REMEDIAL ACTION WORK PLAN

for

4650 BROADWAY
New York, New York

Block 2175, Lot 1
NYSDEC BCP Site No. C231123

Prepared For:

4650 Broadway Holdings LLC and 4650 TIC LLC
850 Third Avenue, Suite 13D
New York, NY

and

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Langan Project No. 170505501

LANGAN

CERTIFICATION

I, Jason Hayes, PE, certify that I am currently a New York State (NYS) registered professional engineer and that this Remedial Action Work Plan was prepared in accordance with 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.

Jason J. Hayes P.E.	1/28/2022	
NYS Professional Engineer #089491	Date	Signature

STATE OF NEW YORK
JASON JAMES HAYES
089491
LICENSED PROFESSIONAL ENGINEER

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
1,2-DCA	1,2-Dichloroethane
ACM	Asbestos-Containing Material
AOC	Area of Concern
ASP	Analytical Services Protocol
AST	Aboveground Storage Tank
ASTM	ASTM International
BCP	Brownfield Cleanup Program
Bgs	below grade surface
C&D	Construction and Demolition
CAMP	Community Air Monitoring Plan
CFR	Code of Federal Regulations
CEQR	City Environmental Quality Review
COC	Contaminant of Concern
CQAP	Construction Quality Assurance 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
EDD	Electronic Data Deliverable
El	Elevation
ELAP	Environmental Laboratory Approval Program
ESA	Environmental Site Assessment
ESI	Environmental Site Investigation
eV	electron volt
FEMA	Federal Emergency Management Agency
FWRIA	Fish and Wildlife Resources Impact Analysis
HASP	Health and Safety Plan
HVAC	Heating, Ventilation, and Air Conditioning
L/min	liters per minute
LBP	Lead-Based Paint
IRM	Interim Remedial Measures
ISCO	In-Situ Chemical Oxidation
NAVD88	North American Vertical Datum of 1988
NYC	New York City

Acronym	Definition
NYCDEP	New York City Department of Environmental Protection
NYCDOB	New York City Department of Buildings
NYCDOT	New York City Department of Transportation
NYCRR	New York Codes, Rules, and Regulations
NYCTA	New York City Transit Authority
NYS	New York State
NYSDOH	New York State Department of Health
NYSDEC	New York State Department of Environmental Conservation
O&M	Operations and Maintenance
OSHA	Occupational Safety and Health Administration
PBS	Petroleum Bulk Storage
PCB	Polychlorinated Biphenyl
PCE	Tetrachloroethene
PFC	Perfluorinated Chemical
PFOA	perfluorooctanoic acid
PID	Photoionization Detector
PPE	Personal Protective Equipment
Ppm	parts per million
PVC	Polyvinyl Chloride
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
RAO	Remedial Action Objective
RAWP	Remedial Action Work Plan
RCA	Recycled Concrete Aggregate
RCNY	Rules of the City of New York
RE	Remediation Engineer
REC	Recognized Environmental Condition
RI	Remedial Investigation
RIR	Remedial Investigation Report
RUR	Restricted Use - Residential
RURR	Restricted Use – Restricted Residential
SCG	Standards, Criteria, and Guidance
SCO	Soil Cleanup Objective
SEQRA	State Environmental Quality Review Act
SGV	Standards and Guidance Values
SMMP	Soil/Materials Management Plan
SPDES	State Pollutant Discharge Elimination System

Acronym	Definition
SVOC	Semivolatile Organic Compound
SWPPP	Stormwater Pollution Prevention Plan
TAL	Target Analyte List
TCE	Trichloroethene
TCL	Target Compound List
TOC	Total Organic Carbon
TOGS	Technical and Operational Guidance Series
TPH	Total Petroleum Hydrocarbons
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UST	Underground Storage Tank
UU	Unrestricted Use
VOC	Volatile Organic Compound

EXECUTIVE SUMMARY

This Remedial Action Work Plan (RAWP) was prepared on behalf of AQOZFI Inwood LLC for the property located at 4650 Broadway in the Inwood neighborhood of New York, New York (the site). The original Volunteers, 4650 Broadway Holdings LLC and 4650 TIC LLC, entered into a Brownfield Cleanup Agreement (BCA) with the New York State Department of Environmental Conservation (NYSDEC) on December 18, 2018, and Brownfield Cleanup Program (BCP) Site No. C231123 was assigned. On December 13, 2019, the BCA was amended to document the transfer of ownership and the addition of AQOZFI Inwood LLC as a Volunteer. The Volunteers propose to remediate the site for residential and commercial use.

