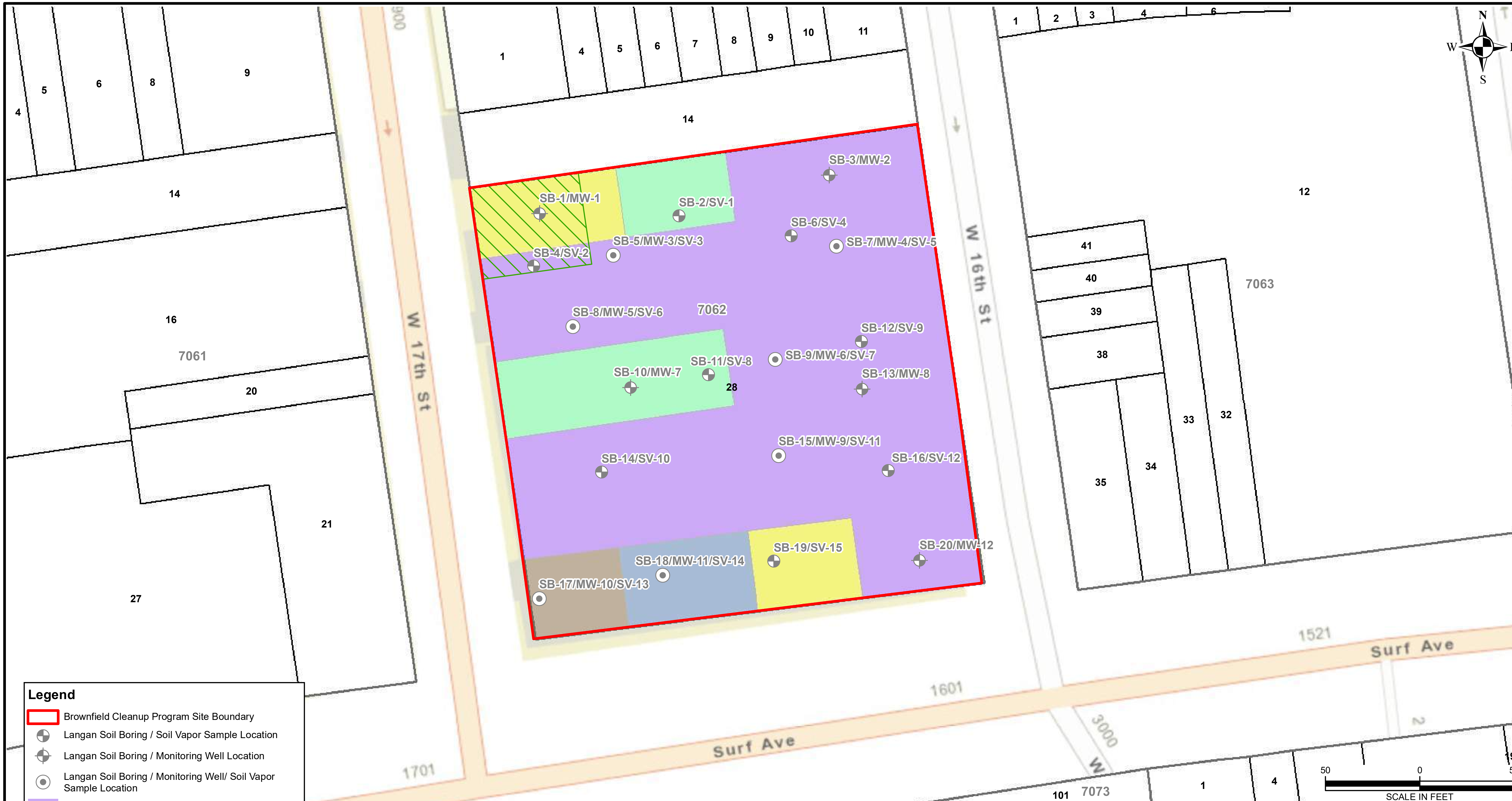
30 0 15 30

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	Drawing Title	Project No.	Figure No.
Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C. 21 Penn Plaza, 360 West 31st Street, 8th Floor New York, NY 10001 T: 212.479.5400 F: 212.479.5444 www.langan.com	1607 SURF AVENUE BLOCK No. 7062, LOT No. 28 CONEY ISLAND BROOKLYN NEW YORK	TENTATIVE VAPOR INTRUSION EVALUATION SAMPLING PLAN	170488401 Date 07/12/2021 Drawn By TM Checked By JH	9

Filename: \\langan.com\data\NYC\data5\170599501\Project Data\CAD\01\2D-DesignFiles\2021 - RAWP\Figure 9 - Tentative Vapor Intrusion Evaluation Sampling Plan.dwg Date: 7/12/2021 Time: 13:47 User: lesmail Style Table: Langan.stb Layout: Monitoring Points



Legend

- Brownfield Cleanup Program Site Boundary
- Langan Soil Boring / Soil Vapor Sample Location
- Langan Soil Boring / Monitoring Well Location
- Langan Soil Boring / Monitoring Well/ Soil Vapor Sample Location
- Excavation to about 2 feet below grade surface
- Excavation to about 4 feet below grade surface
- Excavation to about 7 feet below grade surface
- Excavation to about 8 feet below grade surface
- Excavation to about 12 feet below grade surface
- Approximate Area of PlumeStop® Application
- Tax Block
- Tax Parcel

Notes:
1. World street basemap is provided through Langan's Esri ArcGIS software licensing and ArcGIS online.
2. Parcel boundaries provided through the New York City Department of Planning's MapPLUTO 20v1, last updated 2020.
3. Langan monitoring well locations are based on locations surveyed by a licensed surveyor.
4. Langan soil boring and soil vapor samples shown are approximate and based on field measurements, except for those converted to monitoring wells.
5. bgs: Below grade surface

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Project	Figure Title	Project No.	Figure
1607 SURF AVENUE BLOCK No. 7062, LOT No. 28 CONEY ISLAND BROOKLYN NEW YORK	ALTERNATIVE II - TRACK 2 CLEANUP	170599501	10
		Date: 6/17/2021	
		Scale: 1 " = 50 '	
		Drawn By: JR	
		Submission Date	

Path: \\langan.com\data\NYC\data5\170599501\Project Data\ArcGIS\MXD\Environmental_Figures\2021-03 RAWP\Figure 10 – Alternative II – Track II Cleanup.mxd Date: 6/17/2021 User: aruane Time: 3:35:57 PM

Legend

- Proposed Sidewall Sample Location
- Proposed Endpoint Sample Location
- Brownfield Cleanup Program Site Boundary
- Excavation to about 5 feet below grade surface
- Excavation to about 6 feet below grade surface
- Excavation to about 10 feet below grade surface
- Excavation to about 12 feet below grade surface
- Excavation to about 13.5 feet below grade surface
- Tax Block
- Tax Parcel

50 0 50
SCALE IN FEET

Notes:
1. World street basemap is provided through Langan's Esri ArcGIS software licensing and ArcGIS online.
2. Parcel boundaries provided through the New York City Department of Planning's MapPLUTO 20v1, last updated 2020.

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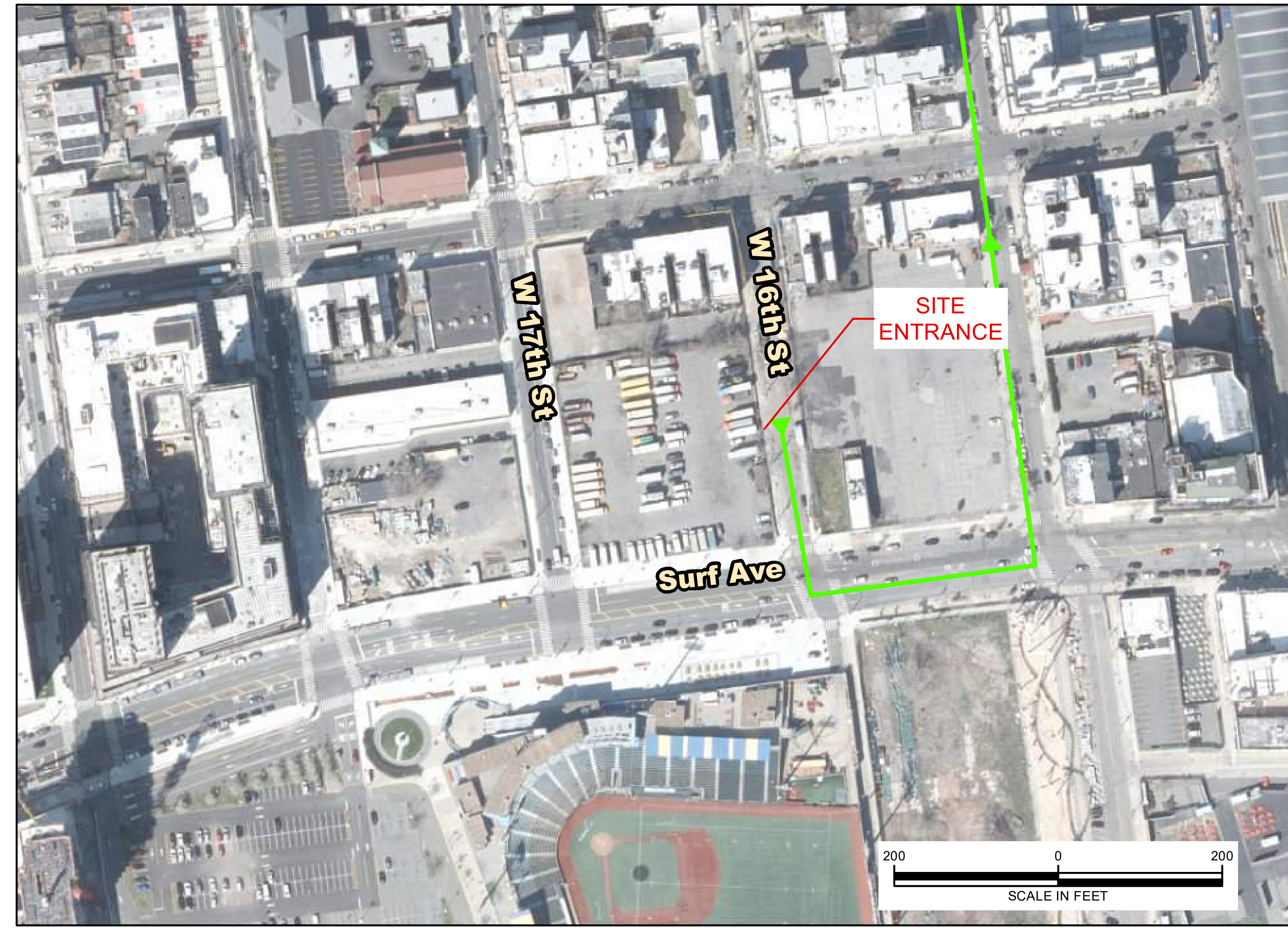
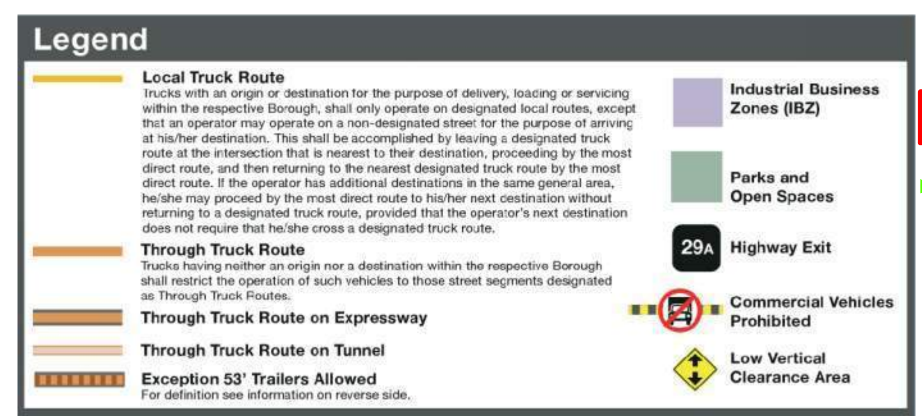
Project	Figure Title	Project No.	Figure
1607 SURF AVENUE BLOCK No. 7062, LOT No. 28 CONEY ISLAND BROOKLYN NEW YORK	PROPOSED ENDPOINT SAMPLE LOCATION PLAN	170599501	11
		Date: 6/17/2021	
		Scale: 1 " = 50 '	
		Drawn By: JR	
		Submission Date	

Path: \\langan.com\data\NYC\data5\170599501\Project Data\ArcGIS\MXD\Environmental_Figures\2021-03 RAWP\Figure 11 – Proposed Endpoint Documentation Sample Location Plan.mxd Date: 6/17/2021 User: aruane Time: 3:33:47 PM





Legend

Brownfield Cleanup Program Site Boundary

Proposed Truck Route

Notes:

1. Basemap taken from the 2015 New York City Department of Transportation "New York City Truck Route Map."
2. Site entrance location may change based on construction logistics.
3. World aerial imagery basemap is provided through Langan's Esri ArcGIS software licensing and ArcGIS online. Source of aerial imagery is New York State from March 2016.

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Project	Figure Title	Project No.	Figure
1607 SURF AVENUE BLOCK No. 7062, LOT No. 28 CONEY ISLAND BROOKLYN NEW YORK	TRUCK ROUTE MAP	170599501	12
		Date: 6/17/2021	
		Scale: As Noted	
		Drawn By: JR	
		Submission Date:	

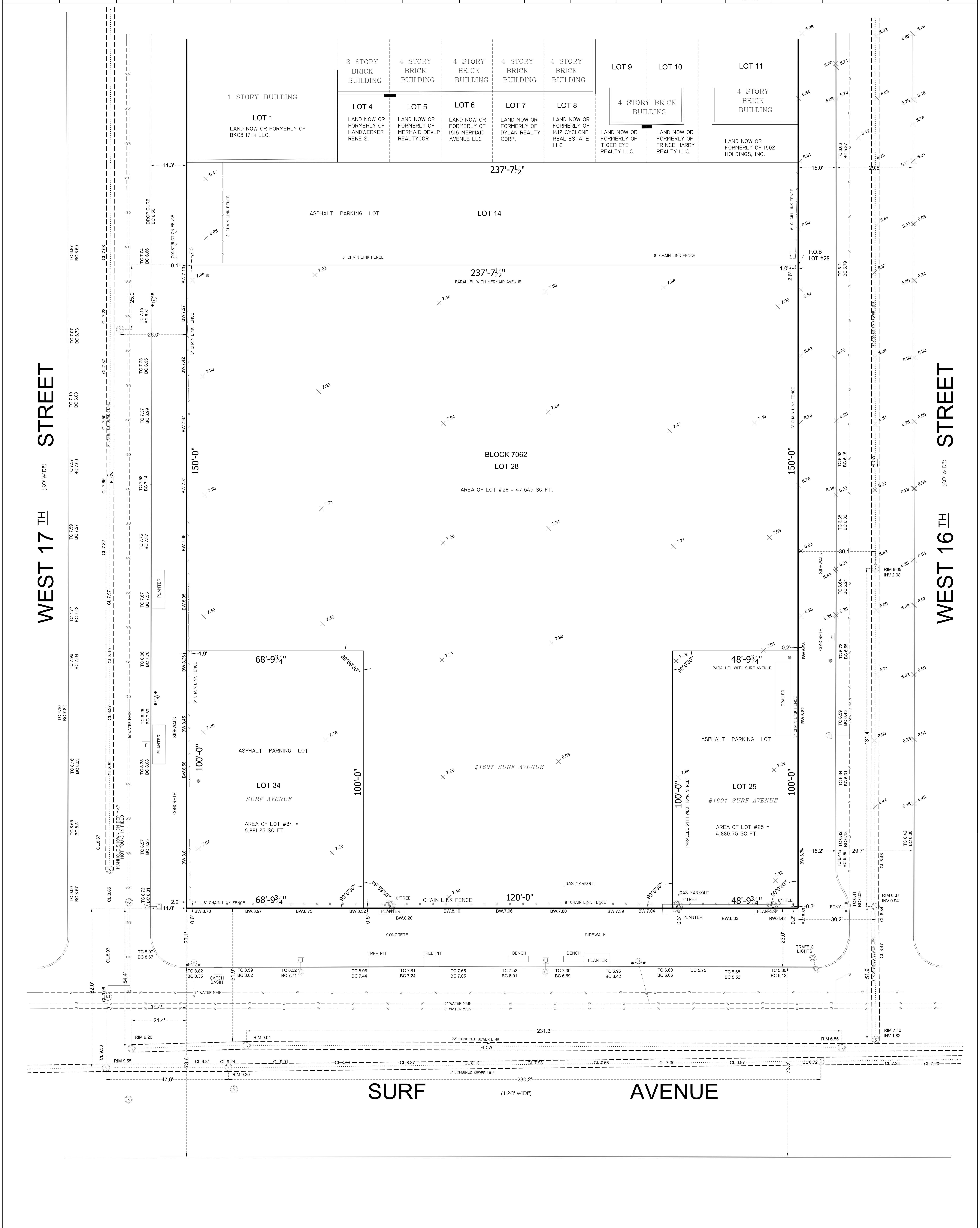
Path: \\langan.com\data\NYC\data5\170599501\Project Data\ArcGIS\MXD\Environmental_Figures\2021-03 RAWP\Figure 12 - Truck Route Map.mxd Date: 6/17/2021 User: aruane Time: 3:45:33 PM

APPENDIX A

Boundary Survey

TREE PIT	HYDRANT	WATER VALVE	CATCH BASIN	LIGHT POST	WATER MANHOLE	TELEPHONE MANHOLE	EL. ELEVATION	BC-EL. ON BOTTOM OF CURB	LG.-LEGAL GRADE	C.D.-CELLAR DOOR	ENT. ENTRANCE	C.L. CLEAR	R.EL. ROOF EL.	PLAT. PLATFORM
ELECTRIC BOX	UTILITY POLE	TRAFFIC SIGN	GAS VALVE	PARKING METER	ELECTRIC MANHOLE	SEWER MANHOLE	TC-EL.ON TOP OF CURB	C.L.-EL. ON CENTER OF ROAD	L.A. LOW AREA	F.E.-FIRE ESCAPE	RT.- RIGHT ON LINE	ENC. ENCROACHMENT	T.W. EL. OF TOP WALL	A.C. AIR CONDITION

76 11th. AVENUE
NEW YORK, NY



DATE	DESCRIPTION
JAN. 28, 2020	UPDATED ELEVATIONS

BLOCK	7062
LOT	14,25,28,34
SECTION	21
COUNTY	KINGS
DWG BY	A.G.
CHKD BY	J.A.

NOTE:
Unauthorized alterations or additions to this survey is a violation of section 7209 of the New York State education law. Copies of this survey map not bearing the land surveyor's inked seal or embossed seal shall not be considered to be a valid true copy. Guarantees or certifications indicated hereon shall run only to the person for whom the survey is prepared, and on his behalf to the title company, governmental agency and lending institution listed hereon, and to the assignees of the lending institution. Guarantees or certification are not transferable to additional institutions or subsequent owners.

CAUTION:
1) Before performing any digging or drilling on this site, it is required that subsurface services, including the underground mains be marked and identified by the utility involved in compliance with industrial code 53 of New York State.

2) All elevations refer to NAVD 88 Datum.

3) Underground utility information shown was obtained from various companies and city agencies and is not guaranteed for accuracy or completeness.

SCALE: 1"= 16'
0' 8' 16' 32'
GRAPHIC SCALE

STATE OF NEW YORK
LICENSED LAND SURVEYOR

MERIDIAN
LAYOUT INC

3280 SUNRISE HWY, SUITE 341
WANTAGH, NY 11793

TEL. 516-787-3299

APPENDIX B

Proposed Development Plans

(submitted under separate cover)

APPENDIX C

Previous Environmental Reports

(submitted under separate cover)

APPENDIX D

Construction Health and Safety Plan

CONSTRUCTION HEALTH AND SAFETY PLAN

for

1607 SURF AVENUE
BROOKLYN, NEW YORK
Brooklyn Borough Tax Map
Block 7062, Lot 28

Prepared For:

Coney Island Associates Phase 2 LLC
c/o BFC Partners
150 Myrtle Ave, 2nd Floor
Brooklyn, New York

Prepared By:

Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.
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March 2021
Langan Project Number: 170559501

LANGAN

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

1.0 INTRODUCTION

1.1 General

This CONSTRUCTION HEALTH AND SAFETY PLAN (CHASP) was developed to address disturbance of known and reasonably anticipated subsurface contaminants and comply with Occupational Safety and Health Administration (OSHA) Standard 29 CFR 1910.120(b)(4), *Hazardous Waste Operations and Emergency Response* during anticipated site work at 1607 Surf Avenue in the Coney Island neighborhood of Brooklyn, New York (the "site") ("the Site"). The Site is identified on the New York City (NYC) Brooklyn Borough Tax Map as Tax Block 7062, Lot 28. This CHASP provides the minimum requirements for implementing site operations during future remedial measure activities. All contractors performing work on this site shall implement their own CHASP that, at a minimum, adheres to this CHASP. The contractor is responsible for their own health and safety and that of their subcontractors. Langan personnel will implement this CHASP while onsite.

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

1.2 Site Location and Background

The site is located at 1607 Surf Avenue in the Coney Island neighborhood of Brooklyn, New York and is identified as Block 7062, Lots 28 on the department of Finance Tax Map. A site location map is provided as Figure 1. The site is improved with an asphalt-paved parking lot and encompasses an area of approximately 59,393 square-feet (1.36 acres). The site is bound by Surf Avenue to the south followed by MCU Park, West 16th Street to the east followed by a vacant parcel and several parking lots, West 17th Street to the west followed by a commercial office building and a parking lot, and a parking lot to the north. A site location map is provided as Figure 1.

The site was a largely undeveloped site with the southeastern part of the site developed with residential dwellings, a shed, and a store in 1895. By 1906, the southern part of the site was developed with stores, sheds, and Johnstown Flood Auditorium. By 1930, the property was primarily developed with the Tilyou Theater, storefronts, and an automobile repair facility on the eastern part of the property. Site conditions appear generally the same by 1950 except a machine shop is identified on the eastern part of the property and a manufacturing facility is identified on the northwestern part of the property. By 1966, the manufacturing facility and the machine shop are no longer identified although the Tilyou Theater remains on site along with stores, a wholesale produce shop, and automobile parking. Site conditions in 1966 are similar to those depicted in 1968. By 1977, the Tilyou Theater is no longer seen and by 1981 the wholesale produce shop is no longer depicted. Following 2001, the site appears as a vacant lot with automobile parking. Site conditions appear generally the same to 2007. City Directory documents also provide additional prior site usage detail including a photo studio (1934-1970), a printing studio/business (1934-1970), an exterminator (1934-1945), and a machinist/machine works (1928-1970).

1.3 Summary of Work Tasks

1.3.1 Hand Clearing of Borehole Locations

If there is no geophysical survey for utility clearance or the results of the geophysical survey are inconclusive at specific locations subject to intrusive work, the contractor may hand clear each location to confirm utilities or other known or suspected subsurface structures. Hand clearing of a soil boring location should extend to a depth of 5-feet and be about 1.5 times the anticipated diameter of the borehole when drilled. Langan personnel will confirm that hand clearing activities are completed to these specifications.

1.3.2 Sub Slab or Soil Vapor Point Installation and Sampling

Langan will install one or more sub-slab or soil vapor points at selected locations. If installed, the sub-slab points will be set at or just below the bottom of the slab in accordance with the work plan. The sub-slab points may be installed using an electric hammer drill to advance small diameter borings through the concrete (or equivalent) slab as defined in the work plan. The borings will terminate in and sample from the gravel substrate below the slab. The soil vapor points will be installed by the drilling contractor as specified in the work plan. Conditions in the field may require adjustment of sampling locations.

Langan personnel will confirm that the sub slab vapor points are advanced not further than 2-inches below the base of the concrete slab. A sample point consisting of open ended Teflon™-lined polyethylene tubing (or equivalent tubing as approved by the project manager [PM]) will be set either within the base of the concrete slab or within the support gravel underlying the slab. The annulus at the top of the concrete slab will be filled with bentonite to seal the slab. A sand pack is not anticipated for sub slab vapor point installation. Unless specified by the work plan, the sub slab points are temporary and will be pulled after the sampling event and the hole will be patched at grade with material similar to the surrounding surface.

Langan personnel will confirm that the soil vapor points (implants) are approximately 2-inches in length constructed of polyethylene material and are connected to the surface by Teflon™-line polyethylene material (equivalent materials for the point and tubing are acceptable as approved by the PM). The annulus around the implant will be filled with clean sand to 6-inches above the implant. A 1-foot bentonite slurry will be applied to the top of the sand up to seal the sampling points. The remaining soil vapor point annulus may be backfilled with clean cuttings or sand to grade. Unless specified by the work plan, the vapor points are temporary and will be pulled after the sampling event and the hole will be patched at grade with material similar to the surrounding surface.

Vapor samples will be collected in accordance with following guidance including: United States Environmental Protection Agency (US EPA) Technical Guide for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Vapor Sources to Indoor Air, the Final Guidance for Evaluating Soil Vapor Intrusion published by the NYSDOH in October 2006 and Langan's Sub-Slab Vapor Sampling SOP (SOP #14) and as specified in the work plan. In addition, ambient air and indoor air samples may be collected for use as a comparison sample. As part of the indoor air sampling program, Langan personnel may complete a building inventory inspection. The inspection may take place prior to the commencement of actual field sampling. Vapor samples will be submitted to a New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP)-certified laboratory in accordance with work plan specifications.

1.3.3 Excavation Observation and Screening

As part of the excavation activities, Langan personnel will observe soil excavation per the work plan. The work plan specifies that the contractor will remove the concrete slab from a specified location on site. The concrete debris may be segregated for separate disposal. Langan will report the location of the concrete debris stockpile and note if the contractor has complied with the concrete debris stockpile instructions specified in the work plan.

Langan will screen excavated spoil 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 duly field-calibrated Photoionization Detector (PID). Contractors will excavate for utilities, foundation components and potential grading using heavy equipment and hand tools in such a manner as to avoid negatively impacting buried utilities or foundation components. Contractors will notify Langan personnel if they identify indications suggestive of a potential chemical or petroleum release.

Langan will coordinate trucking in cooperation with the soil disposal contractors. Langan will only sign non-hazardous manifests if instructed by the PM and provide the specific language. Langan is not to sign hazardous waste manifests. Langan will record the information associated with each manifest as specified in the work plan. Contaminated material shall be handled and property disposed in accordance with federal, state and city regulations, criteria and guidelines. If excavation occur over several days, Langan will confirm that the contractor has placed a barrier around the excavation and stockpile to prevent 3rd party injury.

1.3.4 Soil Screening & Reporting

As part of 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 duly calibrated hand held PID, or equivalent.

1.3.5 Soil Sampling

As part of the excavation activities, soil samples (waste characterization, excavation endpoint, delineation, or quality assurance/quality control [QA/QC]) may be collected during construction, as required. Langan personnel will coordinate with the contractor in sampling soil (in accordance with the work plan, where applicable). If stockpile soil sampling is required from above ground level, suitable excavation equipment (i.e., excavator, front end loader) should be used to collect the sample.

Soil samples excavation endpoint or delineation sampling (along with quality assurance/quality control [QA/QC] samples) may be collected and subsequently submitted to a NYSDOH ELAP-certified laboratory in accordance with work plan specifications.

1.3.6 Stockpiling

Potentially impacted soil may be stockpiled pending laboratory analysis and determining proper off-site disposal. Visibly contaminated soil, if encountered, shall be segregated and stockpiled on at least 10 millimeters of plastic sheeting; reusable soil and fill shall be segregated and stockpiled separately from unusable fill, concrete and other debris; the stockpiles shall be kept covered with 6 millimeters thick plastic sheeting; the plastic sheeting covering the stockpiles shall be anchored firmly in place by weights, stakes, or both; the Contractor shall maintain the plastic sheeting.

1.3.7 Characterization of Excavated Material

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

1.3.8 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 should meet specifications defined in the work plan or 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.

1.3.9 Decommissioning and Removal of Underground Storage Tank

If an underground storage tank (UST) is encountered, a UST decommissioning and removal 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.

1.3.10 Injection/Monitoring 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 or monitoring wells. 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. Monitoring wells will be sampled in accordance with the work plan to evaluate groundwater quality during and after the in-situ groundwater treatment pilot test and final install/treatment. Groundwater samples will be collected in accordance with the Langan Low Flow Groundwater Sampling SOP (SOP #12). Groundwater samples will be submitted to a NYSDOH ELAP-certified laboratory and analyzed in accordance with work plan specifications. Borings not completed as injection or monitoring wells will be backfilled and abandoned in accordance with State and Local regulations.

1.3.11 In-Situ Groundwater Treatment

Langan proposes an in-situ treatment of contamination consisting of injecting remediation compounds 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.

1.3.12 Groundwater Gauging

In conjunction with groundwater sampling or as a separate activity, Langan may gauge monitoring wells to collect synoptic head data or determine the presence of product. When gauging, Langan will also survey head space VOCs within the well using a duly calibrated PID. When collected, gauging data will be based on the northernmost point at top of casing (TOC) using an interface probe (IP) capable of determining the presence of free product in the monitoring well either as light non-aqueous phase liquid (LNAPL) at the top of the water column or as dense non-aqueous phase liquid (DNAPL) at the base of the monitoring well. Langan will decontaminate gauging equipment between wells.

1.3.13 Groundwater Sampling

Groundwater samples may be collected from one or more of the existing on-site monitoring wells following in-Situ treatment 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.

1.3.14 Storm water Pollution Prevention Inspection

If required and in accordance with the work plan, Langan personnel with Storm Water Pollution Prevention (SWPPP) inspection credentials will conduct SWPPP inspections. Langan will observe the stormwater pollution prevention system install to document that the install is in accordance with the work plan and take appropriate measures if impacted soil is observed during excavation.

1.3.15 Construction Activity Inspections and Observations

Langan will observe construction activities including the general oversight, observation of landscaping activities, and other select observation project management and supervision as specified in the work plan or in accordance with the construction documents, or 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.

1.3.16 Equipment Decontamination

Before the start of the day's sampling and after sampling each run, sampling equipment will be decontaminated by the decontamination process outlined Attachment B - Decontamination Procedures. Decontamination wastes and purge water will be temporarily stored on site pending analytical results.

1.3.17 Management of Investigative-Derived Waste

The investigative-derived waste (IDW) generated during this investigation may be stockpiled as defined under the stockpile section (above) or 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.

1.3.18 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.

1.3.19 Surveying

If specified in the work plan, surveying activities may be completed by Langan. Surveying will be conducted by licensed surveyors.

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 PM is Jessica Friscia, her responsibilities include:

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

2.2 Langan Corporate Health and Safety Manager

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

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

2.3 Langan Site Health & Safety Officer

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

- Participating in the development and implementation of this CHASP.
- When on-site, assisting the Langan Field Team Leader in conducting Tailgate Safety Meetings and Jobsite Safety Inspections and correcting any shortcomings in a timely manner.

- Ensuring that proper PPE is available, worn by employees, and properly stored and maintained.
- Controlling entry into and exit from the site contaminated areas or zones.
- Monitoring employees for signs of stress, such as heat stress, fatigue, and cold exposure.
- Monitoring site hazards and conditions.
- Knowing (and ensuring that all site personnel also know) emergency procedures, evacuation routes, and the telephone numbers of the ambulance, local hospital, poison control center, fire department, and police department.
- Resolving conflicts that may arise concerning safety requirements and working conditions.
- Reporting all incidents, injuries and near misses to the Langan Incident/Injury Hotline immediately and the client representative.

2.4 Langan Field Team Leader Responsibilities

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

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

2.5 Contractor Responsibilities

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

- Ensure their employees are trained in the use of all appropriate PPE for the tasks involved;

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

3.0 TASK/OPERATION SAFETY AND HEALTH RISK ANALYSES

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

3.1 Specific Task Safety Analysis

3.1.1 Hand Clearing of Borehole Locations

Hand clearing will be completed by the contractor. Langan personnel are not permitted to operate or otherwise handle the contractor equipment. Langan will update the site map to include the locations of the cleared borehole locations as well as possible utilities and other artifacts that may interfere with the subsurface investigation.

3.1.2 Electric Hammer Drill

Should the contractor use an electric hammer drills to install the sub slab vapor points, Langan will confirm that the contractor inspect each hammer drill prior to use and specifically note the condition of each hammer and attached electrical cord. The electrical cord must be a grounded and connect to the power source using a functional three prong grounded plug. The power source must be a Ground Fault Circuit Interrupter (GFI or GFCI) receptacle. Langan will confirm that the contractor also use a portable GFCI circuit from the outlet to the extension cord. The contractor must test the GFCI before commencing drilling activities.

3.1.3 Vapor Investigation and Sampling

Sampling vapor requires the donning of work gloves in addition to the standard PPE when assembling the Summa™ canister with the regulator and cut resistant gloves when cutting sampling- or silicone-tubing to length. Langan personnel are not to operate drilling equipment nor assemble or install vapor point equipment unless instructed by the work plan. When not instructed by the work plan, these tasks are to be completed by the contractor.

3.1.4 Excavation and Soil Screening

Langan personnel will observe excavation and SOE activities including the general oversight, observation of landscaping activities, and other select observation project management and supervision as specified in the work plan or in accordance with the construction documents, or special inspection requirements administered by the New York City Department of Buildings. Materials used for construction may be inspected by Langan personnel for conformance to the design documents. Prior to entering excavation, Langan personnel will insure that excavation shoring conforms to proper shoring/benching/sloping techniques, at a minimum that soil and equipment is kept at least 2 feet from the edge of the excavation, that there is no water in the excavation, and that a competent person has inspected excavation prior to allow persons to enter. When entering excavation via a ladder, Langan personnel will only use ladders that are properly situated in accordance with the Ladder section of the CHASP.

Sampling the soil requires the donning of chemical resistant gloves in addition to the standard PPE. Langan personnel are not to operate nor direct the use of excavation equipment. These tasks are to be completed by the excavation contractor.

3.1.5 Soil 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.

3.1.6 Stockpile Sampling

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).

3.1.7 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.

3.1.8 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.

3.1.9 Construction Activity Inspection

The contractor will operate equipment used during site construction. Langan personnel will observe construction activities in accordance with specification in the work plan and record the data the work plan requires. Construction activities are to be done exclusively by the contractor following their own health and safety specifications outlined in their HASPs. 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.

3.1.10 Indoor Work

Although not anticipated, indoor work by the contractors may occur at indoor locations where there may not be adequate ventilation sufficient to safely operate equipment powered by an internal combustion engine. Where possible, all such work should be done manually or by equipment powered by electricity. If electrical 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 personnel 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. Langan personnel is to report to the PM and H&S officer when an action level is reached.

3.1.11 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 CHASP.

3.1.12 In-Situ Residual 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 contractor. These tasks are to be completed by the contractor.

3.1.13 Monitoring Well Gauging

Langan will don work gloves when opening the well box pulling the well plug and nitrile gloves when handling the interface probe in addition to standard PPE. Langan will record the head space VOCs with a PID and record the survey data. As product may be observed in the well, Langan personnel will have on hand product absorbing pads.

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

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

3.1.14 Groundwater Monitoring Wells 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.

3.1.15 Storm water Pollution Prevention Inspection

When performing SWPPP inspections, Langan personnel will don all required PPE and maintain awareness to site traffic and site activities. If using a cell phone or tablet application to record the pertinent data, the engineer will do so in an area protected from site traffic and activities. Certain types of inspections may require additional PPE and safety training including fall protection and open water hazards.

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 open any orphaned (unlabeled) drum found on the site without approval of the project manager.

3.2 Radiation Hazards

The Radiological Pre-Demolition Survey will assess radiation hazards for the proposed site work. The current work scope will does not anticipate Langan personnel entering the building during the radiological pre-demolition survey or subsequent building demolition. Changes to the work scope requiring Langan personnel to participate in the survey or demolition will require amending this CHASP to address radiological concerns.

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°F or above. Table 6 presents the suggested frequency for such monitoring. Monitoring frequency should increase as ambient temperature increases or as slow recovery rates are observed. Refer to the Table 7 to assist in assessing when the risk for heat related illness is likely. To use this table, the ambient temperature and relative humidity must be obtained (a regional weather report should suffice). Heat stress monitoring should be performed by the HSO or the FTL, who shall be able to recognize symptoms related to heat stress.

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

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

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

To monitor the worker, measure:

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

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

- Adjust work schedules.
- Mandate work slowdowns as needed.
- Perform work during cooler hours of the day if possible or at night if adequate lighting can be provided.
- Provide shelter (air-conditioned, if possible) or shaded areas to protect personnel during rest periods.

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

3.3.3 Cold-Related Illness

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

- **Hypothermia -** Hypothermia is defined as a decrease in the patient core temperature below 96^{O}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 (GFCI) 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 CHASP. 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.

3.4.4 Coronavirus

3.4.4.1 General Preventative Measures

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

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

3.4.4.2 Construction Trailers

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

3.4.4.3 Communication

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

3.4.4.4 Sick/Ill Workers

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

3.5 Additional Safety Analysis

3.5.1 Presence of Non-Aqueous Phase Liquids (NAPL)

While exposure to NAPL is not anticipated at this site during anticipated activities under this CHASP. However, there is potential for exposure to NAPL at this site as a result of equipment leakages or fuel spills. 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-gallon 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 H.

4.0 PERSONNEL TRAINING

4.1 Basic Training

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

4.2 Initial Site-Specific Training

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

4.3 Tailgate Safety Briefings

Before starting work each day or as needed, the Langan HSO will conduct a brief tailgate safety meeting to assist site personnel in conducting their activities safely. Tailgate meetings will be documented in Attachment I. 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 feet 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, 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 ACTION LEVELS

7.1 Monitoring During Site Operations

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

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

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

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

7.1.1 Volatile Organic Compounds

Monitoring with a PID, such as a MiniRAE 2000 (10.6v) or equivalent may occur during site activities. Colormetric Indicator Tubes for benzene may be used as backup for the PID, if measurements remain above background monitor every 2 hours. The HSO will monitor the employee breathing zone at least every 30 minutes, or whenever there is any indication that concentrations may have changed (odors, visible gases, 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

There is a potential for the soils to contain PAHs and metals in historic fill. Site activities and procedures have the potential for creating airborne dust, 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 at the start of each day prior to intrusive activities within the AOC at an upwind location. BKD levels will also be measured periodically throughout the day. 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 will be conducted in compliance with local standards and the NYSDEC DER-10 Appendix 1A and Appendix 1B (NYS Generic CAMP), provided in Attachment E and outlined below:

Monitoring for dust and odors will be conducted during all ground intrusive activities by the FTL. Continuous monitoring at the upwind and downwind perimeter CAMP Monitoring Stations for odor, VOCs, and dust will be required for all ground intrusive activities such as soil excavation and handling activities. The upwind and downwind locations will be established at points on the site where the general public or site employees may be present (for example, in the vicinity of West 16th Street, West 17th Street, and/or Surf Avenue). The work zone is defined as the general area in which machinery is operating in support of remediation activities. Upwind concentrations will be measured at the start of each workday and periodically throughout the day to establish background concentrations. A portable PID will also be used to monitor the work zone and for periodic monitoring for VOCs during activities such as soil and groundwater sampling and soil excavation. If VOC concentrations exceed the action levels identified in the CAMP, work will stop, and corrective measures will be taken. The site perimeter will be monitored for fugitive dust emissions by visual observations as well as instrumentation measurements. Particulate or dust will be monitored continuously with real-time field instrumentation that will meet, at a minimum, the local standards or, default to the performance standards below. If dust emissions exceed the action levels identified in the CAMP, work will stop, and dust suppression measures will be used.

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 ($\mu g/m^3$) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression must be employed. Work may continue with dust suppression techniques provided that downwind PM10 levels do not exceed 150 $\mu g/m^3$ above the background level and provided that no visible dust is migrating from the work area.
- If, after implementation of dust suppression techniques, downwind PM10 levels are greater than 150 $\mu g/m^3$ above the background level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM10 concentration to within 150 $\mu g/m^3$ of the upwind level and in preventing visible dust migration.

8.1 Dust Suppression Techniques

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

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

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

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

9.0 WORK ZONES AND DECONTAMINATION

9.1 Site Control

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

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

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

9.2 Contamination Zone

9.2.1 Personnel Decontamination Station

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

9.2.2 Minimization of Contact with Contaminants

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

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

9.2.3 Personnel Decontamination Sequence

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

9.2.4 Emergency Decontamination

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

9.2.5 Hand-Held Equipment Decontamination

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

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

9.2.6 Heavy Equipment Decontamination

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

9.3 Support Zone

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

9.4 Communications

The following communications equipment will be utilized as appropriate.

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

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

9.5 The Buddy System

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

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

10.0 NEAREST MEDICAL ASSISTANCE

The address and telephone number of the nearest hospital:

Coney Island Hospital
2601 Ocean Parkway
Brooklyn, New York
718-616-3000

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 G. 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 CHASP are designed to prevent employee injury. However, should an injury occur, no matter how slight, immediately report it will be reported to the HSO. 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 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 CHASP. 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 CHASP 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 CHASP. The CHASP will include emergency contact information including local police and fire departments, hospital emergency rooms, ambulance services, on-site medical personnel and physicians. The CHASP 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.

17.3.4 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 CHASP will require an addendum that is approved by the Langan project manager and Langan HSM to be prepared. Approved changes will be reviewed with all field personnel at a safety briefing.

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 CHASP (Attachment F). 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 **will not** be entered by Langan personnel.

20.0 HASP ACKNOWLEDGEMENT FORM

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

Printed Name	Signature	Company	Date

Printed Name	Signature	Company	Date

TABLES

TABLE 1
TASK HAZARD ANALYSES

Task	Hazard	Description	Control Measures	First Aid
1.3.1 – 1.3.19	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 – 1.3.19	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 – 1.3.19	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 – 1.3.19	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 – 1.3.19	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 – 1.3.19	Noise	Excavation equipment, hand tools, drilling equipment.	Wear hearing protection; maintain safe distance from construction activities	Seek medical attention as required
1.3.1 – 1.3.19	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 – 1.3.19	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 – 1.3.19	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 – 1.3.19	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 – 1.3.19	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 – 1.3.19	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 – 1.3.19	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

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.19	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 – 1.3.19	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
1.3.1 – 1.3.19	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

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.19	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 – 1.3.19	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 – 1.3.19	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 – 1.3.19	4,4’-DDD Dichlorodiphenyldichloroethane 1,1'-(2,2-Dichloroethylidene)bis (4-chlorobenzene)	72-54-8	None	NA NA	Groundwater Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin; paresthesia tongue, lips, face; tremor; anxiety, dizziness, confusion, malaise (vague feeling of discomfort), headache, lassitude (weakness, exhaustion); convulsions; paresis hands; vomiting; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.19	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

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.19	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
1.3.1 – 1.3.19	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

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.19	Acetone Dimethyl ketone Ketone propane 2-Propanone	67-64-1	PID	1000 ppm 2500 ppm	Groundwater Soil	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, nose, throat; headache, dizziness, central nervous system depression; dermatitis	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.19	Alpha-Chlordane Alpha Chlordane	5103-71-9	None	0.5 mg/m^3 100 mg/m^3	Groundwater Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	Blurred vision; confusion; ataxia, delirium; cough; abdominal pain, nausea, vomiting, diarrhea; irritability, tremor, convulsions; anuria	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.19	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 – 1.3.19	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 – 1.3.19	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 – 1.3.19	Aroclor 1242	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 – 1.3.19	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 – 1.3.19	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

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.19	Aroclor 1268	11100-14-4	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 – 1.3.19	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
1.3.1 – 1.3.19	Barium	10022-31-8	None	0.5 mg/m^3 50 mg/m^3	Groundwater Soil	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, upper respiratory system; skin burns; gastroenteritis; muscle spasm; slow pulse	Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.19	Benzene Benzol Phenyl hydride Alkyl benzene isomers	71-43-2	PID	3.19 mg/m^3 1,595 mg/mg^3	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; lassitude (weakness, exhaustion) [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.19	Benzo(a)anthracene Benzanthracene Benzanthrene 1,2-Benzanthracene Benzo[b]phenanthrene Tetraphene	56-55-3	PID	0.2 mg/m^3 80 mg/m^3 (Coal Pitch Tar)	Groundwater Soil	inhalation, skin or eye contact, ingestion	dermatitis, bronchitis, [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.19	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 – 1.3.19	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

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.19	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
1.3.1 – 1.3.19	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 – 1.3.19	Benzoic acid Carboxybenzene E210 Dracylic acid Phenylmethanoic acid Benzenecarboxylic acid Benzoic acid isomer	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 – 1.3.19	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 – 1.3.19	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 – 1.3.19	Bis(2-ethylhexyl)phthalate Bis(2-Ethylhexyl) Phthalate Di-sec octyl phthalate DEHP Di(2-ethylhexyl)phthalate Octyl phthalate bis(2-ethylexyl)phthalate Bis(2-Ethylhexyl) 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 – 1.3.19	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

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.19	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 – 1.3.19	Caprolactam Aminocaproic lactam epsilon-Caprolactam Hexahydro-2H-azepin-2-one 2-Oxohexamethyleneimine	105-60-2	PID	None None	Soil Groundwater Vapor	inhalation, ingestion, skin and/or eye contact	irritation skin, eyes, respiratory system; epistaxis (nosebleed); dermatitis, skin sensitization; asthma; irritability, confusion, dizziness, headache; abdominal cramps, diarrhea, nausea, vomiting; liver, kidney injury	Eye: Irrigate immediately (liquid) Skin: Water flush immediately (liquid) Breathing: Respiratory support
1.3.1 – 1.3.19	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 – 1.3.19	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 – 1.3.19	Chloroform Methane trichloride Trichloromethane Chloro-3-methyl phenol	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 – 1.3.19	Chromium Total Chromium Chromium, Total	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
1.3.1 – 1.3.19	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

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.19	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 – 1.3.19	Cis-Chlordane Cic-Chlordane a-Chlordane alpha Chlordane alpha-chlordane cis-Chlordan CIS-CHLORDANE Chlordane cis-;Chlordane cis;ALPHA-CHLORDAN Chlordan, cis-ALPHA-CHLORDANE alpha(cis)-chlordane α-chlordane solution	5102-71-9	None	0.5 mg/m^3 100 mg/m^3	Groundwater Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	Blurred vision; confusion; ataxia, delirium; cough; abdominal pain, nausea, vomiting, diarrhea; irritability, tremor, convulsions; anuria	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.19	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

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.19	Copper	7440-50-8	None	1.0 mg/m^3 100 mg/m^3	Groundwater Soil	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, nose, metallic taste; dermatitis; anemia	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.19	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 – 1.3.19	DDE 4,4-DDE 4,4’-DDE 1,1-bis-(4-chlorophenyl)-2,2-dichloroethene Dichlorodiphenyldichloroethylene	72-55-9	None	NA NA	Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	Oral ingestion of food is the primary source of exposure for the general population. Acute and chronic ingestion may cause nausea, vomiting, diarrhea, stomach pain, headache, dizziness, disorientation, tingling sensation, kidney damage, liver damage, convulsions, coma, and death. 4,4' DDE may cross the placenta and can be excreted in breast milk	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.19	DDT 4,4-DDT 4,4’-DDT p,p’-DDT Dichlorodiphenyltrichloroethane 1,1,1-Trichloro-2,2-bis(p-chlorophenyl)ethane	50-29-3	None	1 mg/m^3 500 mg/m^3	Groundwater Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin; paresthesia tongue, lips, face; tremor; anxiety, dizziness, confusion, malaise (vague feeling of discomfort), headache, lassitude (weakness, exhaustion); convulsions; paresis hands; vomiting; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.19	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

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.19	Dibenzofuran	132-64-9	None	NA NA	Soil	inhalation, absorption	irritation to eyes, and skin	Eyes: Irrigate immediately Skin: Soap wash promptly.
1.3.1 – 1.3.19	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-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 – 1.3.19	Dichlorodifluoromethane Difluorodichloromethane, Fluorocarbon 12 Freon 12 Freon® 12 Genetron® 12 Halon® 122 Propellant 12 Refrigerant 12 Dichlorodifluromethane	75-71-8	None	1000 pp, 15,000 ppm	Groundwater Soil Vapor	inhalation, skin and/or eye contact (liquid)	dizziness, tremor, asphyxia, unconsciousness, cardiac arrhythmias, cardiac arrest; liquid: frostbite	Eye: Frostbite Skin: Frostbite Breathing: Respiratory support
1.3.1 – 1.3.19	Dieldrin HEOD 1,2,3,4,10,10-Hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-1,4-endo exo-5,8-dimethanonaphthalene	60-57-1	PID	0.25 mg/m^3 50 mg/m^3	Groundwater Soil Water	inhalation, skin absorption, ingestion, skin and/or eye contact	headache, dizziness; nausea, vomiting, malaise (vague feeling of discomfort), sweating; myoclonic limb jerks; clonic, tonic convulsions; coma; [potential occupational carcinogen]; in animals: liver, kidney damage	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.19	Diesel Fuel automotive diesel fuel oil No. 2 distillate diesoline diesel oil diesel oil light diesel oil No. 1-D summer diesel	68334-30-5	PID	NA NA	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat; burning sensation in chest; headache, nausea, lassitude (weakness, exhaustion), restlessness, incoordination, confusion, drowsiness; vomiting, diarrhea; dermatitis; chemical pneumonitis (aspiration liquid)	Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.19	Ethyl benzene Ethylbenzene Ethylbenzol Phenylethane	100-41-4	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 – 1.3.19	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

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.19	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
1.3.1 – 1.3.19	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 – 1.3.19	gamma-Chlordane Gamma Chlordane	5566-34-7	None	0.5 mg/m^3 100 mg/m^3	Groundwater Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	Blurred vision; confusion; ataxia, delirium; cough; abdominal pain, nausea, vomiting, diarrhea; irritability, tremor, convulsions; anuria	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 – 1.3.19	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 – 1.3.19	Helium	7440-59-7	Helium Detector	NA NA	NA	inhalation	dizziness, headache, and nausea	Breathing: Respiratory support
1.3.1 – 1.3.19	Heptachlor	76-44-8	None	0.5 mg/m^3 35 mg/m^3	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	In animals: tremor, convulsions; liver damage; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.19	Heptachlor epoxide 1,4,5,6,7,8,8-Heptachloro-3a,4,7,7a-tetrahydro-4,7-methano-1H-indene	1024-57-3	None	0.5 mg/m^3 35 mg/m^3	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	In animals: tremor, convulsions; liver damage; [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 – 1.3.19	Heptane n-Heptane	142-82-5	PID	500 ppm 750 ppm	Goundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	dizziness, stupor, incoordination; loss of appetite, nausea; dermatitis; chemical pneumonitis (aspiration liquid); unconsciousness	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.19	Hexavalent Chromium Chromium VI Chromium, Hexavalent	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
1.3.1 – 1.3.19	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 – 1.3.19	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

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.19	Isopropyl Acetate Isopranol Isopropyl ester of acetic acid 1-Methylethyl ester of acetic acid 2-Propyl acetate	10821-4	PID	250 ppm 1800 ppm		inhalation, ingestion, skin and/or eye contact	irritation eyes, skin, nose; dermatitis; In Animals: narcosis	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.19	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 – 1.3.19	Magnesium	7439-95-4	None	15 mg/m^3 NA	Soil	inhalation, skin and/or eye contact	irritation to the eyes, skin, respiratory system; cough	Eye: Irrigate immediately Breathing: Fresh air
1.3.1 – 1.3.19	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

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.19	m-Cresol 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 – 1.3.19	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
1.3.1 – 1.3.19	Methyl *tert*-butyl ether MTBE Methyl tertiary-butyl ether Methyl t-butyl ether tert-Butyl methyl ether tBME tert-BuOMe Methyl tert butyl ether	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

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.19	m-Xylenes 1,3-Dimethylbenzene m-Xylol Metaxylene	108-38-3 179601-23-1	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 – 1.3.19	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 – 1.3.19	N-ethyl perfluorooctane-sulfonamidoacetic acid NEtFOSAA	2991-50-6	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 – 1.3.19	n-Hexane Hexane, Hexyl hydride, normal-Hexane	110-54-3	PID	500 ppm 1100 ppm	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, nose; nausea, headache; peripheral neuropathy: numb extremities, muscle weak; dermatitis; dizziness; chemical pneumonitis (aspiration liquid)	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.19	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 – 1.3.19	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 – 1.3.19	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 – 1.3.19	o-Xylenes 1,2-Dimethylbenzene ortho-Xylene o-Xylol	95-47-6 179601-23-1	PID	100 ppm 900 ppm	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 – 1.3.19	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 – 1.3.19	p-Dichlorobenzene p-DCB 1,4-Dichlorobenzene para-Dichlorobenzene Dichlorocide	106-46-7	PID	75 ppm 150 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, swelling periorbital (situated around the eye); profuse rhinitis; headache, anorexia, nausea, vomiting; weight loss, jaundice, cirrhosis; in animals: liver, kidney injury; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.19	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
1.3.1 – 1.3.19	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 – 1.3.19	Perfluorobutanesulfonic acid FC-98 Nonaflate Nonafluorobutanesulphonic acid Perfluorobutanesulfonic Acid Perfluorobutane sulfonate PFBS	375-73-5	NA	None None	Groundwater	inhalation, skin or eye contact, ingestion	irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.19	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

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.19	Perfluorodecanoic acid PFDA	335-76-2	NA	None None	Groundwater	inhalation, skin or eye contact, ingestion	irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.19	Perfluorododecanoic acid Perfluoralauric acid Tricosafluorododecanoic acid PFDoA	307-55-1	NA	None None	Groundwater	inhalation, skin or eye contact, ingestion	irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.19	Perfluoroheptane sulfonic Acid Perfluoroheptane sulfonate Perfluoroheptanesulfonic acid PFHpS	375-92-8	NA	None None	Groundwater	inhalation, skin or eye contact, ingestion	irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.19	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

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.19	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
1.3.1 – 1.3.19	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 – 1.3.19	Perfluorooctanesulfonamide Erfluoroctylsulfonamide Perfluorooctane sulfonamide Heptadecafluorooctanesulphonamide Perfluorooctanesulfonic acid amide Deethylsulfluramid FC-99 PFOSA FOSA	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 – 1.3.19	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 – 1.3.19	Perfluorooctanoic Acid PFOA pentadecafluorooctanoic acid perfluorooctanoate perfluorocaprylic acid	335-67-1	NA	None None	Groundwater	inhalation, skin or eye contact, ingestion	irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.19	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 – 1.3.19	Perfluoroundecanoic Acid PFPUnA	2058-94-8	NA	None None	Groundwater	inhalation, skin or eye contact, ingestion	irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.19	Perfluoroundecanoic Acid PFUnA PFUnDA Perfluoroundecanoic Acid Henicosafluoroundecanoic Acid	4234-23-5	NA	None None	Groundwater	inhalation, skin or eye contact, ingestion	irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.19	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 – 1.3.19	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 – 1.3.19	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 – 1.3.19	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 – 1.3.19	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 – 1.3.19	Selenium	7782-49-2	None	1 mg/m^3 0.2 mg/m^3	Soil	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat; visual disturbance; headache; chills, fever; dyspnea (breathing difficulty), bronchitis; metallic taste, garlic breath, gastrointestinal disturbance; dermatitis; eye, skin burns; in animals: anemia; liver necrosis, cirrhosis; kidney, spleen damage	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.19	Silver	7440-22-4	None	0.01mg/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 – 1.3.19	Sodium	7440-23-5	None	NA NA	Groundwater Soil	ion, ingestion, skin and/or eye contact	sensitization dermatitis, allergic asthma, pneumonitis; [potential occupational carcinogen]	Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.19	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 – 1.3.19	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 – 1.3.19	Toluene Methyl benzene Methyl benzol Phenyl methane Toluol	108-88-3	PID	200 ppm 500 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, nose; lassitude (weakness, exhaustion), confusion, euphoria, dizziness, headache; dilated pupils, lacrimation (discharge of tears); anxiety, muscle fatigue, paresthesia; dermatitis	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.19	Total PCBs Chlorodiphenyl (42% chlorine) Aroclor® 1242 PCB Polychlorinated biphenyl	53469-21-9	None	0.5 mg/m^3 5 mg/m^3	Groundwater Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, chloracne	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.19	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 – 1.3.19	Toxaphene Chlorocamphene Octachlorocamphene Polychlorocamphene Chlorinated camphene	8001-35-2	PID	0.5 mg/m^3 200 mg/m^3	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, respiratory system; central nervous system, lungs, kidneys; may cause convulsive seizures	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.19	Trans-1,2-Dichloroethene trans-1,2-Dichloroethylene tDEC 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

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.19	Trichloroethylene Ethylene trichloride TCE Trichloroethene Trilene	79-01-6	PID	100 ppm 1000 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin; headache, visual disturbance, lassitude (weakness, exhaustion), dizziness, tremor, drowsiness, nausea, vomiting; dermatitis; cardiac arrhythmias, paresthesia; liver injury; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.19	Trichlorofluoromethane Fluorotrichloromethane Freon® 11 Monofluorotrichloromethane Refrigerant 11 Trichloromonofluoromethane	75-69-4	PID	1000 ppm 2000 ppm	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	incoordination, tremor; dermatitis; cardiac arrhythmias, cardiac arrest; asphyxia; liquid: frostbite	Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.19	Trivalent Chromium Chromium III Chromium, Trivalent	NA	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 – 1.3.19	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 – 1.3.19	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 – 1.3.19	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

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		911
Local Fire Department		911
Ambulance/Rescue Squad		911
Hospital	Coney Island Hospital	911 or 718-616-3000
Langan Incident Hotline		800-952-6426 ex 4699
Medical Treatment Hotline	Incident Intervention	888-449-7787
Langan Environmental Project Manager	Jessica Friscia	201-314-7195 (cell)
Langan Health and Safety Manager (HSM)	Tony Moffa	215-756-2523 (cell)
Langan Health & Safety Officer (HSO)	William Bohrer	410-984-3068 (cell)
Langan Field Team Leader (FTL)	To Be Determined	
Client's Representative	Matthew Bassett	718-422-9999
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

RELATIVE HUMIDITY	ENVIRONMENTAL TEMPERATURE (Fahrenheit) 70	75	80	85	90	95	100	105	110	115	120
	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