This RAWP summarizes the nature and extent of contamination as determined from data gathered between April 2018 and August 2019 and summarized in the November 4, 2020 Remedial Investigation Report. The RAWP also describes the implementation of the Interim Remedial Measures Work Plan (IRMWP) between April and August 2019 and subsequent groundwater monitoring and soil sampling to document the effectiveness of the IRM.

This RAWP evaluates applicable remedial action alternatives, their associated costs, and the recommended and preferred Track 4 remedy. The remedy described in this document is consistent with the procedures defined in 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 4650 Broadway in the Inwood neighborhood of New York, New York, and is identified on the Manhattan Borough Tax Map as Block 2175, Lot 1. The 47,175-square foot lot is located at the southwestern corner of the city block bound by Dongan Place to the north, Arden Street to the east, Sherman Avenue to the south, and Broadway to the west and was formerly improved with a two-story vacant parking garage with a full cellar (7 to 12 feet below sidewalk grade) and partial sub-cellar (about 4 feet below cellar grade). The southern part of the building was most recently operated by Park-it Pilot Parking LLC as a commercial parking garage, and the northern part of the building was most recently used to store antique cars and construction materials. The parking garage was demolished between September and November 2021.

The site was an undeveloped vacant lot until at least 1928. By 1928 the existing two-story building was constructed across the entire footprint and was occupied by an automotive garage and service facility. By 1968, the northern part of the building was occupied by offices with an elevator in the northwestern corner, and the southern part of the building remained as an automotive garage and service facility. Two gasoline tanks were shown in the southwestern corner of the building in historical Sanborn maps from 1977 through 1994. According to NYSDEC Petroleum Bulk Storage (PBS) database records, three 550-gallon gasoline underground storage tanks (USTs) were removed from the site in August 2009. Additionally, two No.2 fuel oil USTs (one 5,000-gallon and one 2,500-gallon) and one 5,000-gallon No. 4 fuel oil above ground storage tank (AST) were removed from the site in 1998. The site is listed under NYSDEC PBS Facility ID 2-077666.

Petroleum-impacts to soil and groundwater were documented during subsurface investigations performed in 2004 and 2009. In May 2009, four groundwater monitoring wells were installed near three 550-gallon gasoline USTs and groundwater samples were collected and analyzed for volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs). Based on the investigation findings, a spill was reported and NYSDEC Spill No. 0902240 was assigned. The USTs and petroleum-impacted soil were subsequently removed from the site; however, petroleum contamination persisted in groundwater and soil.

Following enrollment in the BCP, a Remedial Investigation (RI) was completed to define the nature and extent of contamination in soil, groundwater and soil vapor. The RI identified the following environmental concerns: 1) The presence of petroleum impacts in soil and groundwater in the south central part of the site from about 6 to 12 feet below cellar grade and 2) the presence of historic fill material extending from cellar grade to depths of up to 7.5 feet below cellar grade. A draft Remedial Investigation Report (RIR) was prepared and submitted to NYSDEC in 2018. Following completion of emerging contaminants sampling in August 2019 and further review by NYSDEC the RIR was finalized in November 2020 and approved by NYSDEC in December 2020.

Groundwater treatment consisting of PersulfOx®, RegenOx®, PlumeStop®, and Petrofix® injections was implemented from April to August 2019 pursuant to an NYSDEC-approved IRM Work Plan (IRMWP) and seven quarters of post-remedial groundwater sampling have been completed to date. In addition, a supplemental soil investigation was completed in March 2021 to determine the effectiveness of groundwater treatment in saturated soil.

SUMMARY OF THE REMEDIAL INVESTIGATION FINDINGS

The RI findings summarized herein are based on qualitative data (field observations and instrumental readings) and laboratory analytical soil, groundwater, and soil vapor sampling results.

1. <u>Stratigraphy:</u> Historic fill predominantly consisting of brown, fine- to medium-grained sand with varying amounts of silt, gravel, and concrete was encountered across the site from below the cellar slab to depths ranging from about 2 to 7.5 feet below cellar grade (9 to 19.5 feet below grade surface [bgs]). Native soil encountered below historic fill

predominantly consists of fine- to medium-grained sand with varying amounts of gravel and silt. Bedrock was encountered during a geotechnical investigation performed by Langan in April and May 2018 and consists of gneiss, mica schist, and marble. The top of bedrock varies from about 30 to 88 feet below cellar grade. The bedrock surface is irregular and generally slopes down to the west and to the north. Boring data indicates bedrock is shallowest within the southeastern part of the site.