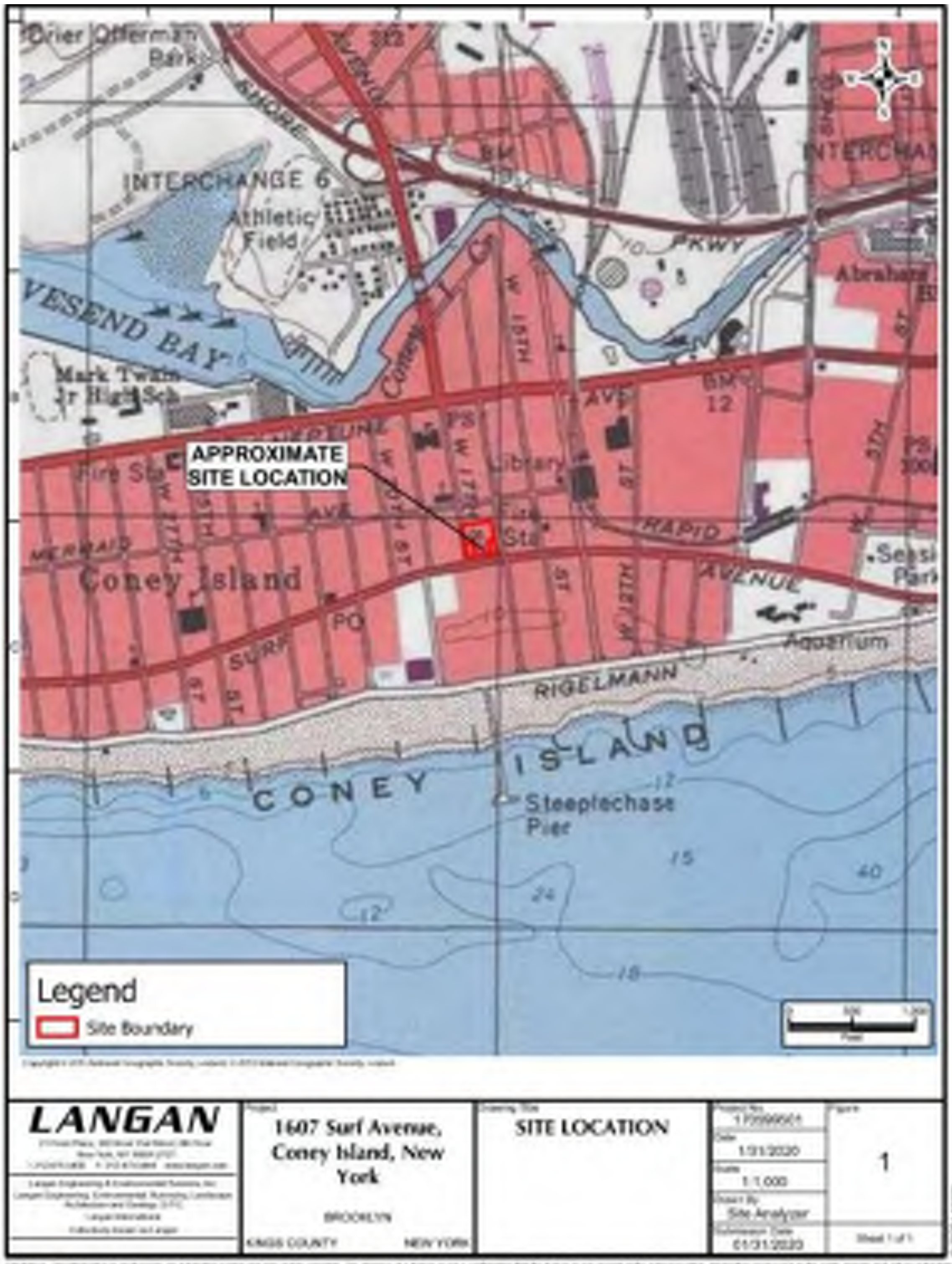


FIGURE 2
HOSPITAL ROUTE PLAN

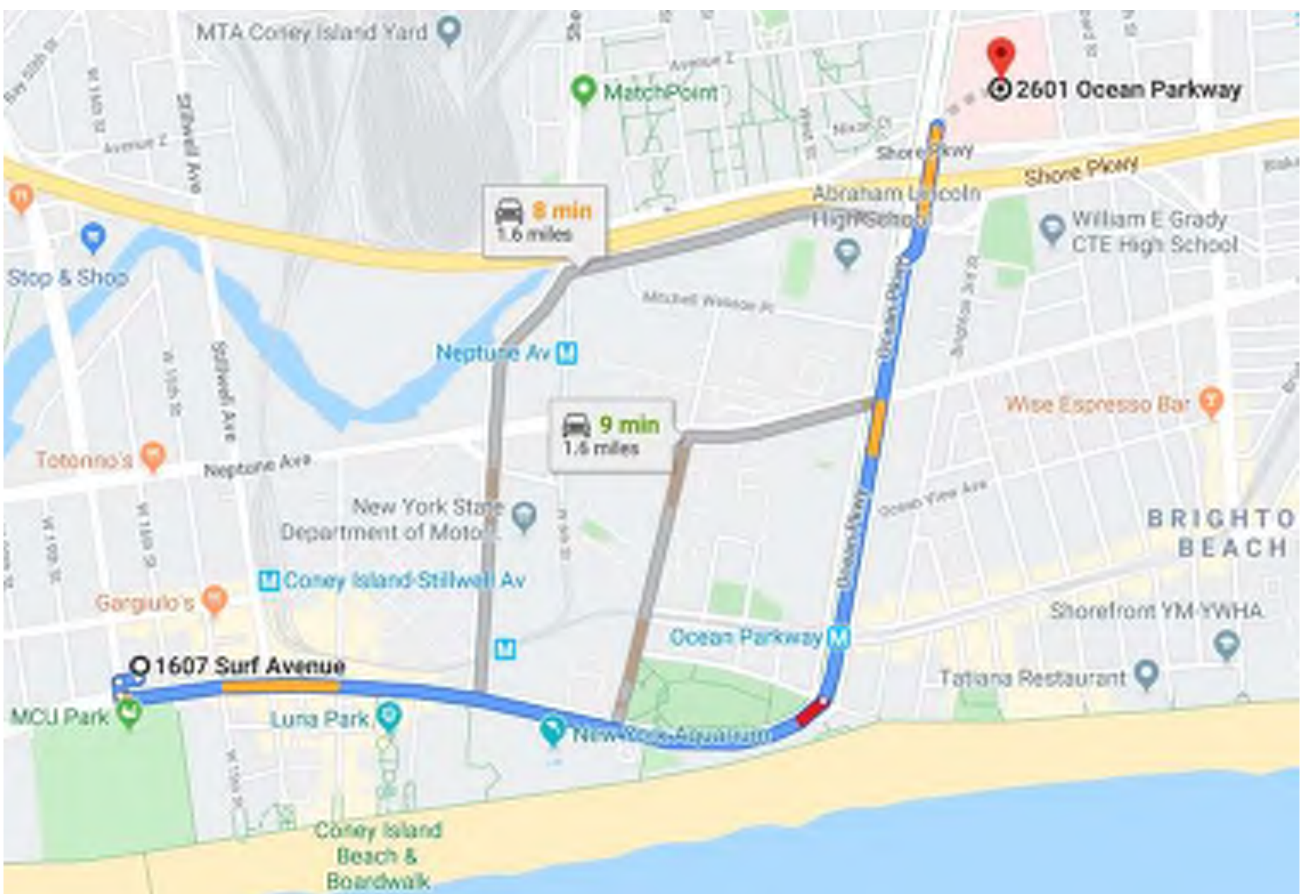
HOSPITAL ROUTE PLAN

Hospital Location: **Coney Island Hospital**
2601 Ocean Parkway
Brooklyn, New York
718-616-3000

START: 1607 Surf Avenue, Coney Island, Brooklyn, New York

1. Head south toward West 17th Street
2. Turn right toward West 17th Street
3. Turn left onto West 17th Street
4. Use the left 2 lanes to turn left at the 1st cross street onto Surf Avenue
5. Continue onto Ocean Parkway
6. Slight right onto Ocean Parkway Service Road.

END: Coney Island Hospital, 2601 Ocean Parkway, Brooklyn, New York



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 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: ______________________________
____

<u>EMPLOYEE INFORMATION</u> (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: ______________

<u>ACCIDENT INFORMATION</u>

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 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:

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

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

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

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

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

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

ATTACHMENT E

NYS GENERIC CAMP

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

Overview

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

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

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

Community Air Monitoring Plan

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

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

Periodic monitoring for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. "Periodic" monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions, particularly if wind direction changes. The monitoring work should be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment should be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

1. If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.

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

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

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

Particulate Monitoring, Response Levels, and Actions

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

1. If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m^3 above the upwind level and provided that no visible dust is migrating from the work area.

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

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

December 2009

Appendix 1B
Fugitive Dust and Particulate Monitoring

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

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

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

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

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

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

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

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

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

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

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

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

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

ATTACHMENT F

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 G

JOBSITE SAFETY INSPECTION CHECKLIST

Jobsite Safety Inspection Checklist

Date: ______________________ **Inspected By:** ______________________

Location: ______________________ **Project #:** ______________________

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

	A	NA	D	Remark
1. CHASP available onsite for inspection?				
2. Health & Safety Compliance agreement (in 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 power lines?				
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: ____

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____

____

Notes: ____

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____

____

ATTACHMENT H

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: COVID-19 Awareness – Site Work
JSA Number: JSA046-00

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. Prior to the start of any work "TAKE 5" and conduct a Last Minute Risk Assessment.

PERSONAL PROTECTIVE EQUIPMENT (Required or to be worn as needed):				
☒ Safety Boots	☐ 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: Alcohol-based hand sanitizer, disinfectant wipes/spray				

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
1. All Activities	1. Transmittal/exposure of COVID-19	1. Ask yourself and your managers – is this work essential? Can this be done remotely? 2. Stay home if sick or showing symptoms of COVID-19 (e.g. fever, cough, etc.). 3. Carry nitrile gloves, alcohol-based hand sanitizer, face coverings and disinfectant wipes/spray during field work. 4. Check federal, state, and/or local travel restrictions **prior** to travel. Many states, counties, and cities are passing strict "shelter-in-place" or business restrictions in response to COVID-19. 5. Immediately notify Beverly Williams or Rory Johnston (Supervisor if employee chooses) if you display symptoms of COVID-19. Symptoms include fever (over 100.4 F), cough, and shortness of breath. 6. Notify Beverly Williams or Rory Johnston, Supervisor and Coronavirus Task Force if you had close contact with an individual who tested positive or displayed symptoms of COVID-19. 7. Do not touch your face, to the extent possible. 8. Wear face coverings when around other worker to minimize spread of COVID-19. (May be required in certain states or locations.)

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
		9. Practice social distancing, maintaining at least 6 feet of distance between yourself and others. Avoid gatherings of more than 10 people. Limit, to the extent possible, contact with public items/objects. 10. Clean your hands frequently with soap and water for at least 20 seconds especially after you have been in a public place, or after blowing your nose, coughing, sneezing, or using the rest room. 11. If soap and water are not readily available, use a hand sanitizer that contains at least 60% alcohol. Cover all surfaces of your hands and rub them together until they feel dry. 12. Cover your mouth and nose with a tissue when you cough or sneeze or use the inside of your elbow. 13. Clean and disinfect frequently touched surfaces daily, for example, cell phones, computer equipment, headsets, tables, doorknobs, light switches, countertops, handles, desks, toilets, faucets, and sinks.
2. Travel to Jobsite	1. Transmittal/exposure of COVID-19 between passengers 2. Transmittal/exposure of COVID-19 from previous occupants (rental and fleet vehicles) 3. Transmittal/exposure of COVID-19 while refueling	1. Limit the number of occupants to each vehicle to 2 people. Employees should sit as far away from each other as possible. 2. Disinfect high “hand-traffic” areas of the vehicle: Door handles, steering wheel, turn signal and control rods, dashboard controls, seatbelts, armrests, etc. To the extent possible, do not use recycled air for heat/AC and travel with the windows open. 3. Use hand sanitizer before and after pumping gas and only return to the inside of the vehicle after refueling is complete. 4. Wear nitrile gloves if available or disinfect the key pad, pump handle, and fuel grade button prior to use. 5. Recommend face coverings are worn to minimize spread of COVID-19.
3. Conduct Tailgate Safety Meeting & Complete H&S Paperwork	1. Transmittal/exposure of COVID-19 between meeting participants	1. Practice social distancing, maintaining at least 6 feet of distance between yourself and others. 2. Recommend face coverings are worn when around other workers to minimize spread of COVID-19, 3. Hold meetings outside and keep in mind wind direction. To the extent possible, remain cross-wind from other people. 4. Designate a single person to maintain sign-in sheets/permits throughout the day to limit the passing of pens/clipboards between people. 5. Each person should complete their own JSA, even if they are completing similar tasks as others in order to limit the passing of paper/pens/clipboards between people. 6. Include COVID-19 topics and prevention measures in safety meetings.
4. Conduct Site Work	1. Transmittal/exposure of COVID-19 between site workers and public.	1. Practice social distancing maintaining 6 feet of distance between yourself and others. 2. Recommend face coverings are worn when around other workers to minimize spread of COVID-19, 3. To the extent possible, do not interact with the public. If it is necessary, politely explain you are practicing social distance and request they stay at least 6 feet away and they do not attempt to pass objects to you. 4. Wear nitrile gloves during site work underneath the appropriate gloves for your task. Utilize appropriate decontamination procedures, securely bag all waste (including nitrile gloves) generated during site work and dispose of.

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
		5. Do not share tools. Each person should be equipped with the tools to complete their task or tasks should be divided to remove the need to share tools. If tools must be shared, surfaces should be disinfected. 6. Clean and disinfect surfaces of rental tools and equipment upon receipt. To the extent possible rent equipment from Langan's internal equipment reservation center, where cleaning/disinfecting procedures can be verified.
5. Use of Construction Trailers	1. Transmittal/exposure of COVID-19 between site workers and others.	1. Avoid use of shared trailers, if possible. Minimize trailer use to essential personnel. 2. Practice social distancing; maintaining 6 feet of distance between yourself and others in trailer. 3. Clean and disinfect areas including desks, phones, chairs and other common areas, before and after use.
6. Purchasing Food from a Restaurant	1. Transmittal/exposure of COVID-19 from other customers, staff, surfaces.	1. To the extent possible, bring your own food. 2. If you must visit a restaurant, call ahead for take-out or "contactless delivery". Do not dine in. When picking up food, follow guidelines for <u>Job Step #8: Purchasing Supplies at Retail/Shipping Centers</u>. 3. Wash hands before and after eating.
7. Smoking Cigarettes	1. Transmittal/exposure of COVID-19 by touching mouth with hands	1. Cigarette smokers maybe at greater risk of complications arising from COVID-19. Nicotine patches/lozenges/gum, smoking cessation programs, and prescription medications may aid in "kicking the habit" if you decide to quit. 2. Wash hands thoroughly before and after smoking. 3. Discard cigarette butts properly. Do not light cigarettes from others and do not give cigarettes to others.
8. Hotel Stay	1. Transmittal/exposure of COVID-19 from previous occupants, hotel staff, common areas.	1. Verify the hotel chain/brand has modified cleaning procedures to reflect risk of COVID-19. Most hotel companies have issued statements on their websites and in email blasts reflecting these new procedures. 2. Use the front door, and not peripheral entrances. Front doors of hotels are generally automatic. 3. Request ground floor room to avoid elevator use and a room that has not be utilized in 48-72 hours. 4. If elevator use is required, do not directly touch elevator buttons with your hands. Do not ride elevators with other people, to the extent possible. 5. Bring disinfecting wipes or sanitizing spray. Upon arrival, disinfect high "hand-traffic" areas of the hotel room: Door handles, light switches, shower/sink faucet handles, TV remote, curtain/blind handles. Clean these surfaces daily. 6. Place the "Do Not Disturb" Sign on your door to prevent people (housekeeping) from entering your room. 7. Avoid common spaces and hotel sponsored events where crowds will be present. 8. Confirm hotel cleaning procedures have been modified to address COVID-19. Confirm no COVID-19 cases have occurred in hotel
9. Purchasing Supplies at Retail/Shipping Centers	1. Transmittal/exposure of COVID-19 from other customers, staff, surfaces.	1. Plan your travel to limit the need to visit retail/shipping centers. 2. Practice social distancing, maintaining at least 6 feet of distance between yourself and others. If the store is too crowded/small, consider visiting another store or returning at a different time. 3. Avoid high "hand-traffic" items/areas like door handles (i.e. use your shoulder, hip/butt, or open with a disposable napkin/paper towel), credit cards terminals (i.e. use Apple/Android pay if available), shopping carts/baskets (i.e. bring your own shopping

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
		bags), counter tops (i.e. ask clerk if you can hold the items while they are scanned) and bulk/buffet items (i.e. just avoid them). 4. Disinfect your hands before and after visiting a retail/shipping center.

Print Name	Sign Name	Date
Prepared by:		
Reviewed by:		

LANGAN

Job Safety Analysis (JSA)
Health and Safety

JSA Title: **Environmental Sampling**
JSA Number: **JSA021-01**

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. Prior to the start of any work “TAKE 5” and conduct a Last Minute Risk Assessment.

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
1. Drive to sample location	1. Rough/Off Road terrain	1. Pay attention to road conditions such as road erosion, unprotected embankments, and soft road conditions.
2. Sample Collection (Walking)	1. Slip/Trips/Falls 2. Back strains 3. Wildlife (Insects, Stray animals, rodents) 4. Poisonous vegetation	1. Minimize distance to sample area/ Plan route and check surface prior to carrying heavy equipment/ Locate safest access point/ Follow good housekeeping procedures/ Mark significant below grade hazards (holes, trenches) with spray paint or cones/ Wear foot protection with ankle support and gripping soles. 2. Use proper lifting techniques/ Use wheeled transport/ Obtain assistance where and when needed/ Consider load weight when evaluating what is safe and unsafe to carry. 3. Be aware of surroundings for the presence of wildlife. Do not approach stray animals. Carry and use animal repellant when needed/ Use bug spray when needed. 4. Keep skin covered/ Identify and avoid poisonous vegetation/ Clean areas after contact with suspected vegetation.
3. Sample Collection (Water)	1. Drowning Hazards 2. Chemical burns (when adding acid preservative to sample) 3. Back Strains 4. Ergonomic issues 5. Slip/Trips/Falls	1. Use buddy system/ Wear flotation vest if water is deeper than 2 feet or swift moving/ Select working area with stable footing. Do not attempt to cross or stand in swift moving water. 2. Wear proper PPE (Nitrile gloves, Tyvek Sleeves) 3. Use proper lifting techniques/ Use wheeled transport/ Obtain assistance where and when needed/ Consider load weight when evaluating what is safe or unsafe to carry. 4. When possible avoid bending over for long periods of time/ Use a small stool for sitting or knee pad for kneeling.

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
		5. Minimize distance to sample area/ Plan route and check surface prior to carrying heavy equipment/ Locate safest access point/ Follow good housekeeping procedures/ Mark significant below grade hazards (holes, trenches) with spray paint or cones/ Wear foot protection with ankle support and gripping soles/ Avoid standing water or slippery terrain.
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	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 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: **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. Prior to the start of any work "TAKE 5" and conduct a Last Minute Risk Assessment.	

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**
5. Unpack/Transport equipment to work area.	2. Back Strains 3. Slip/Trips/Falls 4. Cuts/Abrasions from equipment 4. Contusions from dropped equipment	1. Use proper lifting techniques/Use wheeled transport 2. Minimize distance to work area/Unobstructed path to work area/follow good housekeeping procedures. Mark slip/trip/fall hazards with orange safety cones. 3. Wear proper PPE (leather gloves, long sleeves). 4. Wear proper PPE (Langan approved safety shoes).
6. 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.
7. Collecting Soil/Fluid Sample	5. Irritation to eye from vapor, soil dust, or splashing 6. Irritation to exposed skin	5. 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) 6. Wear proper skin protection including nitrile gloves.
8. Closing Drums	1. Hand Injuries, cuts or lacerations when untightening drum locking bolt, removing drum lid strap, or removing lid.	6. Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery or dirty objects before handling / Wear leather/ cut-resistant gloves. Use non-metallic mallet and non-sparking tools/wrenches.
9. Moving Drums	1. Hand Injuries, cuts or lacerations when untightening drum locking bolt, removing drum lid strap, or removing lid.	1. Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery or dirty

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
	2. Back Strains	objects before handling / Wear leather/ cut-resistant gloves. Use non-metallic mallet and non-sparking tools/wrenches. 2. Use proper lifting techniques/Use wheeled transport
10. 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	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 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: **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. Prior to the start of any work "TAKE 5" and conduct a Last Minute Risk Assessment.

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
11. Transport equipment to work area	5. Back Strain 6. Slips/ Trips/ Falls 7. Traffic 8. Cuts/abrasions from equipment 9. 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)
12. Moving equipment to its planned location	7. Pinch Hazard 8. 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
13. Equipment Set-up	6. Pinch Hazard 7. Cuts/abrasions to knuckles/hands 8. Back Strain	1. Wear proper PPE (leather gloves) 2. Wear proper PPE (leather gloves) 3. Use proper lifting techniques / Use wheeled transport
14. All activities	11. Slips/ Trips/ Falls 12. Hand injuries, cuts or lacerations during manual handling of materials 13. Foot injuries 14. Back injuries 15. Traffic 16. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.) 17. High Noise levels 18. Overhead hazards	11. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards 12. 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 13. Wear Langan approved safety shoes 14. 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)	19. Heat Stress/ Cold Stress 20. Eye Injuries	15. Wear high visibility clothing & vest / Use cones or signs to designate work area 16. 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 17. Wear hearing protection 18. Wear hard hat / Avoid areas were overhead hazards exist. 19. 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 20. Wear safety glasses
Additional items.		
Additional Items identified while in the field. (Delete row if not needed.)		

Print Name	Sign Name	Date
Prepared by:		
Reviewed by:		

LANGAN

Job Safety Analysis (JSA)
Health and Safety

JSA Title: **Field Sampling**
JSA Number: **JSA022-01**

A Job Safety Analysis (JSA) must identify all job steps required to complete the task, the potential hazards employees could be exposed to while performing the job step and the preventative/corrective actions required to reduce/mitigate the identified potential hazards. Employees must certify that they have either prepared the JSA or have reviewed the JSA and are aware of the potential hazards associated with this task and will follow the provided preventive/corrective actions. Prior to the start of any work "TAKE 5" and conduct a Last Minute Risk Assessment.

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
15. Unpack/Transport equipment to work area.	10. Back Strains 11. Slip/Trips/Falls 12. Cuts/Abrasions from equipment 13. Contusions from dropped equipment	4. Use proper lifting techniques/Use wheeled transport 5. Minimize distance to work area/Unobstructed path to work area/follow good housekeeping procedures. Mark slip/trip/fall hazards with orange safety cones. 6. Wear proper PPE (leather gloves, long sleeves). 7. Wear proper PPE (Langan approved safety shoes).
16. Initial Site Arrival-Site Assessment	9. Traffic	7. Situational awareness (be alert of your surroundings). Secure area from through traffic.
17. Surface Water Sampling	9. Contaminated media. Skin/eye contact with biological agents and/or chemicals.	7. Wear appropriate PPE (Safety glasses, appropriate gloves). Review (MSDS for all chemicals being.
18. Sampling from bridges	3. Struck by vehicles	3. Wear appropriate PPE (Safety Vest). Use buddy system and orange safety cones.
19. Icing of Samples/ Transporting coolers/equipment from work area.	21. Back Strains 22. Slips/Trips/Falls 23. Cuts/Abrasions from equipment 24. Pinch/Crushing Hazards.	21. Drain coolers of water. Use proper lifting techniques. Use wheeled transport. 22. Have unobstructed path from work area. Aware of surroundings. 23. Wear proper PPE (Leather gloves, long sleeves) 24. Wear proper PPE (Leather gloves, long sleeves)
20. 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.
21. All activities	1. Slips/ Trips/ Falls 2. Hand injuries, cuts or lacerations during manual	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

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
	handling of materials 3. Foot injuries 4. 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	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 25. Wear high visibility clothing & vest / Use cones or signs to designate work area 26. 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 27. Wear hearing protection 28. Wear hard hat / Avoid areas were overhead hazards exist. 29. 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 30. Wear safety glasses
Additional items.		
Additional Items identified while in the field. (Delete row if not needed.)		

Print Name	Sign Name	Date
Prepared by:		
Reviewed by:		

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

JSA Title: **Excavation Oversight**
JSA Number: **JSA041-01**

A Job Safety Analysis (JSA) must identify all job steps required to complete the task, the potential hazards employees could be exposed to while performing the job step and the preventative/corrective actions required to reduce/mitigate the identified potential hazards. Employees must certify that they have either prepared the JSA or have reviewed the JSA and are aware of the potential hazards associated with this task and will follow the provided preventive/corrective actions. Prior to the start of any work "TAKE 5" and conduct a Last Minute Risk Assessment.

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
22. Transport equipment to work area	14. Back Strain 15. Slips/Trips/Falls 16. Traffic 17. Cuts/abrasions/contusions from equipment	8. Use proper lifting techniques / Use wheeled transport 9. Minimize distance to work area / Have unobstructed path to work area / Follow good housekeeping procedures 10. Wear proper PPE (high visibility vest or clothing) 11. Wear proper PPE (leather gloves, long sleeves, safety shoes)
23.Earth Moving Equipment	10. Equipment running over employee	8. Ensure you have direct line of sight with operator of equipment; don't walk behind equipment; maintain a safe distance away from equipment. 9. Wear proper PPE (high vis vest/clothing)
24.Excavation	10. Excavation collapse 11. Confined space 12. Soil	8. Use proper shoring/benching/sloping techniques; Ladder is properly situated in excavation; no water in excavation; competent person has inspected excavation prior to allow employees to enter. 9. Langan employees are not authorized to enter a confined space; 10. Soil and equipment is kept atleast 2 feet from edge of excavation
25.Excavated soil	1. Hazardous substances	1. Use proper equipment to monitor excavated soil for contaminates; ensure levels do not exceed PEL's for contaminates; Wear proper PPE
26. All activities	31. Slips/ Trips/ Falls 32. Hand injuries, cuts or lacerations during manual handling of materials 33. Foot injuries 34. Back injuries	31. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards 32. Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery or dirty objects before handling / Wear leather/ cut-resistant gloves

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
	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	33. Wear proper PPE (Langan approved safety shoes) 34. 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 35. Wear high visibility clothing & vest / Use cones or signs to designate work area 36. 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 37. Wear hearing protection 38. Wear hard hat / Avoid areas were overhead hazards exist. 39. 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 40. 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. Prior to the start of any work "TAKE 5" and conduct a Last Minute Risk Assessment.

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
27.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	12. 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 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 / Have unobstructed path to vehicle or collection point / Do not lift/walk with boxes that are heavy/difficult to lift 14. Wear high visibility safety vests or clothing / Exercise caution 15. Wear proper PPE (cut-resistant gloves) / Stay alert, be aware of geoprobe rig at all times 16. 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
28.Calibration of monitoring equipment	11.Skin or eye contact with calibration chemicals 12.Pinch fingers in monitoring equipment	10. Wear proper PPE (safety glasses/ goggles) 11. Wear proper PPE (leather gloves)
29.Set-up geoprobe rig	13. Geoprobe rig movement	11. All field personnel should stay clear of the geoprobe rig while moving / Use a spotter when backing up the geoprobe
30.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)
31. Remove and open acetate liner	41. Pinched fingers while removing macrocore	1. Wear proper PPE (nitrile gloves, cut-resistant or leather gloves 2. Wear proper PPE (cut-resistant or leather gloves)

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
5. Remove and open acetate liner (cont'd)	42. Cuts/lacerations when cutting acetate liner open 43. Exposure to hazardous vapors 44. Skin contact with contaminated soil	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 4. Wear proper PPE (nitrile gloves)
32. 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
33. 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)

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
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	41. Use drum cart for moving drums / Use proper lifting techniques / Do not lift heavy loads without assistance 42. Wear proper PPE (cut-resistant or leather gloves) 43. Wear proper PPE (cut-resistant or leather gloves) 44. Wear proper PPE (nitrile gloves underneath work gloves) 45. Follow good housekeeping procedures / Ensure route to move drum and storage space is free from obstructions 46. Wear proper PPE (safety shoes) / Work in a safe manner to prevent dropped drum
9. All activities 9. All activities (cont'd)	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	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 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. Prior to the start of any work "TAKE 5" and conduct a Last Minute Risk Assessment.	

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
34. 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)
35. Remove well cover	13. Scrape knuckles/hand 14. Strain wrist/bruise palm 15. 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)
36. Remove well cap and lock	14. Well can pops from pressure 15. Exposure to hazardous substances through inhalation or dermal exposure 16. Scrape knuckles/hand 17. 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
37. Measure head-space vapor levels	1. Exposure to hazardous substances through inhalation	1. Do not place face over well when collecting measurement
38. 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)

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
39. 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
40. 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)
41. 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
42. 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

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
10. Purge water	1. Contact with potentially contaminated groundwater 2. Back strain from lifting buckets of water 3. Tripping potential on sample discharge lines and pump electric line	1. Wear proper PPE (safety glasses, nitrile gloves) 2. Use proper lifting techniques / Use wheeled transport 3. Organize discharge of electric line to keep out of way as much as possible / Mark potential tripping hazards with caution tape or safety cones
11. Sample water collection	1. Contact with potentially contaminated groundwater through dermal exposure 2. Contact with and burns from acid used for sample preservation 3. Tripping potential on sample discharge lines and pump electric line 4. Lacerations from broken sample bottles 5. Back strain when transporting coolers full of collected samples 6. Slips/ Trips/ Falls	1. Wear proper PPE (safety glasses, nitrile gloves) 2. Wear proper PPE (safety glasses, nitrile gloves) / Ensure sample bottle lids are secure before use and after sample collection 3. Organize line to keep out of the way as much as possible / Mark potential tripping hazards with caution tape or safety cones 4. Do not over-tighten bottle caps / Handle bottles safely to prevent breakage / Wrap glass bottles in bubble wrap, if possible 5. Use proper lifting techniques / Use wheeled transport / Seek assistance if coolers weight exceeds 50lbs. / Minimize distance to vehicle 6. Have unobstructed path to vehicle or collection point / Follow good housekeeping procedures / Do not lift/walk with coolers that are too heavy/difficult to lift
12. Remove pump and pack up equipment	1. Back strain when removing pump or lifting heavy equipment	1. Use proper lifting technique / Use wheeled transport for heavy equipment
13. Replace well cap and lock	1. Scrape fingers/hand 2. Strain wrist/bruise palm	1. Wear proper PPE (leather gloves) 2. Using hammer, tap the end of the well cap to tighten grip
14. Replace well cover	1. Scrape knuckles/hand 2. Strain write/bruise palm 3. Pinch fingers or hand	1. Wear proper PPE (leather gloves) 2. Using hammer, tap the end of the wrench to tighten the grip of the bolts 3. Wear proper PPE (leather gloves)
15. Transport drums to disposal staging location	1. Back, arm or shoulder strain from moving drums 2. Pinch hazard 3. Contact with potentially contaminated groundwater when moving improperly sealed drums 4. Slips/ Trips/ Falls when moving drum 5. Drop drum on feet/toes	1. Use drum cart for moving drums / Use proper lifting techniques / Obtain assistance, if needed 2. Wear proper PPE (leather gloves) 3. Wear proper PPE (nitrile gloves under leather gloves) / Properly seal drum to prevent leak 4. Ensure route to move drum to storage space is dry and free from obstructions 5. Wear proper PPE (safety shoes)
16. Place used PPE in 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	45. Slips/ Trips/ Falls 46. Hand injuries, cuts or lacerations during manual handling of materials 47. Foot injuries 48. Back injuries 49. Traffic 50. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.)	47. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards 48. 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 49. Wear Langan approved safety shoes

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
	51. High Noise levels 52. Overhead hazards 53. Heat Stress/ Cold Stress 54. Eye Injuries	50. 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 51. Wear high visibility clothing & vest / Use cones or signs to designate work area 52. 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 53. Wear hearing protection 54. Wear hard hat / Avoid areas were overhead hazards exist. 55. 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 56. 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: **Well Installation**
JSA Number: **JSA019-01**

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. Prior to the start of any work "TAKE 5" and conduct a Last Minute Risk Assessment.

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: PID, Tyvek sleeves				

JOB STEPS	**POTENTIAL HAZARDS**	**PREVENTATIVE / CORRECTIVE ACTION**
43.Move equipment to work site	23.Back strain when lifting equipment 24.Slips/ Trips/ Falls while moving equipment 25.Traffic (if applicable) 26.Pinched fingers or running over toes during geoprobe set-up 27.Overturn drilling rig while transporting to loading dock on flat-bed tow truck	17. 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 18. 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 19. Wear high visibility safety vests or clothing / Exercise caution 20. Wear proper PPE (cut-resistant gloves) / Stay alert, be aware of geoprobe rig at all times 21. 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
44.Calibration of monitoring equipment	16.Skin or eye contact with calibration chemicals 17.Pinch fingers in monitoring equipment	12. Wear proper PPE (safety glasses/ goggles) 13. Wear proper PPE (leather gloves)
14. Set-up geoprobe rig	18. Geoprobe rig movement	12. All field personnel should stay clear of the geoprobe rig while moving / Use a spotter when backing up the geoprobe
15. Advance geoprobe rods below ground surface to desired depth	6. Underground utilities 7. High noise levels	9. Clean all subsurface soil borings to a minimum of 5 feet below grade 10. Wear proper PPE (hearing protection)

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
16. Remove and open acetate liner 5. Remove and open acetate liner (cont'd)	55. Pinched fingers while removing macrocore 56. Cuts/lacerations when cutting acetate liner open 57. Exposure to hazardous vapors 58. Skin contact with contaminated soil	5. Wear proper PPE (nitrile gloves, cut-resistant or leather gloves 6. Wear proper PPE (cut-resistant or leather gloves) 7. 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 8. Wear proper PPE (nitrile gloves)
6. Remove excess soil from acetate liner and place in 55-gallon drum (IF NOT PERFORMED BY LANGAN, REMOVE!)	5. Cuts/lacerations from acetate liner 6. Pinched fingers/hand while opening/closing drum 7. Skin contact with contaminated soil 8. Soil debris in eyes	5. Wear proper PPE (cut-resistant or leather gloves) 6. Wear proper PPE (cut-resistant or leather gloves) 7. Wear proper PPE (nitrile gloves) 8. Wear proper PPE (safety glasses)
7. Attach hollow-stem augers to the geoprobe rig; Advance augers and attach additional augers until desired depth is reached	1. Strain wrist/bruise palm 2. Pinched fingers 3. Back Strain 4. Clothing entanglement 5. Carbon monoxide poisoning 6. Bruise toes/foot 7. High noise levels 8. Skin contact with contaminated soil	1. Wear proper PPE (cut-resistant or leather gloves) 2. Wear proper PPE (cut-resistant or leather gloves) 3. Use proper lifting techniques 4. Wear proper work attire(no loose clothing/strings) 5. Properly ventilate work area 6. Wear proper PPE (safety shoes) 7. Wear proper PPE (hearing protection) 8. Wear proper PPE (Tyvek sleeves, nitrile gloves)
8. Install monitoring well	1. Pinched fingers 2. Lacerations/abrasions 3. Back Strain	1. Wear proper PPE (cut-resistant or leather gloves) 2. Wear proper PPE (cut-resistant or leather gloves) 3. Use proper lifting techniques
9. Tremie-grout annulus space above bentonite seal	1. Back strain 2. Pinched fingers	1. Use proper lifting techniques 2. Wear proper PPE (cut-resistant or leather gloves)
10. Install flush-mount monitoring well pad	1. Splashed concrete 2. Pinched fingers 3. Cuts/lacerations	1. Wear proper PPE (safety glasses) 2. Wear proper PPE (cut-resistant or leather gloves) 3. Wear proper PPE (cut-resistant or leather gloves)
11. Decontaminate equipment	1. Splashing water/soap 2. Contact with potentially contaminated groundwater/soil 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
12. Transport drums to central staging location (IF NOT PERFORMED BY LANGAN, REMOVE!)	7. Back, arm or shoulder strain from moving drums 8. Pinch fingers/hand in drum cart when moving drums 9. Pinch fingers/hand when operating lift-gate on vehicle 10. Contact with potentially contaminated groundwater when moving improperly sealed drums 11. Slips when moving drums 12. Drop drum on feet/toes	57. Use drum cart for moving drums / Use proper lifting techniques / Do not lift heavy loads without assistance 58. Wear proper PPE (cut-resistant or leather gloves) 59. Wear proper PPE (cut-resistant or leather gloves) 60. Wear proper PPE (nitrile gloves underneath work gloves) 61. Follow good housekeeping procedures / Ensure route to move drum and storage space is free from obstructions 62. Wear proper PPE (safety shoes) / Work in a safe manner to prevent dropped drum

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
13. All activities 13. All activities (cont'd)	11. Slips/ Trips/ Falls 12. Hand injuries, cuts or lacerations during manual handling of materials 13. Foot injuries 14. 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	11. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards 12. 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 13. Wear Langan approved safety shoes 14. 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 15. Wear high visibility clothing & vest / Use cones or signs to designate work area 16. 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 17. Wear hearing protection 18. Wear hard hat / Avoid areas were overhead hazards exist. 19. 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 20. 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. Prior to the start of any work "TAKE 5" and conduct a Last Minute Risk Assessment.

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
45. Transport equipment to work area	28. Back Strains 29. Slips/Trips/Falls 30. Traffic 31. Cuts/Abrasions/Contusions from equipment	22. Use proper lifting techniques/ Use wheeled transport/ use buddy system when lifting equipment. 23. Minimize distance from work area/ unobstructed path to collection points and vehicle/ Follow good housekeeping procedures. 24. Wear high-visibility vest or clothing/Exercise caution/ Use traffic cones or signage if needed. 25. Wear proper PPE (leather gloves, long sleeves, Langan approved safety shoes).
46. Measure depth of water	18. Exposure to hazardous substances 19. Pinched fingers	17. Wear proper PPE (Nitrile gloves, Safety glasses/Face shield). 18. Wear proper PPE (cut-resistant gloves).
47. Install Tremie pipe in the monitoring well and connect to water source.	19. Hand injuries during installation (pinched fingers/hands). 20. Back strain from holding Tremie pipe. 21. High pressure water spray.	13. Wear proper PPE (Nitrile gloves/cut-resistant gloves). 14. Use proper lifting techniques/ Use two personnel when lowering pump greater than 80 feet. 15. Ensure all hose connections are tight and secure/ Use proper PPE (face shield and safety glasses).
48. 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	8. Hand injuries during pump installation and sample tubing cutting. 9. Back strain 10. Electric shock 11. Exhaust gases from generator 12. Burns from hot equipment	11. Wear proper PPE when installing pump and cutting sample tubing (Nitrile and cut-resistant gloves)/ Use tubing cutter. 12. 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. 13. 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.

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
(generator) e. Turn on power source (generator)		14. Position generator so that exhaust is flowing away from work area. 15. 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)
49. 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.	59. Hand injuries 60. Face injuries 61. Contaminated spray from water	63. Wear proper PPE (cut-resistant gloves and nitrile gloves). 64. Wear proper PPE (face shield and safety glasses)/do not stand over well opening. 65. 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.
50. 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.
51. 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. 66. Wear proper PPE (leather gloves, long sleeves, Langan approved safety shoes).
52. All activities	1. Slips/ Trips/ Falls 2. Hand injuries, cuts or lacerations during manual handling of materials 3. Foot injuries 62. Back injuries 63. Traffic 64. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.) 65. High Noise levels 66. Overhead hazards 67. Heat Stress/ Cold Stress 68. 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. 9. Wear proper attire for weather conditions (sunscreen or protective clothing

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
		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: **General Construction Activities**
JSA Number: **JSA010-01**

A Job Safety Analysis (JSA) must identify all job steps required to complete the task, the potential hazards employees could be exposed to while performing the job step and the preventative/corrective actions required to reduce/mitigate the identified potential hazards. Employees must certify that they have either prepared the JSA or have reviewed the JSA and are aware of the potential hazards associated with this task and will follow the provided preventive/corrective actions. Prior to the start of any work "TAKE 5" and conduct a Last Minute Risk Assessment.

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
53.Transport equipment to work area	32.Back Strain 33.Slips/ Trips/ Falls 34.Traffic 35.Cuts/abrasions from equipment 36.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)
54.Installation of piping from vapor wells to skid connections and from discharge pipping to effluent stack	20. Pinch fingers when connecting pipes 21.Slips/ Trips/ Falls 22.Machinery Hazards	6. Wear proper PPE (leather gloves) 7. 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 8. Wear proper PPE (safety vest) / Maintain safe distance from operating machinery
55.Remediation equipment installation	22. Back strain when lifting heavy equipment 23. Slips/ Trips/ Falls 24. Traffic	9. Use proper lifting techniques / Use wheeled transport / Minimize distance to vehicle 10. Be aware of potential trip hazards / Practice good housekeeping procedures / Mark significant below-grade hazards (i.e. holes, trenches) with safety cones or spray pain 11. Wear proper PPE (safety vest)
56. All activities	69. Slips/ Trips/ Falls 70. Hand injuries, cuts or lacerations during manual handling of materials 71. Foot injuries 72. Back injuries	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

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
4. All activities (cont'd)	73. Traffic 74. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.) 75. High Noise levels 76. Overhead hazards 77. Heat Stress/ Cold Stress 78. Eye Injuries	69. Wear Langan approved safety shoes 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.)		

<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: **Hammer Drill**
JSA Number: JSA049

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. Prior to the start of any work "TAKE 5" and conduct a Last Minute Risk Assessment.

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
57.Transport equipment to work area	37.Back Strain 38.Slips/ Trips/ Falls 39.Traffic 40.Cuts/abrasions from equipment 41.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)
58.Electrical Connection	23.Inpsect electrical cord to drill 24.Inspect hammer drill 25.Inspect extension cord 26.Test GFCI	9. Check the plug, insure all connections are in place, and check cord for frayed sections. If plug or cord are worn, do not use equipment until repaired 10. Inspect chuck for proper grasping and holding of bit, check that plastic housing is not cracked or missing pieces. Do not use if chuck doesn't work properly or housing is compromised. 11. Inspect extension cord, if worn or stripped pull from service and replace 12. Test GFCI, replace if GFCI fails
59.Drill Bit	1. Inspect drill bit	1. Replace if worn 2. Wear proper PPE (leather gloves) when installing and removing drill bit. 3. Ensure equipment is unplugged from electrical power when removing and installing drill bit.
60.Use of Hammer Drill	1. Hazards associated with using hammer drill, flying objects, heavy equipment, ground level hazards and dust 2. Slips/ Trips/ Falls 3. Hazards associated drilling into concrete slab	1. Maintain a safe distance from other site operations / Wear proper PPE (hard hat, safety glasses, safety shoes, safety vest, ear protection and leather gloves) 2. Be aware of potential trip hazards / Follow good housekeeping procedures / Mark extension cord pathway with safety cones

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
		3. Do not push hammer drill during use.
61. All activities 4. All activities (cont'd)	79. Slips/ Trips/ Falls 80. Hand injuries, cuts or lacerations during manual handling of materials 81. Foot injuries 82. Back injuries 83. Traffic 84. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.) 85. High Noise levels 86. Overhead hazards 87. Heat Stress/ Cold Stress 88. Eye Injuries	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 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: **Indoor Air Sampling**
JSA Number: **JSA007-01**

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. Prior to the start of any work "TAKE 5" and conduct a Last Minute Risk Assessment.

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: PID, Respiratory Protection (if necessary)				

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
62. Building walkthrough and background contaminant removal	42. Slips / Trips/ Falls 43. Exposure to substances/vapors during removal	16. 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 17. Monitor indoor air concentrations with a PID / Wear proper PPE (nitrile gloves) / Wear proper respiratory protection if necessary
63. Transport equipment to work area	6. Back Strain 7. Slips/ Trips/ Falls 8. Traffic 9. Cuts/abrasions from equipment 10. 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)
64. Mark out areas for indoor air sampling	27. Slips/ Trips/ Falls	13. 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
65. Set-up canisters and begin indoor air sampling	25. Dropping crates or canisters 26. Pinch hazard	12. Exercise caution when moving crates and canisters / Use proper housekeeping of materials during sample events / Do not carry too many items at one time / Perform several trips, if necessary 13. Wear proper PPE (leather gloves)
66. Sample collection	2. Dropping crates or canisters 3. Pinched fingers from opening valves	2. Exercise caution when moving crates and canisters / Use proper housekeeping of materials during sample events / Do not carry too many items at one time / Perform several trips, if necessary 3. Wear proper PPE (leather gloves) / Keep fingers away from pinch points
67. Pack up equipment	3. Back strain	3. Use proper lifting techniques / Use wheeled transport

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
	4. Slips/ Trips/ Falls 5. Traffic	4. Be aware of potential trip hazards / Follow good housekeeping procedures / Minimize distance to vehicle 5. Wear proper PPE (safety vest)
68. All activities	89. Slips/ Trips/ Falls 90. Hand injuries, cuts or lacerations during manual handling of materials 91. Foot injuries 92. Back injuries 93. Traffic 94. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.) 95. High Noise levels 96. Overhead hazards 97. Heat Stress/ Cold Stress 98. 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. 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:		

LANGAN

Job Safety Analysis (JSA)
Health and Safety

JSA Title: **ISCO (In-Situ Chemical Oxidation) Injections Pneumatic Fracturing**
JSA Number: **JSA039-01**

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. Prior to the start of any work “TAKE 5” and conduct a Last Minute Risk Assessment.

PERSONAL PROTECTIVE EQUIPMENT (Required or to be worn as needed):				
☒ Safety Shoes	☒ Long Sleeves	☒ Safety Vest (Class 2)	☒ Hard Hat	☒ Hearing Protection
☒ Safety Glasses	☒ Safety Goggles	☐ Face Shield	☒ Nitrile Gloves	☐ PVC Gloves
☒ Leather Gloves	☒ Cut Resist. Gloves	☐ Fall Protection	☐ Fire Resistant Clothing	☐ Rubber Boots
☐ Insect/Animal Repellent	☐ Ivy Blocker/Cleaner	☐ Traffic Cones/Signs	☐ Life Vest/Jacket	
☒ Other: As needed, full or half face, air purifying respirator, with NIOSH approved HEPA filter; Tyvek Suit (personnel handling potassium permanganate); PID monitor				

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
69. Transport equipment to work site	44. Back strains 45. Slips/Trips/Falls 46. Traffic 47. Overturn of heavy equipment during unloading operations 48. Heavy Equipment Movement	26. Use proper lifting technique/ Get assistance as needed 27. Use proper lifting technique/ Get assistance as needed. Have unobstructed path to vehicle or collection point / Do not walk with boxes that are heavy/difficult to lift or create blind spots 28. Exercise caution/ Use buddy system 29. All unnecessary personnel should stay away from equipment being unloaded 30. All unnecessary personnel should stay clear of moving equipment
70. Excavation Oversight	28. Heavy Equipment Movement 29. Slips/Trips/Falls on Uneven terrain 30. Slope failure 31. Falling Objects (soil, tools, etc.)	19. All unnecessary personnel should stay clear of moving equipment 20. Be aware of potential tripping hazards/ Mark significant hazards 21. Contractor's competent person to determine need to sloping/benching/shoring measures 22. Wear proper PPE (safety shoes, hard hat, safety glasses)
71. ISCO Mixing, Pneumatic Fracturing, and injection	27. Heavy Equipment Movement 28. Splashing solutions/ soil-solution mixture 29. Falling Objects (soil, tools, etc.) 30. Vapors/ Dust (particulate) 31. Slips/Trips/falls 32. Noise Hazard 33. Back injuries 34. Carbon Monoxide exposure	16. All unnecessary personnel should stay clear of moving equipment 17. Wear proper PPE (safety glasses, Tyvek, nitrile gloves) 18. Wear proper PPE (safety glasses, hard hat, safety shoes) 19. Wear proper PPE, in accordance with the air monitoring plan 20. Be aware of potential tripping hazards/ Mark significant hazards with cones, caution tape or spray paint 21. Wear proper PPE (hearing protection) 22. Use proper lifting techniques/ Get assistance as needed 23. Work in a properly ventilated area/ Ensure equipment exhaust is pointed away from employees.

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
72. Performance Sampling/Monitoring	13. Contact with potentially contaminated or corrosive materials through dermal exposure	16. Wear proper PPE (safety glasses, nitrile gloves); Utilize trowels/shovels etc. for materials handling/ Decontaminate equipment and personnel
73. All activities	99. Slips/ Trips/ Falls 100. Hand injuries 101. Foot injuries 102. Back injuries 103. Traffic 104. Wildlife: Stray animals, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.) 105. High Noise levels 106. Overhead hazards 107. Heat Stress/ Cold Stress 108. Eye Injuries	97. Be aware of potential trip hazards/ Follow good housekeeping procedures/ Mark significant hazards 98. 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 or cut-resistant gloves 99. Wear Langan approved safety shoes 100. 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 101. Wear high visibility clothing & vest/ Use cones or signs to designate work area 102. Be aware of surroundings at all times, including the presence of wildlife/ Do not approach stray animals/ Carry and use animal repellant when needed/ Use bug spray when needed 103. Wear hearing protection 104. Wear hard hat/ Avoid areas were overhead hazards exist. 105. 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 106. Wear safety glasses
Additional items.		
Additional Items identified while in the field. (Delete row if not needed.)		

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

LANGAN

Job Safety Analysis (JSA)
Health and Safety

JSA Title: **ISCO Remediation Oversight**
JSA Number: **JSA038-01**

A Job Safety Analysis (JSA) must identify all job steps required to complete the task, the potential hazards employees could be exposed to while performing the job step and the preventative/corrective actions required to reduce/mitigate the identified potential hazards. Employees must certify that they have either prepared the JSA or have reviewed the JSA and are aware of the potential hazards associated with this task and will follow the provided preventive/corrective actions. Prior to the start of any work "TAKE 5" and conduct a Last Minute Risk Assessment.

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

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
74. Mobilization/ Mobilization Oversight	49. Back strains 50. Slips/Trips/Falls 51. Traffic 52. Overturn of heavy equipment during unloading operations 53. Heavy Equipment Movement	31. Use proper lifting technique/ Get assistance as needed 32. Use proper lifting technique/ Get assistance as needed. Have unobstructed path to vehicle or collection point / Do not walk with boxes that are heavy/difficult to lift or create blind spots 33. Exercise caution/ Use buddy system 34. All unnecessary personnel should stay away from equipment being unloaded 35. All unnecessary personnel should stay clear of moving equipment
75. Excavation Oversight	32. Heavy Equipment Movement 33. Slips/Trips/Falls on Uneven terrain 34. Slope failure 35. Falling Objects (soil, tools, etc.)	23. All unnecessary personnel should stay clear of moving equipment 24. Be aware of potential tripping hazards/ Mark significant hazards 25. Contractor's competent person to determine need to sloping/benching/shoring measures 26. Wear proper PPE (safety shoes, hard hat, safety glasses)
76. ISCO Mixing Oversight	35. Heavy Equipment Movement 36. Splashing solutions/ soil-solution mixture 37. Falling Objects (soil, tools, etc.) 38. Vapors	24. All unnecessary personnel should stay clear of moving equipment 25. Wear proper PPE (safety glasses, Tyvek, nitrile gloves) 26. Wear proper PPE (safety glasses, hard hat, safety shoes) 27. Wear proper PPE, in accordance with the air monitoring plan
77. Performance Sampling/Monitoring	14. Contact with potentially contaminated or corrosive materials through dermal exposure	17. Wear proper PPE (safety glasses, nitrile gloves); Utilize trowels/shovels etc. for materials handling
78. All activities	109. Slips/ Trips/ Falls 110. Hand injuries, cuts or lacerations during manual handling of materials 111. Foot injuries	107. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
	112. Back injuries 113. Traffic 114. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.) 115. High Noise levels 116. Overhead hazards 117. Heat Stress/ Cold Stress 118. Eye Injuries	108. 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 109. Wear Langan approved safety shoes 110. 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 111. Wear high visibility clothing & vest / Use cones or signs to designate work area 112. 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 113. Wear hearing protection 114. Wear hard hat / Avoid areas were overhead hazards exist. 115. 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 116. 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 I

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.)

____

____

____

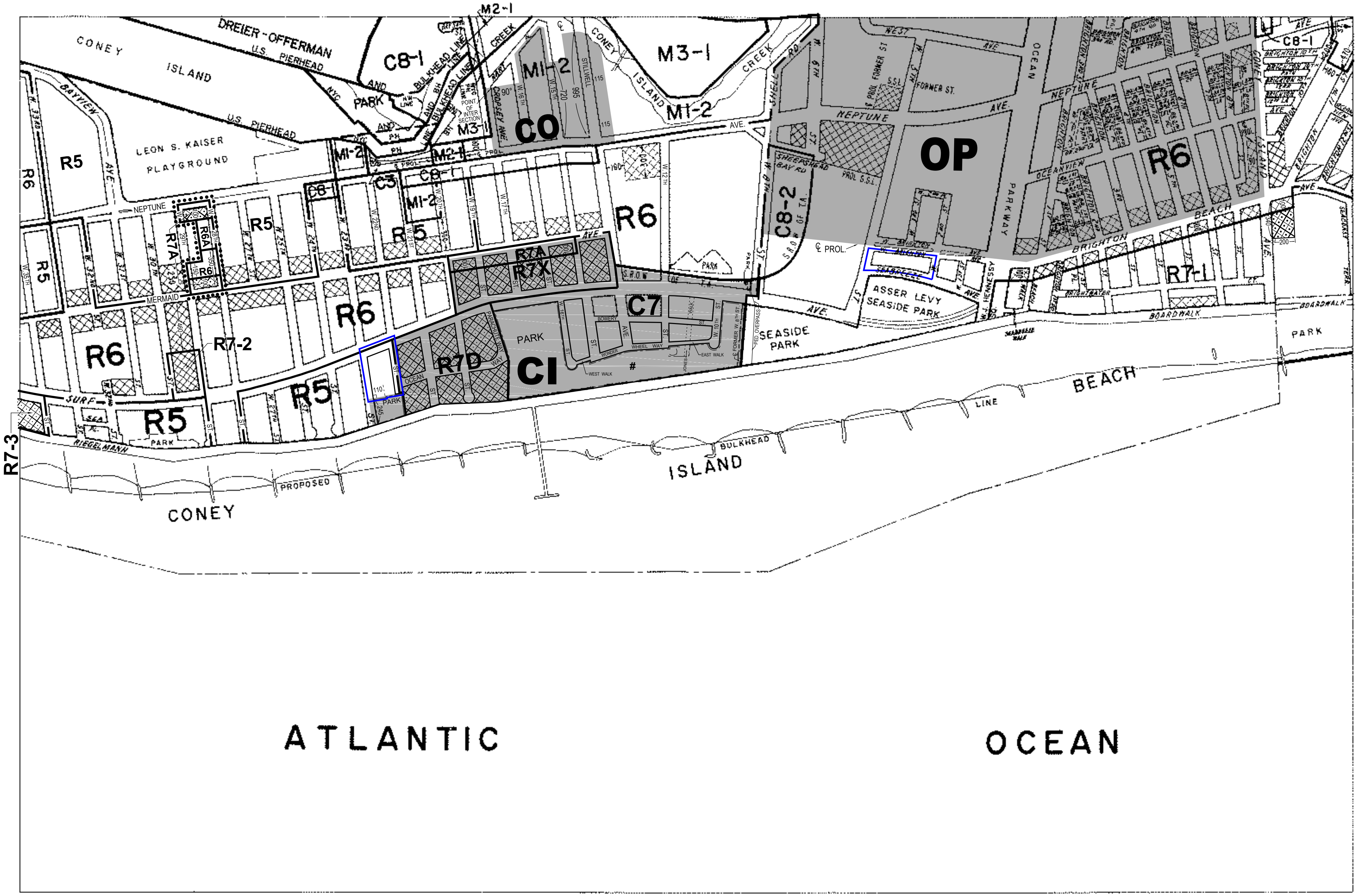
ATTENDEES

PRINT NAME	COMPANY	SIGNATURE

APPENDIX E

New York City Planning Commission Zoning Map

Click blue outline on map to view diagram of **proposed** zoning change



ZONING MAP

THE NEW YORK CITY PLANNING COMMISSION

Major Zoning Classifications:

The number(s) and/or letter(s) that follows an R, C or M District designation indicates use, bulk and other controls as described in the text of the Zoning Resolution.

R – RESIDENTIAL DISTRICT

C – COMMERCIAL DISTRICT

M – MANUFACTURING DISTRICT

SPECIAL PURPOSE DISTRICT
The letter(s) within the shaded area designates the special purpose district as described in the text of the Zoning Resolution.

AREA(S) REZONED

Effective Date(s) of Rezoning:

03-22-2018 C 170240 ZMK

Special Requirements:

For a list of lots subject to CEQR environmental requirements, see APPENDIX C.

For a list of lots subject to "D" restrictive declarations, see APPENDIX D.

For Inclusionary Housing designated areas and Mandatory Inclusionary Housing areas on this map, see APPENDIX F.

MAP KEY

28a	28c	29a
28b	**28d**	29d

N

ZONING MAP **28d**

600 0 600 1200 1800 FEET

 # NOTE: STREETS FOR THE STREET MAP CHANGE C 090107 MMK AND N 090107(A) MMK ARE SHOWN ON THIS MAP PRIOR TO BECOMING EFFECTIVE IN ORDER TO LOCATE ZONING DISTRICT BOUNDARIES.

C1-1 C1-2 C1-3 C1-4 C1-5 C2-1 C2-2 C2-3 C2-4 C2-5

NOTE: Where no dimensions for zoning district boundaries appear on the zoning maps, such dimensions are determined in Article VII, Chapter 6 (Location of District Boundaries) of the Zoning Resolution.

NOTE: Zoning information as shown on this map is subject to change. For the most up-to-date zoning information for this map, visit the Zoning section of the Department of City Planning website: **www.nyc.gov/planning** or contact the Zoning Information Desk at (212) 720-3291.

APPENDIX F

Quality Assurance Project Plan

QUALITY ASSURANCE PROJECT PLAN

for

1607 SURF AVENUE
BROOKLYN, NEW YORK

Prepared For:

Coney Island Associates Phase 2 LLC
c/o BFC Partners
150 Myrtle Ave, 2nd Floor
Brooklyn, New York

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

June 2020

Langan Project No. 170599501

LANGAN

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Attachment B: Analytical Methods/Quality Assurance Summary Table
Attachment C: Sample Nomenclature Standard Operating Procedure

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1.0 PROJECT DESCRIPTION

1.1 INTRODUCTION

This Quality Assurance Project Plan (QAPP) was prepared on behalf of Coney Island Associates Phase 2 LLC (the Volunteer), for the 1607 Surf Avenue site in Brooklyn, New York (the site). This Quality Assurance Project Plan (QAPP) supports the Remedial Action Work Plan (RAWP) submitted to the New York State Department of Environmental Conservation (NYSDEC) as part of a New York State Brownfield Cleanup Program (BCP) application. The Volunteer intends to remediate the site in conjunction with redevelopment.