2. Hydrogeology: Synoptic groundwater measurements were collected on May 9, 2018 from nine of the monitoring wells installed during the April 2018 RI. Groundwater elevations (el)[1] range between el 20.62 to el 21.6 feet, which corresponds to depths of about 4.4 to 5.3 feet below cellar grade (about 11.4 to 17.38 feet bgs). Groundwater flow is to the northeast. Underground utilities and other subsurface structures may locally influence the direction of groundwater flow.

3. Petroleum Impacts in Soil, Groundwater and Soil Vapor: Petroleum impacts were identified across an area of roughly 12,500 square feet within the southern part of the site, occupying about 25% of the site. Petroleum-related volatile organic compounds (VOCs) were detected above the UU and/or Restricted Use-Restricted Residential (RURR) Soil Cleanup Objectives (SCOs) in soil samples collected between 6 and 10 feet below cellar grade (about 13 to 22 feet bgs) within this area. Photoionization detector (PID) headspace readings of up to 875 parts per million (ppm), petroleum-like odors, and petroleum-related VOCs above the NYSDEC Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1 Ambient Water Quality Standards and Guidance Values for Drinking Water (class GA) (collectively referred to as the Standards and Guidance Values [SGVs]) were detected at monitoring well locations within the petroleum-impacted area. Petroleum-related contamination was localized to the southern-central part of the site, which formerly contained three, 550-gallon gasoline USTs and a petroleum tank room. Petroleum-related VOCs in soil and groundwater are related to the historical petroleum bulk storage at the site.

4. Historic Fill: Laboratory analytical results indicate that the historic fill contains SVOCs, metals, and polychlorinated biphenyls (PCBs) at concentrations above the UU and/or RURR SCOs. The deepest samples exceeding the SCOs were found between 7 and 8

[1] Elevations are referenced to the North American Vertical Datum of 1988 (NAVD88) unless otherwise noted.

feet below cellar grade (14 to 20 feet bgs). Per- and poly-fluoroalkyl substances (PFAS) were detected in historic fill samples.

5. Native Soil: Mercury and seven PAHs were detected above UU and/or RURR SCOs in a native soil sample collected between 7 to 8 feet below cellar grade (14 to 20 feet bgs) in soil boring RSB07; however, these detections are likely a result of infiltration of historic fill material into the borehole during sample collection. Manganese and acetone were also detected above the UU SCOs; however, manganese is a naturally occurring metal, and acetone is a common laboratory contaminant.

6. Soil Vapor: The soil vapor samples contained chlorinated volatile organic compound (CVOC) concentrations which were not detected in the indoor air sample. The tetrachloroehtylene (PCE) and trichloroethylene (TCE) concentrations detected in soil vapor may be indicative of a chemical release associated with historical site use, or may be related to the historical use of the southern-adjoining property as a dry cleaning facility. The petroleum-related VOCs detected in the sub-slab soil vapor are likely related to the open petroleum spill in the south-central part of the site. The petroleum-related VOCs detected in indoor air may be related to either the open on-site spill in the south central portion of the site, or to automotive emissions from the former use as a parking garage.

QUALITATIVE HUMAN HEALTH EXPOSURE ASSESSMENT

Based on the conceptual site model and review of environmental data, complete on-site exposure pathways appear to be present in current, construction-phase, and future conditions. The complete exposure pathways indicate there is a risk of exposure to humans from site contaminants via exposure to soil, groundwater, and soil vapor if appropriate measures, including engineering controls (ECs) and institutional controls (ICs) as necessary, are not implemented. A qualitative human health exposure assessment was performed to evaluate the exposure pathways, and the following conclusions were developed:

1. Human exposure to site contaminants is limited under current conditions due to the surface cover, and access is limited to investigation workers. The primary exposure pathways are dermal contact, ingestion, and inhalation of soil, groundwater, or soil vapor by site investigation workers and, to a lesser extent, the nearby public. 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 investigation activities.
2. In the absence of mitigation and controls, there is potential for exposure during the construction-phase 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.
c. These can be avoided or minimized by implementing CAMP and by following the appropriate HASP, vapor and dust suppression, site security measures, and following this NYSDEC-approved RAWP.

3. The existence of a complete exposure pathway for site contaminants to human receptors during proposed future conditions is unlikely, as contaminated soil will be excavated and transported to an off-site disposal facility, groundwater will be remediated, and residual soil will be capped, if required, with an impermeable cover or 2 feet of clean soil. Regional groundwater is not used as a potable water source in New York City. The potential pathway for soil vapor intrusion into the building would be addressed by removal of any source material, though none was identified during the RI.
4. It is possible that a complete exposure pathway exists for the migration of site contaminants to off-site human receptors during current, construction-phase, and future conditions. Monitoring and control measures have been and will continue to be used during investigation and construction to prevent completion of this pathway. Under future conditions, the site will be remediated and ECs and ICs will be implemented, if necessary, to prevent completion of this pathway.

SUMMARY OF THE REMEDY

In preparation for site remediation and in accordance with the approved IRMWP, the existing building was abated of hazardous materials, including asbestos-containing materials (ACM), lead based paint (LBP), and any other identified universal and miscellaneous hazardous waste articles in July 2021. Following abatement of hazardous materials, building demolition was completed between September and November 2021 to facilitate site remediation.

The selected Track 4 remedy will include the following:

- Development and implementation of a HASP and CAMP for the protection of on-site workers, the community, and the environment during the remediation phase of development
- Excavation of all soils in the upper 2 feet and any soil above the groundwater table which exceeds the PGW SCOs for contaminants of concern in groundwater (about 3,500 cubic yards). The site will be further excavated to about 5 feet below cellar grade as part of site development. Remedial excavation is not proposed within the sub-cellar footprint. Following soil removal, an engineered composite cover system will be installed.

- Removal of 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
- Continue quarterly post-injection groundwater sampling for a minimum of two years from the first event (March 2020) per the NYSDEC-approved March 2019 In-Situ Treatment Remedial Design Plan.
- Collection and analysis of documentation soil samples at the excavation bottom (about 5 feet below cellar grade)
- Installation of an engineered composite cover system (i.e., reinforced concrete building foundation) underlain by a minimum 20-mil vapor barrier/waterproofing membrane of a building foundation
- Establishment of use restrictions (institutional controls [IC]) including prohibitions on the use of groundwater from the site and prohibitions on sensitive site uses, such as farming or vegetable gardening, to eliminate future exposure pathways
- Establishment of an approved Site Management Plan to ensure long-term management of ECs and ICs, including the performance of periodic inspections and certification that the controls are performing as they were intended
- Recording of an Environmental Easement (EE) to memorialize the remedial action and the ECs and ICs to ensure that future owners of the site continue to maintain these controls as required

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.

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 AQOZFI Inwood LLC for the property located at 4650 Broadway in the Inwood neighborhood of New York, New York (the site). The original Volunteers, 4650 Broadway Holdings LLC and 4650 TIC LLC, entered into a Brownfield Cleanup Agreement (BCA) with the New York State Department of Environmental Conservation (NYSDEC) on December 18, 2018, and Brownfield Cleanup Program (BCP) Site No. C231123 was assigned. On December 13, 2019, the BCA was amended to document the transfer of ownership and add AQOZFI Inwood LLC as a Volunteer. The Volunteers propose to remediate the site for residential and commercial use.

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1.1 Site Location and Description

The site is located at 4650 Broadway in the Inwood neighborhood of New York, New York, and is identified on the Manhattan Borough Tax Map as Block 2175, Lot 1. The 47,175-square foot lot is located at the southwestern corner of the city block bound by Dongan Place to the north, Arden Street to the east, Sherman Avenue to the south, and Broadway to the west and was formerly improved with a two-story vacant parking garage with a full cellar (7 to 12 feet below sidewalk grade) and partial sub-cellar (about 4 additional feet below cellar grade). The southern part of the building was most recently operated by Park-it Pilot Parking LLC as a commercial parking garage, and the northern part of the building was most recently used to store antique cars and construction materials. The parking garage was demolished between September and November 2021.

A Site Location Map, which includes a United States Geological Survey (USGS) topographical quadrangle map, is included as Figure 1. The site boundaries are indicated on the Boundary Survey included in Appendix A.