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 RAWP covers earthwork to be completed during construction of the proposed development at the site. A Construction Health and Safety Plan (CHASP) and Community Air Monitoring Plan (CAMP) for the protection of on-site workers, the community, and the environment has been developed and will be implemented during remediation and construction activities. 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

Implementation of the RAWP consists of remediation of the site to Track 1 site-specific cleanup standards. The proposed Track 1 remedy consists of the following tasks:

- Development and implementation of a Construction Health and Safety Plan (CHASP) and CAMP for the protection of on-site workers, community/residents, and environment during remediation and construction activities
- Design and construction of a support of excavation (SOE) system to facilitate the Track 1 remediation
- Implementation of soil erosion, pollution and sediment control measures in compliance with applicable laws and regulations

- Screening for indications of contamination (by visual means, odor, and monitoring with a photoionization detector [PID]) of excavated material during intrusive site work
- Excavation, stockpiling, off-site transport, and appropriate disposal of about 20,500 cubic yards of historic fill and native soil that exceeds the 6 NYCRR Part 375 Unrestricted Use (UU) soil cleanup objectives (SCOs) as defined by 6 NYCRR Part 375-6.8
- Dewatering and groundwater treatment, as necessary, to accommodate the removal of material that exceeds UU SCOs
- If encountered, removal of any encountered underground storage tanks (USTs) and/or associated appurtenances (e.g., fill lines, vent line, and electrical conduit) and decommissioning and off-site disposal during redevelopment in accordance with DER-10, 6 NYCRR Part 613.9, NYSDEC Commissioner's Policy (CP)-51, and other applicable NYSDEC UST closure requirements
- Collection and analysis of confirmation soil samples in accordance with DER-10 to confirm a Track 1 remedy was achieved; over-excavation will be completed if necessary to meet UU SCOs
- Completion of in-situ groundwater treatment via injection of liquid-activated carbon in the northeast corner of the site to treat PCE in groundwater
- Importation of certified-clean material (i.e., material meeting UU SCOs), virgin stone, or recycled concrete aggregate (RCA), or virgin, native crushed stone to backfill over-excavated areas to construction depth

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 prevent additional environmental impacts to site media (soil and groundwater). The quality of the data must be sufficient to fulfill the overall objective of the RA.

The DQO process is an iterative process where various options for implementing a project are explored, dissected, and recombined. The feasibility and costs of various options are estimated, and then the most advantageous option is selected and developed into project work plans that will be implemented.

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, based on comparison to Title 6 of the Official Compilation of New York Codes, Rules and Regulations Part 375 NYSDEC UU SCOs for soil samples and to the October 2006 (updated in May 2017) New York State Department of Health (NYSDOH) Guidance for Evaluating Soil Vapor Intrusion in the State of New York Air Guideline Values and Decision Matrices for soil vapor samples.
- Required Analytical Level: The level of data quality, data precision, and QA/Quality Control (QC) documentation required for chemical analysis.
- Required Detection Limits: The detection limits necessary based on the above information.

The investigation will be evaluated using the DQO process on an individual, task-specific basis. DQOs and the required level of review will be determined during this process.

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

Excavation activities will be overseen by Langan on behalf of the Requestor. Langan will perform the sampling collection as described in the RAWP and will subcontract excavation and analytical services. Langan will also arrange data analysis and reporting tasks. The analytical services will be performed by Alpha Analytical Laboratories, Inc. of Westborough, Massachusetts (NYSDOH ELAP certification number 11148). Data validation services will be performed by Emily Strake of Langan.

Key contacts for this project are as follows:

Coney Island Associates Phase 2 LLC:	Mr. Donald Capoccia Telephone: (718) 422-9999 ext. 137
Remediation Engineer:	Mr. Jason Hayes, P.E. Telephone: (212) 479-5427
Langan Project Director:	Mr. Michael Burke, PG, CHMM Telephone: (212) 479-5413
Langan Project Manager:	Mr. Brian Gochenaur, QEP Telephone: (212) 479-5479
Langan Field Team Leader:	Ms. Jessica Friscia Telephone: (973) 560-4488
Langan Quality Assurance Officer (QAO):	Mr. William Bohrer Telephone: (212) 479-5533
Langan Health and Safety Manager:	Mr. Tony Moffa, CHMM Telephone: (215) 491-6545
Langan Health and Safety Officer (H&SO):	Mr. Tony Moffa, CHMM Telephone: (215) 491-6545
Data Validator:	Emily Strake, CEP Telephone: (215) 491-6526
Laboratory Representative:	Mr. Ben Rao (Alpha) Telephone: (201) 812-2633
Field Personnel:	TBD

Langan résumés are appended to the RAWP.

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 accuracy or bias, sensitivity, completeness, representativeness, comparability, and sensitivity of analysis. Variances from the quality assurance objectives at any stage of the investigation will result in the implementation of appropriate corrective measures and an assessment of the impact of corrective measures on the usability of the data.

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. For field duplicates, results less than 2x the reporting limit (RL) meet the precision criteria if the absolute difference is less than ±2x the RL and acceptable based on professional judgement. For results greater than 2x the RL, the acceptance criteria is a relative percent difference (RPD) of ≤50% (soil and air), <30% (water). 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 calibration, 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 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.

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

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

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 director will select, with input from the laboratory and QA personnel, sampling and analytical procedures that achieve the required levels of detection and QC acceptance limits that meet established performance criteria. Concurrently, the project manager will select the level of data assessment to ensure that only data meeting the project DQOs are used in decision-making.

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

Analytical methods and quality assurance parameters associated with the sampling program are presented in Attachment B. 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. Additional sample volume is not required by the laboratory for this purpose. 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 samples.

5.0 SAMPLE COLLECTION AND FIELD DATA ACQUISITION PROCEDURES

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

5.1 FIELD DOCUMENTATION PROCEDURES

Field documentation procedures will include summarizing field data in field books and field data sheets, 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
- Date and time of activity
- Sample identification numbers
- Geographical location of sampling points with references to the site, other facilities or a map coordinate system. Sketches 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 in accordance with the sample nomenclature guidance included in Attachment C, and placed in an appropriate sample container. Each sample container will have a sample label affixed to the outside with the date and time of sample collection and project name. In addition, the label will contain the sample identification number, analysis required and chemical preservatives added, if any. All documentation will be completed in waterproof ink.

5.2 EQUIPMENT CALIBRATION AND PREVENTATIVE MAINTENANCE

A photoionization detector (PID) will be used during the sampling activities to evaluate work zone action levels, collect pre- and post-sample readings for air samples, 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 H&SO, 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 to measure pH, specific conductance, temperature, dissolved oxygen, turbidity and oxidation-reduction-potential (ORP), every ten minutes. 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 VOCs and for health and safety monitoring. Soil samples collected for analysis of VOCs will be collected using either EnCore® or Terra Core® sampling equipment. For analysis of non-volatile parameters, samples will be homogenized and placed into glass jars. After collection, all sample jars will be capped and securely tightened, and placed in iced coolers and maintained at 4°C ±2°C until they are transferred to the laboratory for analysis, in accordance with the procedures outlined in Section 5.4 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 B. In addition, analysis of collected soil sample will meet all quality assurance criteria set forth by this QAPP and DER-10.

Groundwater Samples

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-GW 001, January 19, 2010).

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 ten 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 Section 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 B. In addition, analysis of collected groundwater sample will meet all quality assurance criteria set forth by this QAPP and DER-10.

Soil Vapor Samples

Prior to sample collection, a pre-sampling inspection will be conducted to document chemicals and potential subsurface pathways at the site. Soil vapor samples will be collected into laboratory-supplied, batch certified-clean Summa® canisters calibrated for a sampling rate of two 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 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 samples are analyzed for VOCs during that day.

Duplicate soil and groundwater 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 or groundwater samples 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 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.

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 B.

5.6 SAMPLE SHIPMENT

5.6.1 Packaging

Soil vapor samples canisters can be stored and transported without additional packaging. Soil and groundwater 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 CHASP appended to the RAWP. 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. Debris is expected to be transported to a local municipal landfill for disposal. If applicable, residual solids (e.g., leftover soil cuttings) will be placed back in the borehole from which it was sampled. If gross contamination is observed, soil will be collected and stored in Department of Transportation (DOT)-approved 55-gallon drums in a designated storage area at the site. All drums will be properly labeled, sealed, and characterized as necessary. The residual materials will be stored in a designated storage area at the site for further characterization, treatment or disposal.

Residual fluids (such as purge water) will be collected and stored in DOT-approved (or equivalent) 55-gallon drums in a designated storage area at the site. The residual fluids will be transported to the on-site wastewater treatment plant or analyzed, characterized and disposed off-site in accordance with applicable federal and state regulations. Residual fluids such as decontamination water may be discharged to the ground surface, however, if gross contamination is observed, the residual fluids will be collected, stored, and transported similar to purge water or other residual fluids.

5.9 CHAIN OF CUSTODY PROCEDURES

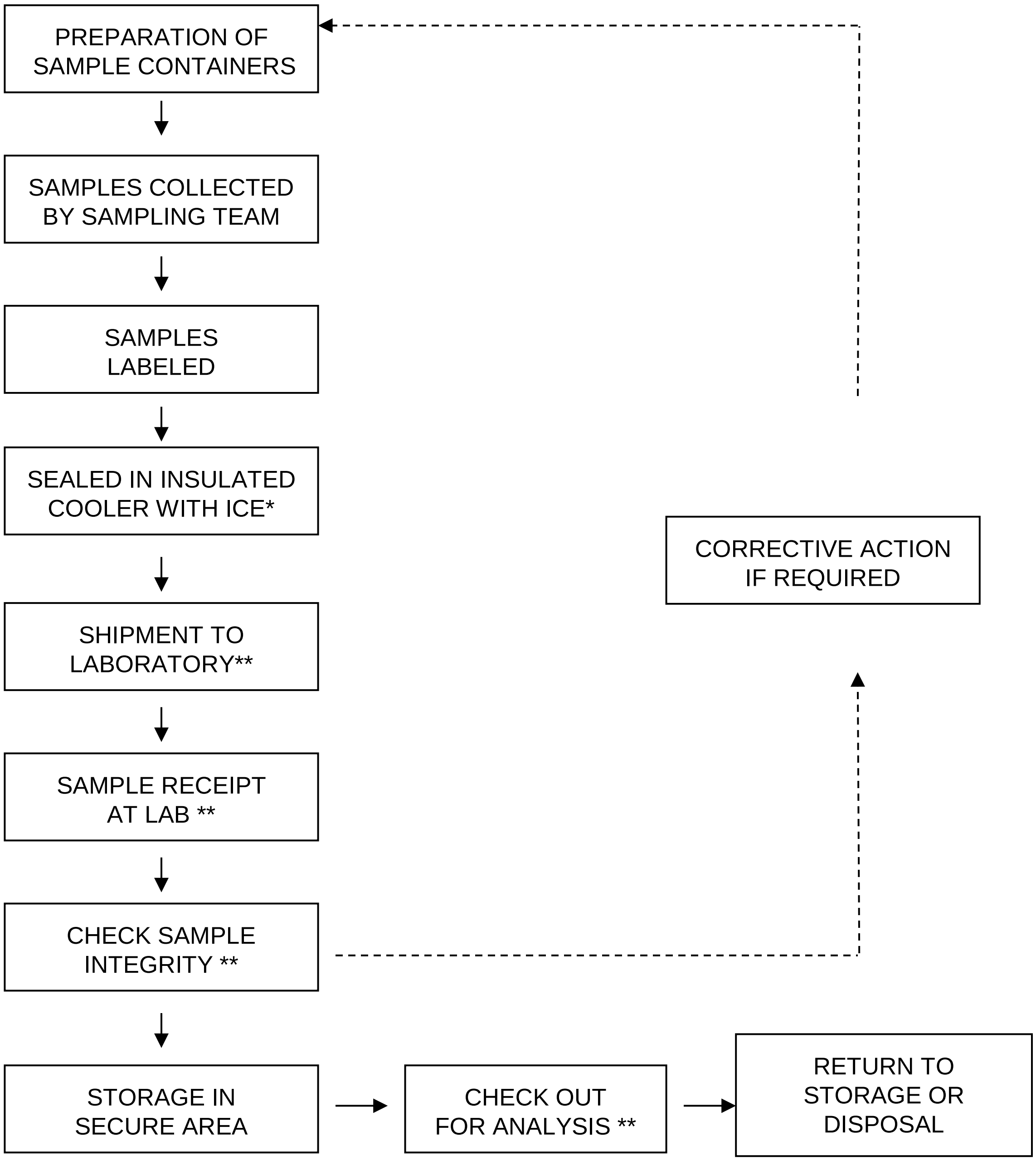
A chain-of-custody protocol has been established for collected samples that will be followed during sample handling activities in both field and laboratory operations. The primary purpose of the chain-of-custody procedures is to document the possession of the samples from collection through shipping, 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/or groundwater 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 example chain-of-custody forms are included as Figures 5.2 and 5.3.

Figure 5.1 Sample Custody



*SUMMA CANISTERS SHOULD NOT BE ICED
** REQUIRES SIGN-OFF ON CHAIN-OF-CUSTODY FORM

Figure 5.2 Sample Chain-of-Custody Form – Air Samples

AIR ANALYSIS

ALPHA ANALYTICAL — 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

Client:
Address:
Phone:
Fax:
Email:
☐ These samples have been previously analyzed by Alpha

Project Information

Project Name:
Project Location:
Project #:
Project Manager:
ALPHA Quote #:

Turn-Around Time

☐ Standard ☐ RUSH (only confirmed if pre-approved)
Date Due: Time:

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	Criteria

Other Project Specific Requirements/Comments:

ANALYSIS

All Columns Below Must Be Filled Out

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection: Date	Start Time	End Time	Initial Vacuum	Final Vacuum	Sample Matrix*	Sampler's Initials	Can Size	I D Can	I D - Flow Controller	TO-14A by TO-15	TO-15	TO-15 SIM	APH	Fixed Gases	TO-13A	TO-4 / TO-10	Sample Comments (i.e. PID)

*SAMPLE MATRIX CODES
AA = Ambient Air (Indoor/Outdoor)
SV = Soil Vapor/Landfill Gas/SVE
Other = Please Specify

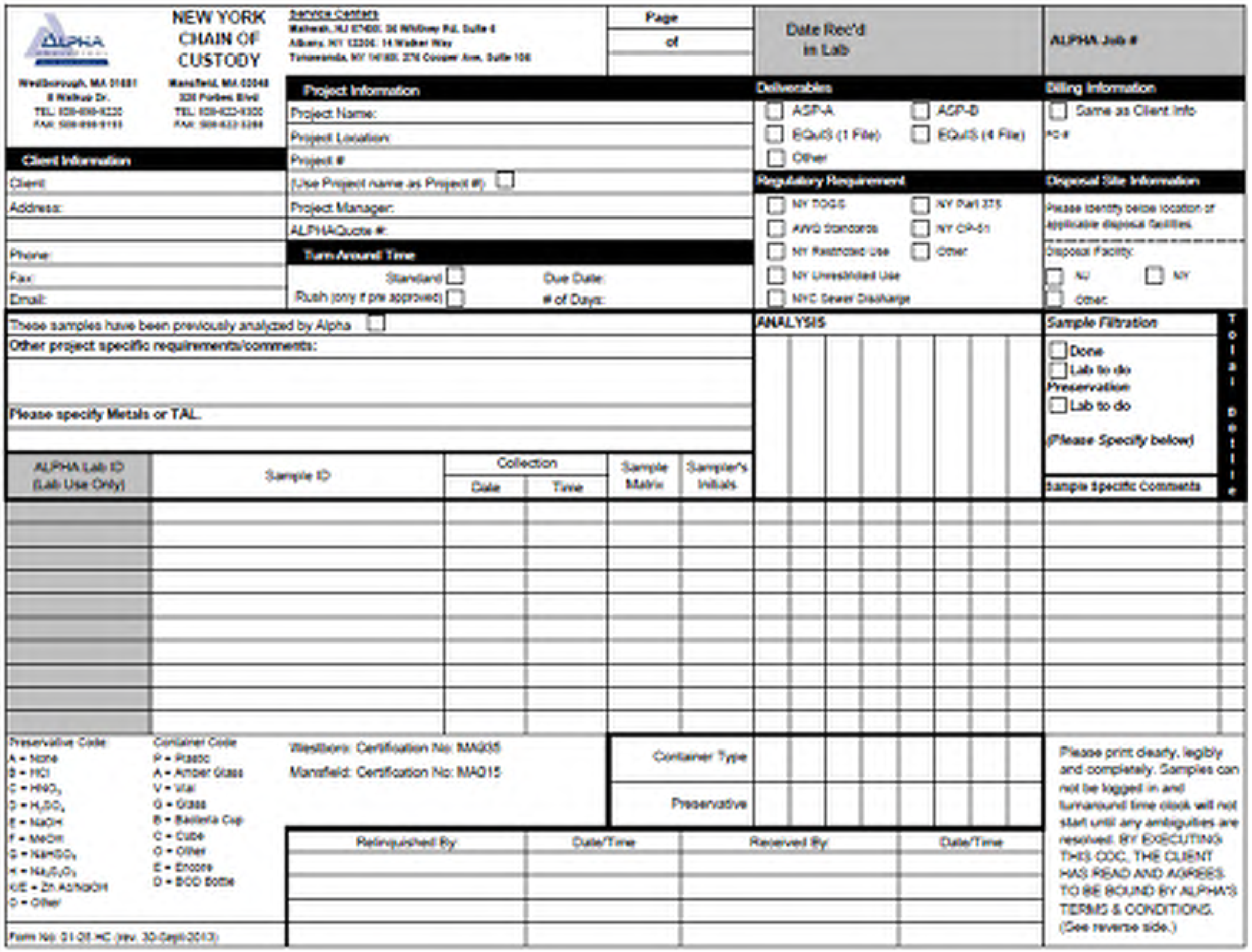
Container Type

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 (19-Jun-09)

Figure 5.3 Sample Chain-of-Custody Form – Soil and Groundwater Samples



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

5.10 LABORATORY SAMPLE STORAGE PROCEDURES

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

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 LIMS. If this cannot be accomplished, the consultant should be notified via letter of transmittal indicating that manual entry of data is required for a particular method of analysis. All EDDs must also undergo a QC check by the laboratory before delivery. The original data, tabulations, and electronic media are stored in a secure and retrievable fashion.

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

6.3 DATA VALIDATION

Data validation will be performed in accordance with the USEPA 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 and reviewed by the QAO before issuance. The DUSR will present the results of data validation, including a summary assessment of laboratory data packages, sample preservation and 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 recovery results (if applicable);
- MS and MSD recoveries and RPDs
- LCS and LCSD recoveries and RPDs
- 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;
- Duplicates;
- Matrix Spike;
- Furnace atomic absorption analysis QC;
- ICP serial dilutions; and
- Results verification and reported detection limits.

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

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

7.0 QUALITY ASSURANCE PERFORMANCE AUDITS AND SYSTEM AUDITS

7.1 INTRODUCTION

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

7.2 SYSTEM AUDITS

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

7.3 PERFORMANCE AUDITS

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

7.4 FORMAL AUDITS

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

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

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

8.0 CORRECTIVE ACTION

8.1 INTRODUCTION

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

8.2 PROCEDURE DESCRIPTION

When a significant condition adverse to quality is noted at 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 QAO, Project Manager, Field Team Leader and involved contractor management, at a minimum. Implementation of corrective action is verified by documented follow-up action.

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

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

Project management personnel, field investigation teams, remedial response planning personnel, and laboratory groups monitor on-going work performance in the normal course of daily responsibilities. Work may be audited at 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

CORRECTIVE ACTION REQUEST

Number: ____________________ Date: __________

TO: ______________________________

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

CONDITION:

REFERENCE DOCUMENTS:

RECOMMENDED CORRECTIVE ACTIONS:

________	_____	________	______	________	______
Originator	Date	Approval	Date	Approval	Date

RESPONSE

CAUSE OF CONDITION

CORRECTIVE ACTION

(A) RESOLUTION

(B) PREVENTION

(C) AFFECTED DOCUMENTS

C.A. FOLLOWUP:

CORRECTIVE ACTION VERIFIED BY: ______________________ DATE:__________

9.0 REFERENCES

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

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

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

USEPA, 1986. SW-846 "Test Method for Evaluating Solid Waste," dated November 1986. USEPA, Washington, D.C.

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

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

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

USEPA, 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.

USEPA 2017. National Functional Guidelines for Superfund Organic Methods Data Review, Office of Superfund Remediation and Technology Innovation, EPA-540-R-2017-002, January 2017.

USEPA 2017b. National Functional Guidelines for Superfund Inorganic Methods Data Review, Office of Superfund Remediation and Technology Innovation, EPA-540-R-2017-001, January 2017

ATTACHMENT A

LABORATORY REPORTING LIMITS
AND METHOD DETECTION LIMITS

ATTACHMENT A

SOIL SAMPLES
LABORATORY REPORTING LIMITS AND METHOD DETECTION LIMITS

Method	Matrix	Analyte	RL	MDL	Units
Volatile Organic Compounds					
EPA 8260C/5035	Soil	1,1,1,2-Tetrachloroethane	0.001	0.000318	mg/kg
EPA 8260C/5035	Soil	1,1,1-Trichloroethane	0.001	0.0001108	mg/kg
EPA 8260C/5035	Soil	1,1,2,2-Tetrachloroethane	0.001	0.0001008	mg/kg
EPA 8260C/5035	Soil	1,1,2-Trichloro-1,2,2-Trifluoroethane	0.02	0.000274	mg/kg
EPA 8260C/5035	Soil	1,1,2-Trichloroethane	0.0015	0.000304	mg/kg
EPA 8260C/5035	Soil	1,1-Dichloroethane	0.0015	0.0000856	mg/kg
EPA 8260C/5035	Soil	1,1-Dichloroethene	0.001	0.000262	mg/kg
EPA 8260C/5035	Soil	1,1-Dichloropropene	0.005	0.0001414	mg/kg
EPA 8260C/5035	Soil	1,2,3-Trichlorobenzene	0.005	0.0001476	mg/kg
EPA 8260C/5035	Soil	1,2,3-Trichloropropane	0.01	0.0001626	mg/kg
EPA 8260C/5035	Soil	1,2,4,5-Tetramethylbenzene	0.004	0.0001302	mg/kg
EPA 8260C/5035	Soil	1,2,4-Trichlorobenzene	0.005	0.0001818	mg/kg
EPA 8260C/5035	Soil	1,2,4-Trimethylbenzene	0.005	0.0001414	mg/kg
EPA 8260C/5035	Soil	1,2-Dibromo-3-chloropropane	0.005	0.000396	mg/kg
EPA 8260C/5035	Soil	1,2-Dibromoethane	0.004	0.0001744	mg/kg
EPA 8260C/5035	Soil	1,2-Dichlorobenzene	0.005	0.0001532	mg/kg
EPA 8260C/5035	Soil	1,2-Dichloroethane	0.001	0.0001134	mg/kg
EPA 8260C/5035	Soil	1,2-Dichloropropane	0.0035	0.000228	mg/kg
EPA 8260C/5035	Soil	1,3,5-Trimethylbenzene	0.005	0.0001434	mg/kg
EPA 8260C/5035	Soil	1,3-Dichlorobenzene	0.005	0.000135	mg/kg
EPA 8260C/5035	Soil	1,3-Dichloropropane	0.005	0.0001452	mg/kg
EPA 8260C/5035	Soil	1,4-Dichlorobenzene	0.005	0.0001384	mg/kg
EPA 8260C/5035	Soil	1,4-Diethylbenzene	0.004	0.0001598	mg/kg
EPA 8260C/5035	Soil	1,4-Dioxane	0.1	0.01442	mg/kg
EPA 8260C/5035	Soil	2,2-Dichloropropane	0.005	0.000226	mg/kg
EPA 8260C/5035	Soil	2-Butanone	0.01	0.000272	mg/kg
EPA 8260C/5035	Soil	2-Hexanone	0.01	0.000666	mg/kg
EPA 8260C/5035	Soil	4-Ethyltoluene	0.004	0.000124	mg/kg
EPA 8260C/5035	Soil	4-Methyl-2-pentanone	0.01	0.000244	mg/kg
EPA 8260C/5035	Soil	Acetone	0.01	0.001036	mg/kg
EPA 8260C/5035	Soil	Acrolein	0.025	0.00806	mg/kg
EPA 8260C/5035	Soil	Acrylonitrile	0.01	0.000514	mg/kg
EPA 8260C/5035	Soil	Benzene	0.001	0.000118	mg/kg
EPA 8260C/5035	Soil	Bromobenzene	0.005	0.000208	mg/kg
EPA 8260C/5035	Soil	Bromochloromethane	0.005	0.000276	mg/kg
EPA 8260C/5035	Soil	Bromodichloromethane	0.001	0.0001732	mg/kg
EPA 8260C/5035	Soil	Bromoform	0.004	0.000236	mg/kg
EPA 8260C/5035	Soil	Bromomethane	0.002	0.000338	mg/kg
EPA 8260C/5035	Soil	Carbon disulfide	0.01	0.001102	mg/kg
EPA 8260C/5035	Soil	Carbon tetrachloride	0.001	0.00021	mg/kg
EPA 8260C/5035	Soil	Chlorobenzene	0.001	0.000348	mg/kg
EPA 8260C/5035	Soil	Chloroethane	0.002	0.000316	mg/kg
EPA 8260C/5035	Soil	Chloroform	0.0015	0.00037	mg/kg
EPA 8260C/5035	Soil	Chloromethane	0.005	0.000294	mg/kg
EPA 8260C/5035	Soil	cis-1,2-Dichloroethene	0.001	0.0001428	mg/kg
EPA 8260C/5035	Soil	cis-1,3-Dichloropropene	0.001	0.0001176	mg/kg
EPA 8260C/5035	Soil	Cyclohexane	0.02	0.000146	mg/kg
EPA 8260C/5035	Soil	Dibromochloromethane	0.001	0.0001536	mg/kg
EPA 8260C/5035	Soil	Dibromomethane	0.01	0.0001636	mg/kg
EPA 8260C/5035	Soil	Dichlorodifluoromethane	0.01	0.0001908	mg/kg
EPA 8260C/5035	Soil	Ethyl ether	0.005	0.00026	mg/kg
EPA 8260C/5035	Soil	Ethylbenzene	0.001	0.0001274	mg/kg
EPA 8260C/5035	Soil	Hexachlorobutadiene	0.005	0.000228	mg/kg
EPA 8260C/5035	Soil	Isopropylbenzene	0.001	0.0001038	mg/kg
EPA 8260C/5035	Soil	Methyl Acetate	0.02	0.00027	mg/kg
EPA 8260C/5035	Soil	Methyl cyclohexane	0.004	0.0001546	mg/kg
EPA 8260C/5035	Soil	Methyl tert butyl ether	0.002	0.0000844	mg/kg
EPA 8260C/5035	Soil	Methylene chloride	0.01	0.001104	mg/kg
EPA 8260C/5035	Soil	Naphthalene	0.005	0.0001384	mg/kg
EPA 8260C/5035	Soil	n-Butylbenzene	0.001	0.0001148	mg/kg
EPA 8260C/5035	Soil	n-Propylbenzene	0.001	0.0001092	mg/kg
EPA 8260C/5035	Soil	o-Chlorotoluene	0.005	0.0001598	mg/kg
EPA 8260C/5035	Soil	o-Xylene	0.002	0.0001718	mg/kg
EPA 8260C/5035	Soil	p/m-Xylene	0.002	0.0001978	mg/kg
EPA 8260C/5035	Soil	p-Chlorotoluene	0.005	0.0001328	mg/kg
EPA 8260C/5035	Soil	p-Isopropyltoluene	0.001	0.000125	mg/kg
EPA 8260C/5035	Soil	sec-Butylbenzene	0.001	0.000122	mg/kg
EPA 8260C/5035	Soil	Styrene	0.002	0.000402	mg/kg
EPA 8260C/5035	Soil	tert-Butyl Alcohol	0.06	0.00292	mg/kg
EPA 8260C/5035	Soil	tert-Butylbenzene	0.005	0.0001354	mg/kg
EPA 8260C/5035	Soil	Tetrachloroethene	0.001	0.0001402	mg/kg
EPA 8260C/5035	Soil	Toluene	0.0015	0.0001948	mg/kg
EPA 8260C/5035	Soil	trans-1,2-Dichloroethene	0.0015	0.000212	mg/kg
EPA 8260C/5035	Soil	trans-1,3-Dichloropropene	0.001	0.0001208	mg/kg
EPA 8260C/5035	Soil	trans-1,4-Dichloro-2-butene	0.005	0.000392	mg/kg
EPA 8260C/5035	Soil	Trichloroethene	0.001	0.000125	mg/kg
EPA 8260C/5035	Soil	Trichlorofluoromethane	0.005	0.000388	mg/kg
EPA 8260C/5035	Soil	Vinyl acetate	0.01	0.0001322	mg/kg
EPA 8260C/5035	Soil	Vinyl chloride	0.002	0.0001174	mg/kg
EPA 8260C/5035	Soil	Xylenes, Total	0.002	0.0001978	mg/kg

ATTACHMENT A

SOIL SAMPLES
LABORATORY REPORTING LIMITS AND METHOD DETECTION LIMITS

Method	Matrix	Analyte	RL	MDL	Units
Semivolatile Organic Compounds					
EPA 8270D	Soil	1,2,4,5-Tetrachlorobenzene	0.1665	0.0515817	mg/kg
EPA 8270D	Soil	1,2,4-Trichlorobenzene	0.1665	0.0545787	mg/kg
EPA 8270D	Soil	1,2-Dichlorobenzene	0.1665	0.0546453	mg/kg
EPA 8270D	Soil	1,3-Dichlorobenzene	0.1665	0.0524808	mg/kg
EPA 8270D	Soil	1,4-Dichlorobenzene	0.1665	0.050616	mg/kg
EPA 8270D	Soil	2,3,4,6-Tetrachlorophenol	0.1665	0.028305	mg/kg
EPA 8270D	Soil	2,4,5-Trichlorophenol	0.1665	0.053946	mg/kg
EPA 8270D	Soil	2,4,6-Trichlorophenol	0.0999	0.0314019	mg/kg
EPA 8270D	Soil	2,4-Dichlorophenol	0.14985	0.053946	mg/kg
EPA 8270D	Soil	2,4-Dimethylphenol	0.1665	0.049617	mg/kg
EPA 8270D	Soil	2,4-Dinitrophenol	0.7992	0.227772	mg/kg
EPA 8270D	Soil	2,4-Dinitrotoluene	0.1665	0.0359307	mg/kg
EPA 8270D	Soil	2,6-Dinitrotoluene	0.1665	0.042624	mg/kg
EPA 8270D	Soil	2-Chloronaphthalene	0.1665	0.054279	mg/kg
EPA 8270D	Soil	2-Chlorophenol	0.1665	0.050283	mg/kg
EPA 8270D	Soil	2-Methylnaphthalene	0.1998	0.0531801	mg/kg
EPA 8270D	Soil	2-Methylphenol	0.1665	0.053613	mg/kg
EPA 8270D	Soil	2-Nitroaniline	0.1665	0.046953	mg/kg
EPA 8270D	Soil	2-Nitrophenol	0.35964	0.051948	mg/kg
EPA 8270D	Soil	3,3'-Dichlorobenzidine	0.1665	0.044289	mg/kg
EPA 8270D	Soil	3-Methylphenol/4-Methylphenol	0.23976	0.054612	mg/kg
EPA 8270D	Soil	3-Nitroaniline	0.1665	0.045954	mg/kg
EPA 8270D	Soil	4,6-Dinitro-o-cresol	0.4329	0.060939	mg/kg
EPA 8270D	Soil	4-Bromophenyl phenyl ether	0.1665	0.038295	mg/kg
EPA 8270D	Soil	4-Chloroaniline	0.1665	0.043956	mg/kg
EPA 8270D	Soil	4-Chlorophenyl phenyl ether	0.1665	0.0506493	mg/kg
EPA 8270D	Soil	4-Nitroaniline	0.1665	0.044955	mg/kg
EPA 8270D	Soil	4-Nitrophenol	0.2331	0.053946	mg/kg
EPA 8270D	Soil	Acenaphthene	0.1332	0.034299	mg/kg
EPA 8270D	Soil	Acenaphthylene	0.1332	0.0311355	mg/kg
EPA 8270D	Soil	Acetophenone	0.1665	0.051615	mg/kg
EPA 8270D	Soil	Anthracene	0.0999	0.0277056	mg/kg
EPA 8270D	Soil	Atrazine	0.1332	0.0377289	mg/kg
EPA 8270D	Soil	Azobenzene	0.1665	0.044622	mg/kg
EPA 8270D	Soil	Benzaldehyde	0.21978	0.067266	mg/kg
EPA 8270D	Soil	Benzidine	0.54945	0.130203	mg/kg
EPA 8270D	Soil	Benzo(a)anthracene	0.0999	0.0326007	mg/kg
EPA 8270D	Soil	Benzo(a)pyrene	0.1332	0.0407259	mg/kg
EPA 8270D	Soil	Benzo(b)fluoranthene	0.0999	0.033633	mg/kg
EPA 8270D	Soil	Benzo(ghi)perylene	0.1332	0.034632	mg/kg
EPA 8270D	Soil	Benzo(k)fluoranthene	0.0999	0.0317682	mg/kg
EPA 8270D	Soil	Benzoic Acid	0.53946	0.168498	mg/kg
EPA 8270D	Soil	Benzyl Alcohol	0.1665	0.051282	mg/kg
EPA 8270D	Soil	Biphenyl	0.37962	0.0549117	mg/kg
EPA 8270D	Soil	Bis(2-chloroethoxy)methane	0.17982	0.0504162	mg/kg
EPA 8270D	Soil	Bis(2-chloroethyl)ether	0.14985	0.0466866	mg/kg
EPA 8270D	Soil	Bis(2-chloroisopropyl)ether	0.1998	0.058608	mg/kg
EPA 8270D	Soil	Bis(2-Ethylhexyl)phthalate	0.1665	0.043623	mg/kg
EPA 8270D	Soil	Butyl benzyl phthalate	0.1665	0.0325341	mg/kg
EPA 8270D	Soil	Caprolactam	0.1665	0.045954	mg/kg
EPA 8270D	Soil	Carbazole	0.1665	0.0357975	mg/kg
EPA 8270D	Soil	Chrysene	0.0999	0.0327006	mg/kg
EPA 8270D	Soil	Dibenzo(a,h)anthracene	0.0999	0.0322344	mg/kg
EPA 8270D	Soil	Dibenzofuran	0.1665	0.0555777	mg/kg
EPA 8270D	Soil	Diethyl phthalate	0.1665	0.0351981	mg/kg
EPA 8270D	Soil	Dimethyl phthalate	0.1665	0.042291	mg/kg
EPA 8270D	Soil	Di-n-butylphthalate	0.1665	0.0321345	mg/kg
EPA 8270D	Soil	Di-n-octylphthalate	0.1665	0.040959	mg/kg
EPA 8270D	Soil	Fluoranthene	0.0999	0.0305694	mg/kg
EPA 8270D	Soil	Fluorene	0.1665	0.0477189	mg/kg
EPA 8270D	Soil	Hexachlorobenzene	0.0999	0.0310356	mg/kg
EPA 8270D	Soil	Hexachlorobutadiene	0.1665	0.046953	mg/kg
EPA 8270D	Soil	Hexachlorocyclopentadiene	0.47619	0.106893	mg/kg
EPA 8270D	Soil	Hexachloroethane	0.1332	0.0302697	mg/kg
EPA 8270D	Soil	Indeno(1,2,3-cd)Pyrene	0.1332	0.036963	mg/kg
EPA 8270D	Soil	Isophorone	0.14985	0.044289	mg/kg
EPA 8270D	Soil	Naphthalene	0.1665	0.055278	mg/kg
EPA 8270D	Soil	Nitrobenzene	0.14985	0.039627	mg/kg
EPA 8270D	Soil	NitrosoDiPhenylAmine(NDPA)/DPA	0.1332	0.034965	mg/kg
EPA 8270D	Soil	n-Nitrosodimethylamine	0.333	0.0539127	mg/kg
EPA 8270D	Soil	n-Nitrosodi-n-propylamine	0.1665	0.049617	mg/kg
EPA 8270D	Soil	P-Chloro-M-Cresol	0.1665	0.048285	mg/kg
EPA 8270D	Soil	Pentachlorophenol	0.1332	0.035631	mg/kg
EPA 8270D	Soil	Phenanthrene	0.0999	0.0325674	mg/kg
EPA 8270D	Soil	Phenol	0.1665	0.049284	mg/kg
EPA 8270D	Soil	Pyrene	0.0999	0.0323676	mg/kg

ATTACHMENT A

SOIL SAMPLES
LABORATORY REPORTING LIMITS AND METHOD DETECTION LIMITS

Method	Matrix	Analyte	RL	MDL	Units
Pesticides					
EPA 8081B	Soil	4,4'-DDD	0.007992	0.00285048	mg/kg
EPA 8081B	Soil	4,4'-DDE	0.007992	0.00184815	mg/kg
EPA 8081B	Soil	4,4'-DDT	0.014985	0.0064269	mg/kg
EPA 8081B	Soil	Aldrin	0.007992	0.00281385	mg/kg
EPA 8081B	Soil	Alpha-BHC	0.00333	0.00094572	mg/kg
EPA 8081B	Soil	Beta-BHC	0.007992	0.0030303	mg/kg
EPA 8081B	Soil	Chlordane	0.064935	0.0264735	mg/kg
EPA 8081B	Soil	cis-Chlordane	0.00999	0.00278388	mg/kg
EPA 8081B	Soil	Delta-BHC	0.007992	0.0015651	mg/kg
EPA 8081B	Soil	Dieldrin	0.004995	0.0024975	mg/kg
EPA 8081B	Soil	Endosulfan I	0.007992	0.00188811	mg/kg
EPA 8081B	Soil	Endosulfan II	0.007992	0.00267066	mg/kg
EPA 8081B	Soil	Endosulfan sulfate	0.00333	0.00158508	mg/kg
EPA 8081B	Soil	Endrin	0.00333	0.0013653	mg/kg
EPA 8081B	Soil	Endrin aldehyde	0.00999	0.0034965	mg/kg
EPA 8081B	Soil	Endrin ketone	0.007992	0.00205794	mg/kg
EPA 8081B	Soil	Heptachlor	0.003996	0.00179154	mg/kg
EPA 8081B	Soil	Heptachlor epoxide	0.014985	0.0044955	mg/kg
EPA 8081B	Soil	Lindane	0.00333	0.00148851	mg/kg
EPA 8081B	Soil	Methoxychlor	0.014985	0.004662	mg/kg
EPA 8081B	Soil	Toxaphene	0.14985	0.041958	mg/kg
EPA 8081B	Soil	trans-Chlordane	0.00999	0.00263736	mg/kg
Polychlorinated Biphenyls					
EPA 8082A	Soil	Aroclor 1016	0.0335	0.0026465	mg/kg
EPA 8082A	Soil	Aroclor 1221	0.0335	0.0030887	mg/kg
EPA 8082A	Soil	Aroclor 1232	0.0335	0.0039262	mg/kg
EPA 8082A	Soil	Aroclor 1242	0.0335	0.0041004	mg/kg
EPA 8082A	Soil	Aroclor 1248	0.0335	0.0028274	mg/kg
EPA 8082A	Soil	Aroclor 1254	0.0335	0.0027537	mg/kg
EPA 8082A	Soil	Aroclor 1260	0.0335	0.0025527	mg/kg
EPA 8082A	Soil	Aroclor 1262	0.0335	0.0016616	mg/kg
EPA 8082A	Soil	Aroclor 1268	0.0335	0.0048575	mg/kg
EPA 8082A	Soil	Total PCBs	0.0335	0.0016616	mg/kg
Herbicides					
EPA 8151A	Soil	2,4-D	0.1665	0.0051615	mg/kg
EPA 8151A	Soil	2,4,5-TP (Silvex)	0.1665	0.0044289	mg/kg
EPA 8151A	Soil	2,4,5-T	0.1665	0.0104895	mg/kg
Metals					
EPA 6010C	Soil	Aluminum	4	0.8	mg/kg
EPA 6010C	Soil	Antimony	2	0.32	mg/kg
EPA 6010C	Soil	Arsenic	0.4	0.08	mg/kg
EPA 6010C	Soil	Barium	0.4	0.12	mg/kg
EPA 6010C	Soil	Beryllium	0.2	0.04	mg/kg
EPA 6010C	Soil	Cadmium	0.4	0.028	mg/kg
EPA 6010C	Soil	Calcium	4	1.2	mg/kg
EPA 6010C	Soil	Chromium	0.4	0.08	mg/kg
EPA 7196A	Soil	Hexvalent Chromium	0.8	0.16	mg/kg
EPA 6010C	Soil	Cobalt	0.8	0.2	mg/kg
EPA 6010C	Soil	Copper	0.4	0.08	mg/kg
EPA 6010C	Soil	Iron	2	0.8	mg/kg
EPA 6010C	Soil	Lead	2	0.08	mg/kg
EPA 6010C	Soil	Magnesium	4	0.4	mg/kg
EPA 6010C	Soil	Manganese	0.4	0.08	mg/kg
EPA 7473	Soil	Mercury	0.08	0.016896	mg/kg
EPA 6010C	Soil	Nickel	1	0.16	mg/kg
EPA 6010C	Soil	Potassium	100	16	mg/kg
EPA 6010C	Soil	Selenium	0.8	0.12	mg/kg
EPA 6010C	Soil	Silver	0.4	0.08	mg/kg
EPA 6010C	Soil	Sodium	80	12	mg/kg
EPA 6010C	Soil	Thallium	0.8	0.16	mg/kg
EPA 6010C	Soil	Vanadium	0.4	0.04	mg/kg
EPA 6010C	Soil	Zinc	2	0.28	mg/kg

ATTACHMENT A

GROUNDWATER SAMPLES
LABORATORY REPORTING LIMITS AND METHOD DETECTION LIMITS

Method	Matrix	Analyte	RL	MDL	Units
		Volatile Organic Compounds			
EPA 8260C	Groundwater	1,1,1,2-Tetrachloroethane	0.5	0.164	ug/L
EPA 8260C	Groundwater	1,1,1-Trichloroethane	0.5	0.158	ug/L
EPA 8260C	Groundwater	1,1,2,2-Tetrachloroethane	0.5	0.144	ug/L
EPA 8260C	Groundwater	1,1,2-Trichloro-1,2,2-Trifluoroethane	10	0.148	ug/L
EPA 8260C	Groundwater	1,1,2-Trichloroethane	0.75	0.144	ug/L
EPA 8260C	Groundwater	1,1-Dichloroethane	0.75	0.21	ug/L
EPA 8260C	Groundwater	1,1-Dichloroethene	0.5	0.142	ug/L
EPA 8260C	Groundwater	1,1-Dichloropropene	2.5	0.173	ug/L
EPA 8260C	Groundwater	1,2,3-Trichlorobenzene	2.5	0.234	ug/L
EPA 8260C	Groundwater	1,2,3-Trichloropropane	5	0.176	ug/L
EPA 8260C	Groundwater	1,2,4,5-Tetramethylbenzene	2	0.542	ug/L
EPA 8260C	Groundwater	1,2,4-Trichlorobenzene	2.5	0.22	ug/L
EPA 8260C	Groundwater	1,2,4-Trimethylbenzene	2.5	0.191	ug/L
EPA 8260C	Groundwater	1,2-Dibromo-3-chloropropane	2.5	0.327	ug/L
EPA 8260C	Groundwater	1,2-Dibromoethane	2	0.193	ug/L
EPA 8260C	Groundwater	1,2-Dichlorobenzene	2.5	0.184	ug/L
EPA 8260C	Groundwater	1,2-Dichloroethane	0.5	0.132	ug/L
EPA 8260C	Groundwater	1,2-Dichloropropane	1.75	0.133	ug/L
EPA 8260C	Groundwater	1,3,5-Trimethylbenzene	2.5	0.174	ug/L
EPA 8260C	Groundwater	1,3-Dichlorobenzene	2.5	0.186	ug/L
EPA 8260C	Groundwater	1,3-Dichloropropane	2.5	0.212	ug/L
EPA 8260C	Groundwater	1,4-Dichlorobenzene	2.5	0.187	ug/L
EPA 8260C	Groundwater	1,4-Diethylbenzene	2	0.392	ug/L
EPA 8260C	Groundwater	2,2-Dichloropropane	2.5	0.204	ug/L
EPA 8260C	Groundwater	2-Butanone	5	1.94	ug/L
EPA 8260C	Groundwater	2-Hexanone	5	0.515	ug/L
EPA 8260C	Groundwater	4-Ethyltoluene	2	0.34	ug/L
EPA 8260C	Groundwater	4-Methyl-2-pentanone	5	0.416	ug/L
EPA 8260C	Groundwater	Acetone	5	1.46	ug/L
EPA 8260C	Groundwater	Acrolein	5	0.633	ug/L
EPA 8260C	Groundwater	Acrylonitrile	5	0.43	ug/L
EPA 8260C	Groundwater	Benzene	0.5	0.159	ug/L
EPA 8260C	Groundwater	Bromobenzene	2.5	0.152	ug/L
EPA 8260C	Groundwater	Bromochloromethane	2.5	0.138	ug/L
EPA 8260C	Groundwater	Bromodichloromethane	0.5	0.192	ug/L
EPA 8260C	Groundwater	Bromoform	2	0.248	ug/L
EPA 8260C	Groundwater	Bromomethane	1	0.256	ug/L
EPA 8260C	Groundwater	Carbon disulfide	5	0.299	ug/L
EPA 8260C	Groundwater	Carbon tetrachloride	0.5	0.134	ug/L
EPA 8260C	Groundwater	Chlorobenzene	0.5	0.178	ug/L
EPA 8260C	Groundwater	Chloroethane	1	0.134	ug/L
EPA 8260C	Groundwater	Chloroform	0.75	0.162	ug/L
EPA 8260C	Groundwater	Chloromethane	2.5	0.176	ug/L
EPA 8260C	Groundwater	cis-1,2-Dichloroethene	0.5	0.187	ug/L
EPA 8260C	Groundwater	cis-1,3-Dichloropropene	0.5	0.144	ug/L
EPA 8260C	Groundwater	Cyclohexane	10	0.271	ug/L
EPA 8260C	Groundwater	Dibromochloromethane	0.5	0.149	ug/L
EPA 8260C	Groundwater	Dibromomethane	5	0.363	ug/L
EPA 8260C	Groundwater	Dichlorodifluoromethane	5	0.245	ug/L
EPA 8260C	Groundwater	Ethyl ether	2.5	0.15	ug/L
EPA 8260C	Groundwater	Ethylbenzene	0.5	0.168	ug/L
EPA 8260C	Groundwater	Hexachlorobutadiene	0.5	0.217	ug/L
EPA 8260C	Groundwater	Isopropylbenzene	0.5	0.187	ug/L
EPA 8260C	Groundwater	Methyl Acetate	10	0.234	ug/L
EPA 8260C	Groundwater	Methyl cyclohexane	10	0.396	ug/L
EPA 8260C	Groundwater	Methyl tert butyl ether	1	0.16	ug/L
EPA 8260C	Groundwater	Methylene chloride	3	0.289	ug/L
EPA 8260C	Groundwater	Naphthalene	2.5	0.216	ug/L
EPA 8260C	Groundwater	n-Butylbenzene	0.5	0.192	ug/L
EPA 8260C	Groundwater	n-Propylbenzene	0.5	0.173	ug/L
EPA 8260C	Groundwater	o-Chlorotoluene	2.5	0.17	ug/L
EPA 8260C	Groundwater	o-Xylene	1	0.33	ug/L
EPA 8260C	Groundwater	p/m-Xylene	1	0.332	ug/L
EPA 8260C	Groundwater	p-Chlorotoluene	2.5	0.185	ug/L
EPA 8260C	Groundwater	p-Isopropyltoluene	0.5	0.188	ug/L
EPA 8260C	Groundwater	sec-Butylbenzene	0.5	0.181	ug/L
EPA 8260C	Groundwater	Styrene	1	0.359	ug/L
EPA 8260C	Groundwater	tert-Butyl Alcohol	10	0.899	ug/L
EPA 8260C	Groundwater	tert-Butylbenzene	2.5	0.185	ug/L
EPA 8260C	Groundwater	Tetrachloroethene	0.5	0.181	ug/L
EPA 8260C	Groundwater	Toluene	0.75	0.161	ug/L
EPA 8260C	Groundwater	trans-1,2-Dichloroethene	0.75	0.163	ug/L
EPA 8260C	Groundwater	trans-1,3-Dichloropropene	0.5	0.164	ug/L
EPA 8260C	Groundwater	trans-1,4-Dichloro-2-butene	2.5	0.173	ug/L
EPA 8260C	Groundwater	Trichloroethene	0.5	0.175	ug/L
EPA 8260C	Groundwater	Trichlorofluoromethane	2.5	0.161	ug/L
EPA 8260C	Groundwater	Vinyl acetate	5	0.311	ug/L
EPA 8260C	Groundwater	Vinyl chloride	1	0.0699	ug/L
EPA 8260C	Groundwater	Xylenes, Total	1	0.33	ug/L

ATTACHMENT A

GROUNDWATER SAMPLES
LABORATORY REPORTING LIMITS AND METHOD DETECTION LIMITS

Method	Matrix	Analyte	RL	MDL	Units
		Semivolatile Organic Compounds			
EPA 8270D	Groundwater	1,2,4,5-Tetrachlorobenzene	10	0.357	ug/L
EPA 8270D	Groundwater	1,2,4-Trichlorobenzene	5	0.21	ug/L
EPA 8270D	Groundwater	1,2-Dichlorobenzene	2	0.302	ug/L
EPA 8270D	Groundwater	1,3-Dichlorobenzene	2	0.35	ug/L
EPA 8270D	Groundwater	1,4-Dichlorobenzene	2	0.323	ug/L
EPA 8270D	Groundwater	2,3,4,6-Tetrachlorophenol	5	0.59	ug/L
EPA 8270D	Groundwater	2,4,5-Trichlorophenol	5	0.748	ug/L
EPA 8270D	Groundwater	2,4,6-Trichlorophenol	5	0.775	ug/L
EPA 8270D	Groundwater	2,4-Dichlorophenol	5	0.564	ug/L
EPA 8270D	Groundwater	2,4-Dimethylphenol	5	0.578	ug/L
EPA 8270D	Groundwater	2,4-Dinitrophenol	20	1.4081	ug/L
EPA 8270D	Groundwater	2,4-Dinitrotoluene	5	1.05	ug/L
EPA 8270D	Groundwater	2,6-Dinitrotoluene	5	0.89	ug/L
EPA 8270 SIM Isotope Dilution	Groundwater	1,4-Dioxane	0.35	0.075	ug/L
EPA 8270D	Groundwater	2-Chloronaphthalene	2	0.455	ug/L
EPA 8270D	Groundwater	2-Chlorophenol	2	0.58	ug/L
EPA 8270D	Groundwater	2-Methylnaphthalene	2	0.355	ug/L
EPA 8270D	Groundwater	2-Methylphenol	5	0.703	ug/L
EPA 8270D	Groundwater	2-Nitroaniline	5	0.956	ug/L
EPA 8270D	Groundwater	2-Nitrophenol	10	1.05	ug/L
EPA 8270D	Groundwater	3,3'-Dichlorobenzidine	5	0.478	ug/L
EPA 8270D	Groundwater	3-Methylphenol/4-Methylphenol	5	0.72	ug/L
EPA 8270D	Groundwater	3-Nitroaniline	5	0.668	ug/L
EPA 8270D	Groundwater	4,6-Dinitro-o-cresol	10	1.36	ug/L
EPA 8270D	Groundwater	4-Bromophenyl phenyl ether	2	0.428	ug/L
EPA 8270D	Groundwater	4-Chloroaniline	5	0.835	ug/L
EPA 8270D	Groundwater	4-Chlorophenyl phenyl ether	2	0.355	ug/L
EPA 8270D	Groundwater	4-Nitroaniline	5	0.83	ug/L
EPA 8270D	Groundwater	4-Nitrophenol	10	1.09	ug/L
EPA 8270D	Groundwater	Acenaphthene	2	0.284	ug/L
EPA 8270D	Groundwater	Acenaphthylene	2	0.372	ug/L
EPA 8270D	Groundwater	Acetophenone	5	0.428	ug/L
EPA 8270D	Groundwater	Anthracene	2	0.2	ug/L
EPA 8270D	Groundwater	Atrazine	10	0.794	ug/L
EPA 8270D	Groundwater	Azobenzene	2	0.537	ug/L
EPA 8270D	Groundwater	Benzaldehyde	5	0.986	ug/L
EPA 8270D	Groundwater	Benzidine	20	5.24	ug/L
EPA 8270D	Groundwater	Benzo(a)anthracene	2	0.323	ug/L
EPA 8270D	Groundwater	Benzo(a)pyrene	2	0.658	ug/L
EPA 8270D	Groundwater	Benzo(b)fluoranthene	2	0.371	ug/L
EPA 8270D	Groundwater	Benzo(ghi)perylene	2	0.574	ug/L
EPA 8270D	Groundwater	Benzo(k)fluoranthene	2	0.3	ug/L
EPA 8270D	Groundwater	Benzoic Acid	50	1.0104	ug/L
EPA 8270D	Groundwater	Benzyl Alcohol	2	0.677	ug/L
EPA 8270D	Groundwater	Biphenyl	2	0.237	ug/L
EPA 8270D	Groundwater	Bis(2-chloroethoxy)methane	5	0.596	ug/L
EPA 8270D	Groundwater	Bis(2-chloroethyl)ether	2	0.409	ug/L
EPA 8270D	Groundwater	Bis(2-chloroisopropyl)ether	2	0.597	ug/L
EPA 8270D	Groundwater	Bis(2-Ethylhexyl)phthalate	3	0.928	ug/L
EPA 8270D	Groundwater	Butyl benzyl phthalate	5	1.13	ug/L
EPA 8270D	Groundwater	Caprolactam	10	0.3895	ug/L
EPA 8270D	Groundwater	Carbazole	2	0.374	ug/L
EPA 8270D	Groundwater	Chrysene	2	0.304	ug/L
EPA 8270D	Groundwater	Dibenzo(a,h)anthracene	2	0.438	ug/L
EPA 8270D	Groundwater	Dibenzofuran	2	0.218	ug/L
EPA 8270D	Groundwater	Diethyl phthalate	5	0.393	ug/L
EPA 8270D	Groundwater	Dimethyl phthalate	5	0.333	ug/L
EPA 8270D	Groundwater	Di-n-butylphthalate	5	0.768	ug/L
EPA 8270D	Groundwater	Di-n-octylphthalate	5	1.2	ug/L
EPA 8270D	Groundwater	Fluoranthene	2	0.401	ug/L
EPA 8270D	Groundwater	Fluorene	2	0.32	ug/L
EPA 8270D	Groundwater	Hexachlorobenzene	2	0.396	ug/L
EPA 8270D	Groundwater	Hexachlorobutadiene	2	0.417	ug/L
EPA 8270D	Groundwater	Hexachlorocyclopentadiene	20	0.585	ug/L
EPA 8270D	Groundwater	Hexachloroethane	2	0.298	ug/L
EPA 8270D	Groundwater	Indeno(1,2,3-cd)Pyrene	2	0.433	ug/L
EPA 8270D	Groundwater	Isophorone	5	0.787	ug/L
EPA 8270D	Groundwater	Naphthalene	2	0.332	ug/L
EPA 8270D	Groundwater	Nitrobenzene	2	0.401	ug/L
EPA 8270D	Groundwater	NitrosoDiPhenylAmine(NDPA)/DPA	2	0.34	ug/L
EPA 8270D	Groundwater	n-Nitrosodimethylamine	2	0.498	ug/L
EPA 8270D	Groundwater	n-Nitrosodi-n-propylamine	5	0.645	ug/L
EPA 8270D	Groundwater	P-Chloro-M-Cresol	2	0.543	ug/L
EPA 8270D	Groundwater	Pentachlorophenol	10	3.22	ug/L
EPA 8270D	Groundwater	Phenanthrene	2	0.23	ug/L
EPA 8270D	Groundwater	Phenol	5	0.27	ug/L
EPA 8270D	Groundwater	Pyrene	2	0.524	ug/L
EPA 8270D-SIM	Groundwater	2-Chloronaphthalene	0.2	0.035	ug/L
EPA 8270D-SIM	Groundwater	2-Methylnaphthalene	0.2	0.045	ug/L
EPA 8270D-SIM	Groundwater	Acenaphthene	0.2	0.035	ug/L
EPA 8270D-SIM	Groundwater	Acenaphthylene	0.2	0.035	ug/L
EPA 8270D-SIM	Groundwater	Anthracene	0.2	0.035	ug/L
EPA 8270D-SIM	Groundwater	Benzo(a)anthracene	0.2	0.016	ug/L
EPA 8270D-SIM	Groundwater	Benzo(a)pyrene	0.2	0.039	ug/L
EPA 8270D-SIM	Groundwater	Benzo(b)fluoranthene	0.2	0.016	ug/L
EPA 8270D-SIM	Groundwater	Benzo(ghi)perylene	0.2	0.042	ug/L
EPA 8270D-SIM	Groundwater	Benzo(k)fluoranthene	0.2	0.042	ug/L
EPA 8270D-SIM	Groundwater	Chrysene	0.2	0.038	ug/L
EPA 8270D-SIM	Groundwater	Dibenzo(a,h)anthracene	0.2	0.039	ug/L
EPA 8270D-SIM	Groundwater	Fluoranthene	0.2	0.038	ug/L
EPA 8270D-SIM	Groundwater	Fluorene	0.2	0.037	ug/L
EPA 8270D-SIM	Groundwater	Hexachlorobenzene	0.8	0.032	ug/L
EPA 8270D-SIM	Groundwater	Hexachlorobutadiene	0.5	0.036	ug/L
EPA 8270D-SIM	Groundwater	Hexachloroethane	0.8	0.03	ug/L
EPA 8270D-SIM	Groundwater	Indeno(1,2,3-cd)Pyrene	0.2	0.04	ug/L
EPA 8270D-SIM	Groundwater	Naphthalene	0.2	0.043	ug/L
EPA 8270D-SIM	Groundwater	Pentachlorophenol	0.8	0.22	ug/L
EPA 8270D-SIM	Groundwater	Phenanthrene	0.2	0.015	ug/L
EPA 8270D-SIM	Groundwater	Pyrene	0.2	0.04	ug/L