1.2 Redevelopment Plan

The remedy proposed in this RAWP is intended to make the site protective of human health and the environment consistent with the contemplated residential and commercial end use. The proposed redevelopment plan and end use are described here to provide the basis for this assessment; however, the remedial action contemplated under this RAWP may be implemented independent of the proposed redevelopment plan.

The proposed redevelopment project is still in design development and is subject to change. Current plans call for the development to include demolition of the existing building and construction of a 20-story structure with a cellar level. The new building footprint will span the entire 47,175-square-foot lot, and is anticipated to include parking, residential units and amenities, an elementary and middle school, and community space. The existing cellar grade is at about elevation (el)[1] 26, corresponding to between about 7 to 12 feet below sidewalk grade, which ranges from el 32.9 to 38.6 around the site perimeter. The current plans show the top of the proposed cellar slab at about el 24.0, corresponding to between about 9 and 14 feet below sidewalk grade. The site will be excavated up to five feet below current cellar grade to accommodate the construction of a new cellar level and foundation elements. Proposed redevelopment plans are included in Appendix B.

1.3 Description of Surrounding Property

The site is located in an urban area characterized by multiple-story commercial, residential, and institutional buildings and a municipal park. The table on the following page is a summary of surrounding property usage:

[1] Elevations are referenced to the North American Vertical Datum of 1988 (NAVD88) unless otherwise noted.

Direction	Adjoining Properties			Surrounding Properties
	Block No.	Lot No.	Description	
North	2175	10	Five-story residential/commercial building (4672 Broadway)	Multiple-story residential and commercial buildings and Fort Tryon Park
East	2175	100	Six-story residential/commercial building (20 Sherman Avenue)	Multiple-story commercial and residential buildings and a private school
	2175	113	Six-story residential building (19 Dongan Place)	
South	Sherman Avenue followed by:			
	2174	1	Five-story residential/commercial building (1 Sherman Avenue)	Multiple-story commercial and residential buildings
	2174	8	Six-story residential/commercial building (9 Sherman Avenue)	
West	Broadway followed by:			
	2179	625	Fort Tryon Park	Henry Hudson Parkway and Fort Washington Park

Land use within a half mile of the site is primarily commercial and residential, but also includes public parks, day care centers, and schools. A New York City Transit Authority (NYCTA) subway tunnel for the "A" line is located about 300 feet northwest of the site beneath Fort Tryon Park. Sensitive receptors, as defined in NYSDEC DER-10, located within a half mile of the site are listed in the following table:

Number	Name (approximate distance from site)	Address
1	Our Lady Queen of Martyrs School (350 feet northeast)	71 Arden Street New York, New York 10040
2	New York Child Resource Center (370 feet south)	4624 Broadway New York, New York 10040
3	Middle School 322 (400 feet south)	4600 Broadway New York, New York 10040
4	Middle School 322/I.S. 218 Salome Urena (415 feet south)	4600 Broadway New York, New York 10040
5	P.S 152M (450 feet southeast)	93 Nagle Avenue New York, New York 10040
6	Cecelia Garcia Family Day Care (600 feet south)	61 Ellwood Street New York, New York 10040
7	The Y Nursery School (790 feet south)	54 Nagle Avenue New York, New York 10040
8	GR Family Daycare (850 feet southeast)	2 Thayer Street New York, New York 10040
9	High School for Excellence and Innovation (1,300 feet northeast)	650 Academy Street New York, New York 10034