ATTACHMENT A

GROUNDWATER SAMPLES
LABORATORY REPORTING LIMITS AND METHOD DETECTION LIMITS

Method	Matrix	Analyte	RL	MDL	Units
		Pesticides			
EPA 8081B	Groundwater	4,4'-DDD	0.04	0.00464	ug/L
EPA 8081B	Groundwater	4,4'-DDE	0.04	0.00381	ug/L
EPA 8081B	Groundwater	4,4'-DDT	0.04	0.00432	ug/L
EPA 8081B	Groundwater	Aldrin	0.02	0.00216	ug/L
EPA 8081B	Groundwater	Alpha-BHC	0.02	0.00439	ug/L
EPA 8081B	Groundwater	Beta-BHC	0.02	0.0056	ug/L
EPA 8081B	Groundwater	Chlordane	0.2	0.0463	ug/L
EPA 8081B	Groundwater	cis-Chlordane	0.02	0.00666	ug/L
EPA 8081B	Groundwater	Delta-BHC	0.02	0.00467	ug/L
EPA 8081B	Groundwater	Dieldrin	0.04	0.00429	ug/L
EPA 8081B	Groundwater	Endosulfan I	0.02	0.00345	ug/L
EPA 8081B	Groundwater	Endosulfan II	0.04	0.00519	ug/L
EPA 8081B	Groundwater	Endosulfan sulfate	0.04	0.00481	ug/L
EPA 8081B	Groundwater	Endrin	0.04	0.00429	ug/L
EPA 8081B	Groundwater	Endrin aldehyde	0.04	0.0081	ug/L
EPA 8081B	Groundwater	Endrin ketone	0.04	0.00477	ug/L
EPA 8081B	Groundwater	Heptachlor	0.02	0.0031	ug/L
EPA 8081B	Groundwater	Heptachlor epoxide	0.02	0.00415	ug/L
EPA 8081B	Groundwater	Lindane	0.02	0.00434	ug/L
EPA 8081B	Groundwater	Methoxychlor	0.2	0.00684	ug/L
EPA 8081B	Groundwater	Toxaphene	0.2	0.0627	ug/L
EPA 8081B	Groundwater	trans-Chlordane	0.02	0.00627	ug/L
		Polychlorinated Biphenyls			
EPA 8082A	Groundwater	Aroclor 1016	0.083	0.05478	ug/L
EPA 8082A	Groundwater	Aroclor 1221	0.083	0.05312	ug/L
EPA 8082A	Groundwater	Aroclor 1232	0.083	0.03071	ug/L
EPA 8082A	Groundwater	Aroclor 1242	0.083	0.05976	ug/L
EPA 8082A	Groundwater	Aroclor 1248	0.083	0.05063	ug/L
EPA 8082A	Groundwater	Aroclor 1254	0.083	0.03403	ug/L
EPA 8082A	Groundwater	Aroclor 1260	0.083	0.03154	ug/L
EPA 8082A	Groundwater	Aroclor 1262	0.083	0.02905	ug/L
EPA 8082A	Groundwater	Aroclor 1268	0.083	0.03735	ug/L
EPA 8082A	Groundwater	PCBs, Total	0.083	0.02905	ug/L
		Herbicides			
EPA 8151A	Groundwater	2,4,5-T	2	0.531	ug/L
EPA 8151A	Groundwater	2,4,5-TP (Silvex)	2	0.539	ug/L
EPA 8151A	Groundwater	2,4-D	10	0.498	ug/L
		Metals			
EPA 6010A	Groundwater	Aluminum, Dissolved	0.01	0.00169	mg/L
EPA 6010A	Groundwater	Aluminum, Total	0.01	0.00169	mg/L
EPA 6010A	Groundwater	Antimony, Dissolved	0.0005	0.0000699	mg/L
EPA 6010A	Groundwater	Antimony, Total	0.0005	0.0000699	mg/L
EPA 6010A	Groundwater	Arsenic, Dissolved	0.0005	0.000123	mg/L
EPA 6010A	Groundwater	Arsenic, Total	0.0005	0.000123	mg/L
EPA 6010A	Groundwater	Barium, Dissolved	0.0005	0.0000625	mg/L
EPA 6010A	Groundwater	Barium, Total	0.0005	0.0000625	mg/L
EPA 6010A	Groundwater	Beryllium, Dissolved	0.0005	0.00015	mg/L
EPA 6010A	Groundwater	Beryllium, Total	0.0005	0.00015	mg/L
EPA 6010A	Groundwater	Cadmium, Dissolved	0.0002	0.00005	mg/L
EPA 6010A	Groundwater	Cadmium, Total	0.0002	0.00005	mg/L
EPA 6010A	Groundwater	Calcium, Dissolved	0.1	0.032	mg/L
EPA 6010A	Groundwater	Calcium, Total	0.1	0.032	mg/L
EPA 6010A	Groundwater	Chromium, Dissolved	0.001	0.000253	mg/L
EPA 6010A	Groundwater	Chromium, Total	0.001	0.000253	mg/L
EPA 7196A	Groundwater	Chromium, Hexavalent, Dissolved	0.01	0.003	mg/L
EPA 7196A	Groundwater	Chromium, Hexavalent, Total	0.01	0.003	mg/L
EPA 6010A	Groundwater	Cobalt, Dissolved	0.0002	0.0000621	mg/L
EPA 6010A	Groundwater	Cobalt, Total	0.0002	0.0000621	mg/L
EPA 6010A	Groundwater	Copper, Dissolved	0.001	0.000262	mg/L
EPA 6010A	Groundwater	Copper, Total	0.001	0.000262	mg/L
EPA 6010A	Groundwater	Iron, Dissolved	0.05	0.012	mg/L
EPA 6010A	Groundwater	Iron, Total	0.05	0.012	mg/L
EPA 6010A	Groundwater	Lead, Dissolved	0.001	0.000129	mg/L
EPA 6010A	Groundwater	Lead, Total	0.001	0.000129	mg/L
EPA 6010A	Groundwater	Magnesium, Dissolved	0.07	0.0223	mg/L
EPA 6010A	Groundwater	Magnesium, Total	0.07	0.0223	mg/L
EPA 6010A	Groundwater	Manganese, Dissolved	0.001	0.000302	mg/L
EPA 6010A	Groundwater	Manganese, Total	0.001	0.000302	mg/L
EPA 7470A	Groundwater	Mercury, Dissolved	0.0002	0.000066	mg/L
EPA 7470A	Groundwater	Mercury, Total	0.0002	0.000066	mg/L
EPA 6010A	Groundwater	Nickel, Dissolved	0.0005	0.0000865	mg/L
EPA 6010A	Groundwater	Nickel, Total	0.0005	0.0000865	mg/L
EPA 6010A	Groundwater	Potassium, Dissolved	0.1	0.0193	mg/L
EPA 6010A	Groundwater	Potassium, Total	0.1	0.0193	mg/L
EPA 6010A	Groundwater	Selenium, Dissolved	0.005	0.001	mg/L
EPA 6010A	Groundwater	Selenium, Total	0.005	0.001	mg/L
EPA 6010A	Groundwater	Silver, Dissolved	0.00025	0.0000779	mg/L
EPA 6010A	Groundwater	Silver, Total	0.00025	0.0000779	mg/L
EPA 6010A	Groundwater	Sodium, Dissolved	0.1	0.0161	mg/L
EPA 6010A	Groundwater	Sodium, Total	0.1	0.0161	mg/L
EPA 6010A	Groundwater	Thallium, Dissolved	0.0002	0.0000566	mg/L
EPA 6010A	Groundwater	Thallium, Total	0.0002	0.0000566	mg/L
EPA 6010A	Groundwater	Vanadium, Dissolved	0.005	0.000551	mg/L
EPA 6010A	Groundwater	Vanadium, Total	0.005	0.000551	mg/L
EPA 6010A	Groundwater	Zinc, Dissolved	0.01	0.00256	mg/L
EPA 6010A	Groundwater	Zinc, Total	0.01	0.00256	mg/L

ATTACHMENT A

GROUNDWATER SAMPLES
LABORATORY REPORTING LIMITS AND METHOD DETECTION LIMITS

Method	Matrix	Analyte	RL	MDL	Units
		PFAS Compounds			
EPA 537 Rev 1.15	Groundwater	Perfluorohexanoic acid (PFHxA)	2	0.1264	ng/L
EPA 537 Rev 1.15	Groundwater	Perfluoroheptanoic acid (PFHpA)	2	0.0924	ng/L
EPA 537 Rev 1.15	Groundwater	Perfluorooctanoic acid (PFOA)	2	0.0504	ng/L
EPA 537 Rev 1.15	Groundwater	Perfluorononanoic acid (PFNA)	2	0.1008	ng/L
EPA 537 Rev 1.15	Groundwater	Perfluorodecanoic acid (PFDA)	2	0.1904	ng/L
EPA 537 Rev 1.15	Groundwater	Perfluoroundecanoic acid (PFUdA)	2	0.1912	ng/L
EPA 537 Rev 1.15	Groundwater	Perfluorododecanoic acid (PFDoA)	2	0.0916	ng/L
EPA 537 Rev 1.15	Groundwater	Perfluorotridecanoic Acid (PRTrDA)	2	0.0904	ng/L
EPA 537 Rev 1.15	Groundwater	Perfluorotetradecanoic acid (PFTA)	2	0.072	ng/L
EPA 537 Rev 1.15	Groundwater	Perfluorobutanesulfonic acid (PFBS)	2	0.11	ng/L
EPA 537 Rev 1.15	Groundwater	Perfluorohexanesulfonic acid (PFHxS)	2	0.1076	ng/L
EPA 537 Rev 1.15	Groundwater	Perfluorooctanesulfonic acid (PFOS)	2	0.1116	ng/L
EPA 537 Rev 1.15	Groundwater	Perfluorodecanesulfonic Acid (PFDS)	2	0.2224	ng/L
EPA 537 Rev 1.15	Groundwater	Perfluorobutanoic Acid (PFBA)	2	0.1312	ng/L
EPA 537 Rev 1.15	Groundwater	Perfluoropentanoic Acid (PFPeA)	2	0.0856	ng/L
EPA 537 Rev 1.15	Groundwater	Perfluoroheptane Sulfonic Acid (PFHpS)	2	0.1552	ng/L
EPA 537 Rev 1.15	Groundwater	1H,1H,2H,2H-Perfluorooctane Sulfonate (6:2 FTS)	2	0.194	ng/L
EPA 537 Rev 1.15	Groundwater	1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2 FTS)	2	0.2908	ng/L
EPA 537 Rev 1.15	Groundwater	Perfluorooctanesulfonamide (FOSA)	2	0.2268	ng/L
EPA 537 Rev 1.15	Groundwater	N-methyl perfluorooctanesulfonamidoacetic acid (MeFOSAA)	2	0.2504	ng/L
EPA 537 Rev 1.15	Groundwater	N-ethyl perfluorooctanesulfonamidoacetic acid (EtFOSAA)	2	0.3728	ng/L

ATTACHMENT A

AIR SAMPLES
LABORATORY REPORTING LIMITS AND METHOD DETECTION LIMITS

Method	Matrix	Analyte	RL	MDL	Units	RL	MDL	Units
		Volatile Organic Compounds						
EPA TO-15	Air	1,1,1,2-Tetrachloroethane	1.37	0.38	ug/m^3	0.2	0.0547	ppbV
EPA TO-15	Air	1,1,1-Trichloroethane	1.09	0.31	ug/m^3	0.2	0.057	ppbV
EPA TO-15	Air	1,1,2,2-Tetrachloroethane	1.37	0.38	ug/m^3	0.2	0.0548	ppbV
EPA TO-15	Air	1,1,2-Trichloro-1,2,2-Trifluoroethane	1.53	0.39	ug/m^3	0.2	0.0511	ppbV
EPA TO-15	Air	1,1,2-Trichloroethane	1.09	0.36	ug/m^3	0.2	0.0667	ppbV
EPA TO-15	Air	1,1-Dichloroethane	0.81	0.31	ug/m^3	0.2	0.0771	ppbV
EPA TO-15	Air	1,1-Dichloroethene	0.79	0.22	ug/m^3	0.2	0.0566	ppbV
EPA TO-15	Air	1,1-Dichloropropene	0.91	0.32	ug/m^3	0.2	0.0715	ppbV
EPA TO-15	Air	1,2,3-Trichlorobenzene	1.48	0.32	ug/m^3	0.2	0.0436	ppbV
EPA TO-15	Air	1,2,3-Trichloropropane	1.21	0.46	ug/m^3	0.2	0.0767	ppbV
EPA TO-15	Air	1,2,3-Trimethylbenzene	0.98	0.37	ug/m^3	0.2	0.0751	ppbV
EPA TO-15	Air	1,2,4,5-Tetramethylbenzene	1.1	0.44	ug/m^3	0.2	0.0795	ppbV
EPA TO-15	Air	1,2,4-Trichlorobenzene	1.48	0.45	ug/m^3	0.2	0.0611	ppbV
EPA TO-15	Air	1,2,4-Trimethylbenzene	0.98	0.34	ug/m^3	0.2	0.0694	ppbV
EPA TO-15	Air	1,2-Dibromo-3-chloropropane	1.93	0.72	ug/m^3	0.2	0.0744	ppbV
EPA TO-15	Air	1,2-Dibromoethane	1.54	0.6	ug/m^3	0.2	0.0779	ppbV
EPA TO-15	Air	1,2-Dichloro-1,1,2,2-tetrafluoroethane	1.4	0.29	ug/m^3	0.2	0.0419	ppbV
EPA TO-15	Air	1,2-Dichlorobenzene	1.2	0.37	ug/m^3	0.2	0.0614	ppbV
EPA TO-15	Air	1,2-Dichloroethane	0.81	0.22	ug/m^3	0.2	0.0552	ppbV
EPA TO-15	Air	1,2-Dichloroethene (total)	0.79	0.23	ug/m^3	0.2	0.0587	ppbV
EPA TO-15	Air	1,2-Dichloropropane	0.92	0.32	ug/m^3	0.2	0.0697	ppbV
EPA TO-15	Air	1,3,5-Trimethylbenzene	0.98	0.29	ug/m^3	0.2	0.0584	ppbV
EPA TO-15	Air	1,3-Butadiene	0.44	0.18	ug/m^3	0.2	0.0799	ppbV
EPA TO-15	Air	1,3-Dichlorobenzene	1.2	0.38	ug/m^3	0.2	0.0637	ppbV
EPA TO-15	Air	1,3-Dichloropropane	0.92	0.36	ug/m^3	0.2	0.0776	ppbV
EPA TO-15	Air	1,3-Dichloropropene, Total	0.91	0.31	ug/m^3	0.2	0.0693	ppbV
EPA TO-15	Air	1,4-Dichlorobenzene	1.2	0.25	ug/m^3	0.2	0.0418	ppbV
EPA TO-15	Air	1,4-Dioxane	0.72	0.28	ug/m^3	0.2	0.078	ppbV
EPA TO-15	Air	1-Methylnaphthalene	5.82	1.66	ug/m^3	1	0.286	ppbV
EPA TO-15	Air	2,2,4-Trimethylpentane	0.93	0.31	ug/m^3	0.2	0.0659	ppbV
EPA TO-15	Air	2,2-Dichloropropane	0.92	0.27	ug/m^3	0.2	0.0581	ppbV
EPA TO-15	Air	2-Butanone	1.47	0.15	ug/m^3	0.5	0.0522	ppbV
EPA TO-15	Air	2-Ethylthiophene	0.92	0.26	ug/m^3	0.2	0.0571	ppbV
EPA TO-15	Air	2-Hexanone	0.82	0.25	ug/m^3	0.2	0.0604	ppbV
EPA TO-15	Air	2-Methylnaphthalene	5.82	0.16	ug/m^3	1	0.0273	ppbV
EPA TO-15	Air	2-Methylthiophene	0.8	0.32	ug/m^3	0.2	0.0789	ppbV
EPA TO-15	Air	3-Chloropropene	0.63	0.25	ug/m^3	0.2	0.0812	ppbV
EPA TO-15	Air	3-Methylthiophene	0.8	0.27	ug/m^3	0.2	0.0669	ppbV
EPA TO-15	Air	4-Ethyltoluene	0.98	0.38	ug/m^3	0.2	0.0776	ppbV
EPA TO-15	Air	4-Methyl-2-pentanone	2.05	0.25	ug/m^3	0.5	0.0607	ppbV
EPA TO-15	Air	Acetaldehyde	4.5	0.99	ug/m^3	2.5	0.547	ppbV
EPA TO-15	Air	Acetone	2.38	0.64	ug/m^3	1	0.269	ppbV
EPA TO-15	Air	Acetonitrile	0.34	0.13	ug/m^3	0.2	0.0761	ppbV
EPA TO-15	Air	Acrolein	1.15	0.26	ug/m^3	0.5	0.114	ppbV
EPA TO-15	Air	Acrylonitrile	1.09	0.17	ug/m^3	0.5	0.079	ppbV
EPA TO-15	Air	Benzene	0.64	0.17	ug/m^3	0.2	0.0537	ppbV
EPA TO-15	Air	Benzothiophene	2.74	0.26	ug/m^3	0.5	0.0468	ppbV
EPA TO-15	Air	Benzyl chloride	1.04	0.33	ug/m^3	0.2	0.0645	ppbV
EPA TO-15	Air	Bromobenzene	0.79	0.31	ug/m^3	0.2	0.079	ppbV
EPA TO-15	Air	Bromodichloromethane	1.34	0.44	ug/m^3	0.2	0.0656	ppbV
EPA TO-15	Air	Bromoform	2.07	0.54	ug/m^3	0.2	0.0523	ppbV
EPA TO-15	Air	Bromomethane	0.78	0.27	ug/m^3	0.2	0.0696	ppbV
EPA TO-15	Air	Butane	0.48	0.11	ug/m^3	0.2	0.0442	ppbV
EPA TO-15	Air	Butyl Acetate	2.38	0.54	ug/m^3	0.5	0.114	ppbV
EPA TO-15	Air	Carbon disulfide	0.62	0.11	ug/m^3	0.2	0.0345	ppbV
EPA TO-15	Air	Carbon tetrachloride	1.26	0.3	ug/m^3	0.2	0.0471	ppbV
EPA TO-15	Air	Chlorobenzene	0.92	0.36	ug/m^3	0.2	0.0789	ppbV
EPA TO-15	Air	Chlorodifluoromethane	0.71	0.22	ug/m^3	0.2	0.0626	ppbV

ATTACHMENT A

AIR SAMPLES
LABORATORY REPORTING LIMITS AND METHOD DETECTION LIMITS

Method	Matrix	Analyte	RL	MDL	Units	RL	MDL	Units
EPA TO-15	Air	Chloroethane	0.53	0.2	ug/m^3	0.2	0.0767	ppbV
EPA TO-15	Air	Chloroform	0.98	0.22	ug/m^3	0.2	0.0452	ppbV
EPA TO-15	Air	Chloromethane	0.41	0.2	ug/m^3	0.2	0.0958	ppbV
EPA TO-15	Air	cis-1,2-Dichloroethene	0.79	0.23	ug/m^3	0.2	0.0587	ppbV
EPA TO-15	Air	cis-1,3-Dichloropropene	0.91	0.34	ug/m^3	0.2	0.0745	ppbV
EPA TO-15	Air	Cyclohexane	0.69	0.23	ug/m^3	0.2	0.0656	ppbV
EPA TO-15	Air	Decane (C10)	1.16	0.28	ug/m^3	0.2	0.0484	ppbV
EPA TO-15	Air	Dibromochloromethane	1.7	0.64	ug/m^3	0.2	0.0747	ppbV
EPA TO-15	Air	Dibromomethane	1.42	0.34	ug/m^3	0.2	0.0476	ppbV
EPA TO-15	Air	Dichlorodifluoromethane	0.99	0.23	ug/m^3	0.2	0.0466	ppbV
EPA TO-15	Air	Dichlorofluoromethane	0.84	0.24	ug/m^3	0.2	0.0572	ppbV
EPA TO-15	Air	Dodecane (C12)	1.39	0.39	ug/m^3	0.2	0.0564	ppbV
EPA TO-15	Air	Ethyl Acetate	1.8	0.47	ug/m^3	0.5	0.131	ppbV
EPA TO-15	Air	Ethyl Alcohol	4.71	1.02	ug/m^3	2.5	0.542	ppbV
EPA TO-15	Air	Ethyl ether	0.61	0.18	ug/m^3	0.2	0.0591	ppbV
EPA TO-15	Air	Ethylbenzene	0.87	0.24	ug/m^3	0.2	0.0555	ppbV
EPA TO-15	Air	Ethyl-Tert-Butyl-Ether	0.84	0.22	ug/m^3	0.2	0.0515	ppbV
EPA TO-15	Air	Heptane	0.82	0.23	ug/m^3	0.2	0.0553	ppbV
EPA TO-15	Air	Hexachlorobutadiene	2.13	0.78	ug/m^3	0.2	0.0732	ppbV
EPA TO-15	Air	Indane	0.97	0.38	ug/m^3	0.2	0.0795	ppbV
EPA TO-15	Air	Indene	0.95	0.29	ug/m^3	0.2	0.0608	ppbV
EPA TO-16	Air	iso-Propyl Alcohol	1.23	0.28	ug/m^3	0.5	0.114	ppbV
EPA TO-17	Air	Isopropyl Ether	0.84	0.27	ug/m^3	0.2	0.0656	ppbV
EPA TO-18	Air	Isopropylbenzene	0.98	0.21	ug/m^3	0.2	0.043	ppbV
EPA TO-19	Air	Methanol	6.55	0.96	ug/m^3	5	0.736	ppbV
EPA TO-20	Air	Methyl Methacrylate	2.05	0.61	ug/m^3	0.5	0.148	ppbV
EPA TO-21	Air	Methyl tert butyl ether	0.72	0.16	ug/m^3	0.2	0.0452	ppbV
EPA TO-22	Air	Methylene chloride	1.74	0.65	ug/m^3	0.5	0.188	ppbV
EPA TO-23	Air	Naphthalene	1.05	0.23	ug/m^3	0.2	0.0432	ppbV
EPA TO-24	Air	n-Butylbenzene	1.1	0.35	ug/m^3	0.2	0.0639	ppbV
EPA TO-25	Air	n-Heptane	0.82	0.23	ug/m^3	0.2	0.0553	ppbV
EPA TO-26	Air	n-Hexane	0.7	0.18	ug/m^3	0.2	0.0518	ppbV
EPA TO-27	Air	Nonane (C9)	1.05	0.34	ug/m^3	0.2	0.0644	ppbV
EPA TO-28	Air	n-Propylbenzene	0.98	0.27	ug/m^3	0.2	0.0559	ppbV
EPA TO-29	Air	o-Chlorotoluene	1.04	0.25	ug/m^3	0.2	0.0487	ppbV
EPA TO-30	Air	Octane	0.93	0.2	ug/m^3	0.2	0.0421	ppbV
EPA TO-31	Air	o-Xylene	0.87	0.27	ug/m^3	0.2	0.0631	ppbV
EPA TO-32	Air	p/m-Xylene	1.74	0.6	ug/m^3	0.4	0.139	ppbV
EPA TO-33	Air	p-Chlorotoluene	1.04	0.4	ug/m^3	0.2	0.0764	ppbV
EPA TO-34	Air	Pentane	0.59	0.14	ug/m^3	0.2	0.0475	ppbV
EPA TO-35	Air	p-Isopropyltoluene	1.1	0.33	ug/m^3	0.2	0.0608	ppbV
EPA TO-36	Air	Propane	0.9	0.21	ug/m^3	0.5	0.114	ppbV
EPA TO-37	Air	Propylene	0.86	0.16	ug/m^3	0.5	0.0929	ppbV
EPA TO-38	Air	sec-Butylbenzene	1.1	0.4	ug/m^3	0.2	0.0731	ppbV
EPA TO-39	Air	Styrene	0.85	0.34	ug/m^3	0.2	0.0799	ppbV
EPA TO-40	Air	tert-Butyl Alcohol	1.52	0.18	ug/m^3	0.5	0.0599	ppbV
EPA TO-41	Air	tert-Butylbenzene	1.1	0.22	ug/m^3	0.2	0.0402	ppbV
EPA TO-42	Air	Tertiary-Amyl Methyl Ether	0.84	0.33	ug/m^3	0.2	0.0795	ppbV
EPA TO-43	Air	Tetrachloroethene	1.36	0.51	ug/m^3	0.2	0.0758	ppbV
EPA TO-44	Air	Tetrahydrofuran	1.47	0.18	ug/m^3	0.5	0.0622	ppbV
EPA TO-45	Air	Thiophene	0.69	0.18	ug/m^3	0.2	0.0528	ppbV
EPA TO-46	Air	Toluene	0.75	0.24	ug/m^3	0.2	0.0628	ppbV
EPA TO-47	Air	Total HC As Hexane	39.34	0.2	ug/m^3	10	0.0518	ppbV
EPA TO-48	Air	Total VOCs As Toluene	37.69	0.24	ug/m^3	10	0.0628	ppbV
EPA TO-49	Air	trans-1,2-Dichloroethene	0.79	0.29	ug/m^3	0.2	0.074	ppbV
EPA TO-50	Air	trans-1,3-Dichloropropene	0.91	0.31	ug/m^3	0.2	0.0693	ppbV
EPA TO-51	Air	Trichloroethene	1.07	0.38	ug/m^3	0.2	0.071	ppbV
EPA TO-52	Air	Trichlorofluoromethane	1.12	0.23	ug/m^3	0.2	0.0416	ppbV
EPA TO-53	Air	Undecane	1.28	0.34	ug/m^3	0.2	0.0528	ppbV
EPA TO-54	Air	Vinyl acetate	3.52	0.2	ug/m^3	1	0.0567	ppbV
EPA TO-55	Air	Vinyl bromide	0.87	0.31	ug/m^3	0.2	0.0699	ppbV
EPA TO-56	Air	Vinyl chloride	0.51	0.14	ug/m^3	0.2	0.0533	ppbV
EPA TO-57	Air	Xylene (Total)	0.87	0.27	ug/m^3	0.2	0.0631	ppbV

ATTACHMENT B

ANALYTICAL METHODS/QUALITY ASSURANCE SUMMARY TABLE

ATTACHMENT B

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	Equipment Blank Samples	Trip Blank Samples	Ambient Air Samples	MS/MSD Samples
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
		1,4-dioxane	8270D SIM isotope dilution	Cool to 4°C	One 1-Liter Amber Glass	7 days to extract, 40 days after extraction to analysis					
		Part 375 + TCL SVOCs	EPA 8270D	Cool to 4°C	Two 1-Liter Amber Glass	7 days to extract, 40 days after extraction to analysis					
		Part 375 + TAL Metals	EPA 6020B, EPA 7470A	Cool to 4°C; HNO_3	250 ml plastic	6 months, except Mercury 28 days					
		Hexavalent Chromium	EPA 7196A	Cool to 4°C	250 ml plastic	24 hours					
		Cyanide	EPA 9010C/9012B	Cool to 4°C; NaOH plus 0.6g ascorbic acid	250 ml plastic	14 days					
		Part 375 + TCL Herbicides	EPA 8151A	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 for Pesticides/PCB	7 days to extract, 40 days after extraction to analysis					
		Part 375 + TCL PCBs	EPA 8082A	Cool to 4°C		7 days to extract, 40 days after extraction to analysis					
		Per- and polyfluoroalykl substances (PFAS)	EPA 537(M) Rev 1.1	Cool to 4°C, Trizma	One 8-oz pre-certified PFAS-free plastic container	14 days	1 per 20 samples (minimum 1)	1 per 20 samples (minimum 1)	NA	NA	1 per 20 samples (minimum 1)

ATTACHMENT B

ANALYTICAL METHODS/QUALITY ASSURANCE SUMMARY TABLE

<table>
<tr><th>Matrix Type</th><th>Field Parameters</th><th>Laboratory Parameters</th><th>Analytical Methods</th><th>Sample Preservation</th><th>Sample Container Volume and Type</th><th>Sample Hold Time</th><th>Field Duplicate Samples</th><th>Equipment Blank Samples</th><th>Trip Blank Samples</th><th>Ambient Air Samples</th><th>MS/MSD Samples</th></tr>
<tr><td rowspan="9">**Soil**</td><td rowspan="9">Total VOCs via PID</td><td>Part 375 + TCL VOCs</td><td>EPA 8260C</td><td>Cool to 4°C</td><td>Two 40-ml VOC vials with 5ml H_2O, one with MeOH or 3 En Core Samplers (separate container for % solids)</td><td>48 hours after sampling if samples are not frozen to -7° C, 14 days after extraction to analysis</td><td rowspan="9">1 per 20 samples (minimum 1)</td><td rowspan="9">1 per 20 samples (minimum 1)</td><td>1 per shipment of VOC samples</td><td rowspan="9">NA</td><td rowspan="9">1 per 20 samples</td></tr>
<tr><td>Part 375 + TCL SVOCs</td><td>EPA 8270D</td><td>Cool to 4°C</td><td>4 oz. amber glass jar</td><td>14 days extract, 40 days after extraction to analysis</td><td rowspan="8">NA</td></tr>
<tr><td>Part 375 + TAL Metals</td><td>EPA 6010D, EPA 7471B, EPA 7196A, EPA 9010C/9012B</td><td>Cool to 4°C</td><td>2 oz. amber glass jar</td><td>6 months, except mercury 28 days</td></tr>
<tr><td>Hexavalent Chromium</td><td>EPA 7196A</td><td>Cool to 4°C</td><td>4 oz. amber glass jar</td><td>30 days</td></tr>
<tr><td>Cyanide</td><td>EPA 9010C/9012B</td><td>Cool to 4°C</td><td>8 oz. amber glass jar</td><td>14 days</td></tr>
<tr><td>Part 375 + TCL Pesticides</td><td>EPA 8081B</td><td>Cool to 4°C</td><td>4 oz. amber glass jar</td><td>14 days extract, 40 days after extraction to analysis</td></tr>
<tr><td>Part 375 + TCL Herbicides</td><td>EPA 8151A</td><td>Cool to 4°C</td><td>8 oz. amber glass jar</td><td>14 days</td></tr>
<tr><td>Part 375 + TCL PCBs</td><td>EPA 8082A</td><td>Cool to 4°C</td><td>4 oz. amber glass jar</td><td>14 days extract, 40 days after extraction to analysis</td></tr>
<tr><td>Per- and polyfluoroalykl substances (PFAS)</td><td>EPA 537(M) Rev 1.1</td><td>Cool to 4°C, Trizma</td><td>Two 250 mL high density polyethylene (HDPE) bottles</td><td>14 days</td></tr>
<tr><td>**Soil Vapor**</td><td>Total VOCs and Methane with MultiGas Meter</td><td>TO-15 Listed VOCs</td><td>TO-15</td><td>Ambient Temperature</td><td>6-Liter Summa Canister</td><td>Analyze within 30 days of collection</td><td>1 per 20 samples (minimum 1)</td><td>NA</td><td>NA</td><td>1 per 10 samples (minimum 1)</td><td>NA</td></tr>
<tr><td>**Ambient Air**</td><td>Total VOCs via PID</td><td>TO-15 Listed VOCs</td><td>TO-15</td><td>Ambient Temperature</td><td>6-Liter Summa Canister</td><td>Analyze within 30 days of collection</td><td>1 per 20 samples (minimum 1)</td><td>NA</td><td>NA</td><td>1 per 10 samples (minimum 1)</td><td>NA</td></tr>
</table>

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. NA - Not applicable

ATTACHMENT C

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.

APPENDIX G

Project Personnel Resumes

JASON J. HAYES, PE, LEED AP

PRINCIPAL/VICE PRESIDENT

ENVIRONMENTAL ENGINEERING

Mr. Hayes has experience in New York, New Jersey, Washington D.C., California, Washington, Oregon, Alaska, and Internationally. His experience includes Environmental Protection Agency (EPA), New York State (NYS) Brownfields applications, investigation, and remediation; New York City Department of Environmental Protection (NYCDEP) and New York City Office of Environmental Remediation (OER) E-designated site applications, investigations, and remediation. His expertise also includes Phase I and II Environmental Site Investigations and Assessments; contaminated building cleanup and demolition; Underground Storage Tank (UST) permitting, removal specifications, and closure reporting; soil vapor intrusion investigation and mitigation system design (depressurization systems, etc.); development of groundwater contaminant plume migration models; environmental analysis; and oversight, design and specification generation for remediation operations with contaminants of concern to include polychlorinated biphenyls (PCBs), solvents, mercury, arsenic, petroleum products, asbestos, mold and lead.

SELECTED PROJECTS

- Confidential Location (Remediation for Mercury-Contaminated Site), New York, NY
- Confidential Location (Phase II ESI and Remedial Design for Mercury Impacted Site), Brooklyn, NY
- NYC School Construction Authority (PCB Remediation), Various Locations, New York, NY
- 28-29 High Line (Phase I ESA, Phase II ESI, and Environmental Remediation), New York, NY
- Georgetown Heating Plant (Phase II ESI and Remedial Design for Mercury Impacted Site), Washington D.C.
- 268 West Street (BCP Application, RI and RIWP), New York, NY
- Confidential Multiple Mixed-Use Tower Location (BCP Application, RI, Phase I ESA, and Phase II ESI), New York, NY
- Dock 72 at Brooklyn Navy Yard, (NYS Voluntary Cleanup Program), Brooklyn, NY
- 27-21 44th Drive (BCP Application, Remedial Investigation Phase I ESA, and Phase II ESI), Long Island City, NY
- Purves Street Development, BCP Application, RAWP, and Phase II ESI, Long Island City, NY
- 267-273 West 87th Street (BCP Application, Remedial Investigation, RIWP, RAWP), New York, NY
- New York Aquarium, Shark Tank and Animal Care Facility (Environmental Remediation), Coney Island, NY
- International Leadership Charter School (Environmental Remediation), Bronx, NY
- West & Watts (BCP Application), New York, NY
- Hudson Yards Redevelopment (Phase I ESA and Phase II ESI), New York, NY

EDUCATION

M.S., Environmental Engineering Columbia University

B.S., Chemistry, Environmental Toxicology Humboldt State University

Business Administration (minor) Humboldt State University

PROFESSIONAL REGISTRATION

Professional Engineer (PE) in NY

LEED Accredited Professional (LEED AP)

Troxler Certification for Nuclear Densometer Training

CPR and First Aid Certification

OSHA 40-Hour HAZWOPER

OSHA HAZWOPER Site Supervisor

AFFILIATIONS

US Green Building Council, NYC Chapter (USGBC), Communications Committee

LANGAN

- 627 Smith Street (RI and Report), Brooklyn, NY
- Gateway Center II Retail (Phase I ESA and Phase II ESI), Brooklyn, NY
- 261 Hudson Street (Phase I ESA, Phase II ESI, BCP, and RAWP), New York, NY
- Riverside Center, Building 2 (BCP, Phase I ESA and Phase II ESI), New York, NY
- New York Police Academy, (Sub-Slab Depressurization and Vapor Barrier System), College Point, NY
- Bronx Terminal Market (BCP, RIWP, RAWP, Phase I ESA and Phase II ESI), Bronx, NY
- Jacob Javits Convention Center (Phase I ESA and Phase II ESI), New York, NY
- Yankee Stadium Development Waterfront Park (NYSDEC Spill Sites), Bronx, NY
- Bushwick Inlet Park (Phase I ESA, Approvals for NYC E-Designation), Brooklyn, NY
- Silvercup West (BCP, RIWP, RIR, RAWP, and RAA), Long Island City, NY
- 29 Flatbush, Tall Residential Building (Groundwater Studies, RIR and RAWP), Brooklyn, NY
- Gowanus Village I (BCP, RIWP and RIR), Brooklyn, NY
- Sullivan Street Hotel (Site Characterization Study and Owner Representation), New York, NY
- Riker's Island Co-Generation Plant (Soil and Soil Vapor Quality Investigations), Bronx, NY
- The Shops at Atlas Park (Sub-Slab Depressurization and Vapor Barrier Design), Glendale, NY
- Memorial Sloan-Kettering Cancer Center (Subsurface and Soil Vapor Intrusion Investigations), New York, NY
- Element West 59th Street (Oversight and Monitoring of Sub-Slab Depressurization and Vapor Barrier Systems), New York, NY
- Teterboro Airport (Delineation and Remedial Oversight of Petroleum-Contaminated Soils), Teterboro, NJ
- Proposed New York JETS Stadium (Phase I ESA), New York, NY
- Former Con Edison Manufactured Gas Plant Sites (Research Reports), New York, NY
- 7 World Trade Center (Endpoint Sampling and Final Closure Report), New York, NY
- Peter Cooper Village, Environmental Subsurface Investigations, New York, NY

SELECTED PUBLICATIONS, REPORTS, AND PRESENTATIONS

NYC Mayor's Office of Environmental Remediation – Big Apple Brownfield Workshop – Presented on Soil Vapor Intrusion Remedies (e.g., SSD Systems, Vapor Barriers, Modified HVAC)

New York City Brownfield Partnership – Presented on environmental considerations and complications of the Hudson Yards Development

Urban Land Institute (ULI), member

Commercial Real Estate Development Associations (NAIOP), member

NYC Brownfield Partnership, member

Waterfront Development Technical Course – Presented on Impacted Waterfront Planning Considerations

MICHAEL D. BURKE, PG, CHMM, LEED AP

PRINCIPAL/VICE PRESIDENT

ENVIRONMENTAL ENGINEERING AND REMEDIATION

Mr. Burke is a geologist/environmental scientist whose practice involves site investigation and remediation, transactional due diligence, environmental site assessments, in-situ remedial technology, and manufactured gas plant (MGP) site characterization and remediation. His additional services include multi-media compliance audits, sub-slab depressurization system design, non-hazardous and hazardous waste management, emergency response, community air monitoring programs, environmental and geotechnical site investigations, and health and safety monitoring. He has experience with projects in the New York State Department of Environmental Conservation (NYSDEC) and New York State Brownfield Cleanup (NYS BCP) Programs; Inactive Hazardous Waste, and Spill Programs, and New York City Office of Environmental Remediation (OER) e-designated and New York City Voluntary Cleanup Program (NYC VCP) sites.

SELECTED PROJECTS

- 227-14 North Conduit Avenue, Industrial Wastewater Compliance, Jamaica, NY
- 420 Kent Avenue, NYS Brownfield Cleanup Program, Brooklyn, NY
- 572 Eleventh Avenue, NYC VCP, New York, NY
- Monian Site A, OER E-Designated Site, New York, NY
- 537 Sackett Street, Gowanus Canal Due Diligence/MGP Site, Brooklyn, NY
- ABC Blocks 25, 26 and 27, NYS Brownfield Cleanup Program Sites, Long Island City, NY
- 432 Rodney Street, NYS Brownfield Cleanup Program, Petroleum and Chlorinated Volatile Organic Compound Investigation and Remediation, Brooklyn, NY
- 787 Eleventh Avenue, NYS Brownfield Cleanup Program Site, New York, NY
- President Street at Gowanus Canal, NYS Brownfield Cleanup Program Site, Brooklyn, NY
- 22-36 Second Avenue at Gowanus Canal, NYS Brownfield Cleanup Program Site, Brooklyn, NY
- 563 Sacket Street, NYS Brownfield Cleanup Program Site, MGP Investigation, and Remediation, Brooklyn, NY
- 156-162 Perry Street, NYS Brownfield Cleanup Program Site, New York, NY
- Christopher and Weehawken Streets, NYS Brownfield Cleanup Program, New York, NY
- Phelps Dodge Block 2529 (Lots 40, 50, and 45), Inactive Hazardous Waste Disposal Site, Maspeth NY
- 42-50 24^{th} Street, NYS Brownfield Cleanup Program Site, Long Island City, NY
- Storage Deluxe (163 6^{th} Street), OER E-Designation Site, New York, NY

EDUCATION

M.S., Environmental Geology
Rutgers University

B.S., Geological Sciences
Rutgers University

B.S., Environmental Science
Rutgers University

PROFESSIONAL REGISTRATION

Professional Geologist (PG) in NY

Certified Hazardous Materials Manager – CHMM No. 15998

LEED Accredited Professional (LEED AP)

OSHA Certification for Hazardous Waste Site Supervisor

OSHA 29 CFR 1910.120 Certification for Hazardous Waste Operations and Emergency Response

NJDEP Certification for Community Noise Enforcement

Troxler Certification for Nuclear Densometer Training

LANGAN

- Prospect Park Redevelopment, Landfill Reclamation, Prospect Park, NJ
- 431 Carroll Street, Gowanus Canal Due Diligence, Brooklyn, NY
- 76 4th Street Property, Gowanus Due Diligence, Brooklyn, NY
- Foxgate/MREC, Due Diligence and Solid Waste Compliance, Central Islip, NY
- 175-225 3rd Street at Gowanus Canal, NYS Brownfield Cleanup Program, Brooklyn, NY
- New York University Tandon School of Engineering, Spill Investigation/Remediation Dual Phase Recovery, and Laser Fluorescence Investigation, Brooklyn, NY
- 2420-2430 Amsterdam Avenue, NYS Brownfield Cleanup Program/Board of Standards and Appeals Variance, New York, NY
- 170 Amsterdam Avenue, NYC VCP, New York, NY
- 538-540 Hudson Street, NYS Brownfield Cleanup Program (Former Gas Station), New York, NY
- 234 Butler Street, Gowanus Canal Due Diligence, Brooklyn, NY
- 550 Clinton Street, NYS Brownfield Cleanup Program E-Designation, Brooklyn, NY
- 111 Leroy Street, OER E-Designation Site, New York, NY
- 335 Bond Street, NYS Brownfield Cleanup Program, New York, NY
- Gowanus Canal Northside, NYS BCP Former Fuel Oil Terminal, Brooklyn, NY
- Multiple Buildings, Major Oil Storage Facility, Gowanus Canal Location, Brooklyn, NY
- 197-205 Smith Street at Gowanus Canal, MGP Due Diligence, Brooklyn, NY
- 450 Union Street at Gowanus Canal, NYS Brownfield Cleanup Program, Brooklyn, NY
- 86 Fleet Place, NYC VCP E-Designation, Brooklyn, NY
- New York University College of Nursing at 433 1st Avenue, NYS BCP, Bronx, NY
- Retail Building at 225 3rd Street, Brooklyn, NY
- 29-37 41st Avenue, NYS Brownfield Cleanup Program, Long Island City, NY
- 43-01 22nd Street, NYS Brownfield Cleanup Program, Long Island City, NY
- Compliance Audit for NYU at Washington Square Park, New York, NY
- Former Watermark Locations, NYS Brownfield Cleanup Program, Chlorinated Volatile Organic Compound Investigation and Remediation; AS/SVE, Brooklyn, NY
- Former Gas Station (1525 Bedford Avenue), Brooklyn, NY
- NYS Brownfield Cleanup Program at 514 West 24th Street, New York, NY
- Gowanus Canal Due Diligence at 76 4th Street, Brooklyn, NY
- Urban Health Plan, Medical Building, NYS Brownfield Cleanup Program CVOC Investigation and Remediation, Bronx, NY
- 420 East 54th Street, NYS Spill Closure, New York, NY
- Equity Residential at 160 Riverside Boulevard, NYS Spill Closure, New York, NY
- 357-359 West Street and 156 Leroy Street, NYC VCP, New York, NY
- Emergency Spill Response at 322 West 57th Street, Investigation and Closure, New York, NY

- Hurricane Sandy, Emergency Response at 21 West Street, New York, NY
- Hurricane Sandy, Emergency Response at 71 Pine Street, New York, NY
- Greenpoint Landing, NYC E-Designation, Brooklyn, NY
- 23-01 42nd Road, NYS Brownfield Cleanup Program, Long Island City, NY
- Greenpoint Waterfront Development, NYS Brownfield Cleanup Program, Brooklyn, NY
- 125th Street and Lenox Avenue, NYC VCP, New York, NY
- Whitehead Realty Solvent Site, Inactive Hazardous Waste site, CVOC
  Investigation and Remediation, Brooklyn, NY
- SunCap Property Group Environmental On-Call Consulting, Various Locations, Nationwide
- Consolidated Edison Company of New York, Underground Storage Tank On-Call Contract, Five Boroughs of New York City, NY
- Consolidated Edison Company of New York, Appendix B Spill Sites On-Call Contract, Five Boroughs of New York City, NY
- Meeker Avenue Plume Trackdown Site, Brooklyn, NY
- Distribution Facility, Superfund Redevelopment, Long Island City, NY
- Edison Properties, West 17th Street Development Site (Former MGP Site), New York, NY
- Con Edison on Governors Island, Dielectric Fluid Spill, Investigation and Remediation, New York, NY
- 144-150 Barrow Street, NYS Brownfield Cleanup Program, New York, NY
- West 17th Street Development, NYS Brownfield Cleanup Program, MGP Investigation and Remediation, New York, NY
- Montefiore Medical Center, Emergency Response, PCB Remediation, Bronx, NY
- New York University, 4 Washington Square Village Fuel Oil Remediation, New York, NY
- NYCSCA, Proposed New York City School Construction Sites, Five Boroughs of New York City, NY
- Con Edison, East 60th Street Generating Station, New York, NY
- Residential Building at 82 Irving Place, Environmental Remediation, New York, NY
- 1113 York Avenue, Storage Tank Closures, New York, NY
- Peter Cooper Village/Stuyvesant Town, Phase I ESA, New York, NY
- Superior Ink, Waste Characterization and Remedial Action Plans, New York, NY
- Bronx Mental Health Redevelopment Project, Phase I ESA, Bronx, NY
- 2950 Atlantic Avenue, Site Characterization Investigation, Brooklyn, NY
- Con Edison, East 74th Street Generating Station, Sediment Investigation, New York, NY
- Con Edison, First Avenue Properties, New York, NY
- Queens West Development Corp. Stage II, Long Island City, NY
- Article X Project Environmental Reviews, Various New York State Electrical Generation Sites, NY
- Poletti Generating Station, Astoria, NY
- Arthur Kill Generating Station, Staten Island, NY

- Distribution Facility, Phase I & Phase II ESA and Regulatory Compliance, Bohemia, NY
- Huntington Station Superfund Due Diligence, Huntington Station, NY
- Garvies Point Bulkhead, Glen Cove, NY
- Johnson & Hoffman Metal Stamping Facility, Environmental Compliance, Carle Place, NY
- Floral Park Storage Facility, Phase I and Phase II ESA
- Garden City Phase I ESAs at two sites, including part of a Superfund Site, Garden City, NY
- Huntington Station Storage Facility, Phase I and II ESA, Huntington Station, NY
- Trevor Day School, NYS Spill Site Expert Testimony, New York, NY

SELECTED PUBLICATIONS, REPORTS, AND PRESENTATIONS

Burke, M., Ciambruschini, S., Nicholls, G., Tashji, A., Vaidya, S., "Redeveloping a Remediated MGP Site", MGP Symposium 2019, Atlantic City, NJ.

BRIAN GOCHENAUR, QEP

SENIOR PROJECT MANAGER

ENVIRONMENTAL SCIENTIST

Mr. Gochenaur is an environmental project manager whose experience includes environmental due diligence, site investigation and remediation, fuel oil storage tank investigation and removal, soil vapor intrusion assessments, in-situ remedial technology, spill closure, vapor barrier and sub-slab depressurization system design and construction, emergency response, environmental and geotechnical site investigations, and health and safety monitoring. He has extensive experience with the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup, Voluntary Cleanup and Spill Programs and New York City Department of Environmental Protection (NYCDEP) "E" Designated and New York City Voluntary Cleanup Program (BCP) sites. His areas of expertise include Phase I Environmental Site Assessments, Phase II Site Investigations, and environmental consulting and oversight on large scale construction projects.

SELECTED PROJECTS

- 440 Washington Street, E-Designated services, New York, NY
- 3514 Surf Avenue, Tall Residential and Retail Building, Brooklyn, NY
- ARO 242 West 53, Tall Residential Building, New York, NY
- NY Aquarium Shark Exhibit, Soil Characterization and Excavation Oversight, Coney Island Neighborhood, Brooklyn, NY
- 60 West Street, Site Investigation and Redevelopment, Brooklyn, NY
- 535 4th Avenue, BCP Auto Repair Cleanup and Redevelopment, Brooklyn, NY
- 1525 Bedford Avenue, BCP Gas Station Cleanup and Redevelopment, Brooklyn, NY
- 220 Eleventh Avenue, Residential Building, New York, NY
- 432 Rodney Street, Residential Building, Brooklyn, NY
- 563 Sackett Street, Brooklyn, NY
- 362 West 125th Street, Residential Building, New York, NY
- Bedford Armory Redevelopment, Brooklyn, NY
- 268 West Street, BCP Redevelopment of Former Commercial and Industrial Site, New York, NY
- 110 125th Street, Soil Excavation and Remediation, New York, NY
- Former Roseland Ballroom Redevelopment, Soil Characterization and Excavation Oversight, New York, NY
- 42 Crosby Street, "E" Designated Site Investigation and Remediation, New York, NY
- New York School Construction Authority, Various Locations, In-House Environmental Consulting, Five Boroughs of New York City
- EZ Serve Portfolio, GE Capital, Various Phase II Site Investigations, FL, GA, LA, and MS
- Beth Elohim Child Daycare Center, Lead Based Paint Abatement, Brooklyn, NY
- Price Battery, Environmental Protection Agency (EPA) Lead Fallout Superfund Site, Hamburg, PA

EDUCATION

B.S., Environmental Science
University of Florida

PROFESSIONAL REGISTRATION

Qualified Environmental Professional (QEP) certified by the Institute of Professional Environmental Practice

40-Hour OSHA (HAZWOPER)

- Clark Portfolio, GE Capital, Various Phase II Locations, MI, IL, ID, and OH
- Tops Plaza Portfolio, Prudential Real Estate Investors, Various Phase II Locations, NY
- Cingular Wireless Portfolio, Cingular Wireless, Various Locations Phase I and II Locations, WA
- Queens Center Mall Expansion, Remedial Oversight, Elmhurst, NY
- Soka Gakkai International-USA, Cultural Center, Brooklyn, NY

WILLIAM BOHRER, PG

PROJECT GEOLOGIST

GEOLOGIST

Mr. Bohrer is an experienced geologist responsible for managing Langan's environmental standards and Health and Safety compliance for projects throughout New York City. His services include dissemination of environmental protocols, troubleshooting at project sites, in-house/field training, and maintenance of quality standards across the environmental discipline. Mr. Bohrer has a diverse and extensive background in geophysics, hydrogeology, mining and petroleum, and geotechnical engineering. He has developed conceptual site models for public, industrial and commercial facilities nationwide.

SELECTED PROJECTS

- NYU Poly – 122 Johnson Street, Brooklyn, NY
- Con Edison of New York at Governor's Island, NY, NY
- 535 4th Avenue, Brooklyn, NY
- 27 Wooster Street, New York, NY
- 42 West Street, Brooklyn, NY
- 455 West 19th Street, New York, NY
- Kings Plaza Mall, Brooklyn, NY
- Hudson Yards "Terra Firma", New York, NY
- Hudson Yards, Platform Special Inspection, New York, NY
- PSAC II, Bronx, NY
- 595-647 Smith Street, Brooklyn, NY
- New York University, 7-13 Washington Square North Investigation, New York, NY
- NYU 4 Washington Square Village, New York, NY
- 125th Street and Lenox Avenue, New York, NY
- Sullivan Street Development, New York, NY
- Hudson Crossing II, New York, NY
- New York Aquarium, Shark Tank & Animal Care Facility, Brooklyn, NY
- 209-219 Sullivan Street, New York, NY
- 261 Hudson Street, New York, NY
- 460 Washington Street, New York, NY
- 552 West 24th Street, New York, NY
- Brooklyn Bridge Park Pier 1, New York, NY
- International Leadership Bronx Charter School, Bronx, NY
- 203 East 92nd Street, New York, NY
- HighLine 28-29, New York, NY
- 539 Smith Street Bulkhead, Brooklyn, NY
- Willets Point, Corona, NY
- Plume Migration and Fracture Flow Aquifer Investigation, Brunswick, MD
- Plume Migration and Fracture Flow Aquifer Investigation, Fallston, MD
- Emergency Response Site Investigation & Remediation, Wappingers Falls, NY
- Emergency Response Site Investigation & Remediation, Allentown, PA

EDUCATION

Post Graduate Studies in Geophysics
Cornell University

B.S., Geology
Tufts University

PROFESSIONAL REGISTRATION

Professional Geologist (PG) in NY

40 Hour OSHA HazWOPER

OSHA Construction Safety & Health

OSHA Supervisory Certification
Credential (TWIC)

Transportation Worker Identification

NYS DEC- Protecting New York's Natural Resources with Better Construction Site Management

AFFILIATIONS

American Association of Petroleum Geologists

National Groundwater Association

Geological Society of America

LANGAN

- Emergency Response Site Investigation & Remediation, Shamokin, PA
- Bermuda International Airport, Jet Fuel Release Investigation, Bermuda
- Little Missouri River Basin, Geotechnical Site Evaluation (Horizontal Drilling Pipeline Install), ND
- Seismic Susceptibility Evaluation (Class 2 Injection Wells), Litchfield, OH
- Bedrock Mapping, Bradford and Sullivan Counties, PA
- Soil Solidification, Carteret, NJ

PA Council of Professional Geologists

JESSICA FRISCIA, EIT, PE

PROJECT ENGINEER

ENVIRONMENTAL ENGINEERING

Ms. Friscia's experience includes field work and office work on environmental investigation and remediation projects across New Jersey and New York. Her field work experience includes soil, soil vapor, and groundwater sampling; drilling oversight; air monitoring; soil management; and remediation oversight, including excavation, zero-valent iron injections, air sparge/SVE system installation, MPE system installation, and SSDS installation. Her office work experience includes EQuIS database management, data evaluation, remedial design, and report work, including, but not limited to, Phase I ESAs, Preliminary Assessment/Site Investigations, Remedial Investigation Reports, Remedial Action Work Plans, and Remedial Action Reports.

SELECTED PROJECTS

- Former Penick Corporation Facility RCRA Site, Montville, NJ
- Bond Street Brownfields Redevelopment Site, Brooklyn, NY
- Former Pan Graphics Facility, Garfield, NJ
- Former Flintkote Company Facility Site, East Rutherford, NJ
- Former Agricultural Research Facility, West Windsor, NJ
- Liberty Plaza VCP Site, Randallstown, MD
- Consolidated Edison Site, New York, NY
- Kent Avenue Site, Brooklyn, NY
- 505 West 19th Street NYCOER E-Designated Site, New York, NY
- 401 Washington Street NYCOER E-Designated Site, New York, NY
- 400 Park Avenue South Site NYCOER E-Designated Site, New York, NY

EDUCATION

M.E., Environmental and Water Quality Engineering
Massachusetts Institute of Technology

B.E., Civil Engineering
The Cooper Union for the Advancement of Science and Art

PROFESSIONAL REGISTRATION

Engineer in Training (EIT) NY

Professional Engineer (PE) in NY

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

AFFILIATIONS

Beverly Willis Architecture Foundation Emerging Leaders Program

EMILY STRAKE, CEP

SENIOR PROJECT CHEMIST / RISK ASSESSOR
HUMAN HEALTH RISK ASSESSMENT / CHEMICAL DATA VALIDATION

Ms. Strake has 20 years of environmental chemistry, risk assessment, auditing, and quality assurance experience. Ms. Strake has extensive experience assessing potential adverse health effect to humans from exposure to hazardous contaminants in soil, sediment, groundwater, surface water, ambient and indoor air, and various types of animal, fish, and plant materials. 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 broad experience in environmental data validation, focused on ensuring laboratory deliverables follow specific guidelines as described by regulatory agencies and the analytical methods employed. She 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.

SELECTED PROJECTS

- Air Products and Chemicals, Edison, NJ
- Ametek, Sellersville, PA
- Burnt Timber, Alberta, Canada
- Delaware City Refinery, DE
- DOW Chemical, Various Locations
- DuPont South River, Waynesboro, VA
- East Cat Canyon Oil Field, Santa Maria, CA
- Fair Lawn Superfund Site, Fairlawn, NJ
- Floreffe Terminal, Pittsburgh, PA
- FONF Expansion/Sabre Park BCP, Niagara Falls, NY
- Former NPR-1 Remediation Project, Taft, CA
- Golden Gate National Parks Conservancy, San Francisco, CA
- H&H Burn Pit, Farrington, VA
- Hercules Santa Barbara Gas Plant, Montecito, CA
- Honeywell, Highland Park, NJ
- Hunters Point Shipyard, San Francisco, CA
- John Evans Superfund Site, Lansdale, PA
- Little Mill Creek, New Castle, DE
- Major League Soccer's San Jose Earthquakes Stadium, Santa Clara, CA
- Mannington Mills, Mannington, NJ
- Midway Village, Daly City, CA
- Morgans Point, Bermuda
- Occidental Chemical, Bakersfield, CA

EDUCATION

M.B.A., Business Administration
The University of Scranton

B.S., Chemistry
Cedar Crest College

CERTIFICATION

Board Certified Environmental Professional (CEP) in Assessment

MEMBERSHIPS

Interstate Technology and Regulatory Council

Montgomery Township Environmental Advisory Committee, Vice-Chair, Term ending 1/1/2022.

Society of Environmental Toxicology and Chemistry

TRAINING

40 hr. OSHA HAZWOPER Training/Nov 2002

8 hr. HAZWOPER Supervisor/June 2004

8 hr. OSHA HAZWOPER Refresher/Oct 2017

LANGAN

- PECO/Exelon, Various Locations
- 365 Bond Street Development, Brooklyn, NY
- Regency, Philadelphia, PA
- Rohm and Haas, Philadelphia, PA
- Ryder, Hartford, CT
- Santa Clara Landfill Site, San Jose, CA
- Sunoco Philadelphia (PES) Facility, Philadelphia, PA
- Texas Instruments, San Francisco, CA
- Veteran's Affairs, Palo Alto, CA
- Whitehead Realty - Former ACME Sites, Brooklyn, NY
- 55 Bank Street, White Plains, NY
- 268 West Street, New York, NY
- 300 Jackson Ave. RA/RI, Downingtown, PA
- 420 Kent Avenue, Brooklyn, NY
- 805-825 Atlantic Avenue, Brooklyn, NY
- 521-539 4th Ave, Brooklyn, NY
- 1525 Bedford Avenue, Brooklyn, NY
- 2420 - 2430 Amsterdam Avenue, New York, NY
- 3093 Broadway Phase I ESA, Oakland, CA

SELECTED PUBLICATIONS, REPORTS, AND PRESENTATIONS

PFAS Uncertainty in Exposure and Toxicity Information. Presented to the bipartisan Congressional PFAS Task Force

Decision Making at Contaminated Sites: Issues and Options in Human Health Risk Assessment. Interstate Technology and Regulatory Council

Alternate Approaches for Act 2 Risk Assessments Using Site-Specific Information. Pennsylvania Brownfields Conference

Risk Assessment in Remediation
Montclair State University Faculty Coordinator

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

ASSOCIATE
CORPORATE HEALTH AND SAFETY MANAGER

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

EDUCATION

B.S., Physics
West Chester University

PROFESSIONAL REGISTRATION

Associate Safety Professional (ASP)

Certified Hazardous Material Manager (CHMM)

Certified Occupational Safety Specialist (COSS)

Certified Safety Professional (CSP)

AFFILIATIONS

Pennsylvania Chamber of Business & Industry

Chemical Council of New Jersey

New Jersey Business & Industry Association

Geoprofessional Business Association

American Society of Safety Professionals

LANGAN

APPENDIX H

Remedial Action Construction Schedule

Appendix H
Remedial Action Work Plan
Remedial Action Construction Schedule
1607 Surf Avenue
Brooklyn, New York

Estimated Project Schedule

Item	Action	2020												2021												2022								
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	Preparation and Submission of BCP Application, RIR, and RAWP			■	■	■	■																											
2	NYSDEC & NYSDOH Review of BCP Application, RIR, and RAWP						■	■	■	■	■	■	■	■	■	■																		
3	Execute BCA											■																						
3	45-Day Public Comment Period for RAWP and Issuance of Decision Document															■																		
5	Implementation of RAWP with Engineering Oversight																■	■	■	■	■	■												
6	Preparation of an Environmental Easement, FER, and SMP (if required)																					■	■	■										
7	NYSDEC & NYSDOH Review of FER (and SMP, if required)																							■	■	■	■							
8	NYSDEC Issues COC																											■						

Notes:

a) This is an estimated schedule; all items are subject to change.
b) Completion of Item 5 refers to the completion of remediation and not the end of overall construction.
c) BCP = Brownfield Cleanup Program
d) NYSDEC = New York State Department of Environmental Conservation
e) BCA = Brownfield Cleanup Agreement
f) NYSDOH = New York State Department of Health
g) RIR = Remedial Investigation Report
h) RAWP = Remedial Action Work Plan
i) FER = Final Engineering Report
j) SMP = Site Management Plan
k) COC = Certificate of Completion