Number	Name (approximate distance from site)	Address
10	The Learning Clubhouse Day Care (1,200 feet southwest)	10 Hillside Avenue New York, New York 10040
11	Treehouse Daycare (1,350 feet northeast)	11 Seaman Avenue New York, New York 10034
12	Payson Playground (1,400 feet north)	285-287 Dyckman Street New York, New York 10034
13	Little Red Daycare (1,250 feet southeast)	176 Nagle Avenue New York, New York 10034
14	Inwood Early College for Health and Information Technology (1,500 feet northeast)	650 Academy Street New York, NY 10034
15	B & J Wonderland Daycare #4 (1,670 feet south)	4500 Broadway New York, New York 10040
16	Aura's Bright Children Daycare (1,450 feet northeast)	13-19 Cumming Street New York, New York 10034
17	Amistad Dual Language School/ Muscota New School (1,725 feet northeast)	4862 Broadway New York, New York 10034
18	Professor Juan Bosch Public School/P.S 178M (1,775 feet southeast)	12 Ellwood Street New York, New York 10040
19	My Little Dream Daycare (1,830 feet northeast)	71 Vermilyea Avenue New York, New York 10034
20	George Washington Educational Campus (1,970 feet southeast)	549 Audubon Avenue New York, New York 10040
21	The Equity Project Charter School (1,700 feet northeast)	153 Sherman Avenue New York, New York 10034
22	Monsignor Kett Playground (2,045 feet east)	500 West 204th Street New York, New York 10034
23	New City Housing Authority's Dyckman Day Care Center (2,000 feet southeast)	3732 10th Avenue New York, New York 10034
24	Muscota New School (1,900 feet northeast)	4862 Broadway New York, New York 10034
25	Nicholas Cardell Day Care Center (1,950 feet northeast)	84 Vermilyea Avenue New York, New York 10034
26	Washington Heights Academy (2,150 feet northeast)	202 Sherman Avenue New York, New York 10034
27	Bellgan Group Family Daycare (2,000 feet south)	82 Wadsworth Terrace New York, New York 10040
28	Little Daydreamers 2 Day Care (2,100 feet northeast)	81 Seaman Avenue New York, New York 10034
29	Success Academy Washington Heights (2,265 feet southwest)	701 Fort Washington Avenue New York, New York 10040
30	Little Daydreamers Early Learning Center (2,300 feet northeast)	103 Seaman Avenue New York, New York 10034

Number	Name (approximate distance from site)	Address
31	God Is Love Reaching the Heights Inc. (2,000 feet northeast)	650 W 204th Street New York, New York 10034
32	Public School 5 Ellen Lurie (2,200 feet southeast)	3703 10th Avenue New York, New York 10034
33	Inwood Academy for Leadership (2,420 feet east)	433 West 204th Street New York, New York 10034
34	Little Jewel Childcare, Inc. (2,600 feet northeast)	4915 Broadway New York, New York 10034
35	Bright Moon Group Family Day Care (2,300 feet southwest)	195 Bennett Avenue New York, New York 10040
36	Smart Start Learning Center WeeCare (2,600 feet northeast)	125 Seaman Avenue New York, New York 10034
37	Peek A Boo Day Care (2,400 feet east)	436 W 204th Street New York, New York 10034
38	Happy Shiny Faces Daycare (2,630 feet northeast)	136 Seaman Avenue New York, New York 10034
39	Growing Happy Group Family Day Care (2,500 feet south	330 Wadsworth Avenue New York, New York 10040
40	Dreams of Kids Group Family Day Care (2,500 feet south)	607 W 190th Street New York, New York 10040

2.0 DESCRIPTION OF REMEDIAL INVESTIGATION FINDINGS

The RI was completed to characterize the nature and extent of contamination at the site, in accordance with Title 6 of the New York Codes, Rules, and Regulations (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), between April 9 and September 13, 2018. Emerging contaminant sampling was completed in August 2019. The RI Report (RIR) was approved by the NYSDEC and NYSDOH on December 11, 2020.

2.1 Remedial Investigation

The RI consisted of the following:

- Advancement of 39 soil borings, from which 79 grab soil samples (including four duplicate samples) were collected
- Advancement of 8 soil borings from which 17 grab soil samples were collected for emerging contaminant analysis (including one duplicate sample)
- Installation of fifteen groundwater monitoring wells and collection of seventeen groundwater samples (including two duplicate samples)
- Surveying and synoptic gauging of nine groundwater monitoring wells (RMW01 through RMW09) to determine local groundwater flow direction
- Installation of eight soil vapor points and collection of eight soil vapor samples

2.1.1 Soil Investigation

A Langan field engineer documented the advancement of 39 RI soil borings by Eastern Environmental Solutions, Inc. (Eastern) of Manorville, New York. Boring locations were selected to investigate the potential areas of concern (AOCs). The borings were advanced using a direct-push Geoprobe® 6610DT track-mounted drill rig. Borings located in the cellar were advanced to depths ranging from about 9 to 16 feet below cellar grade (between 16 and 28 feet below grade surface [bgs]). Two sidewalk borings were advanced to 20 and 28 feet bgs.

Soil was recovered continuously from the surface to the completion depth of each boring. Samples were collected into 3- or 4-foot long acetate liners using a 2-inch diameter Macro-Core® or DualTube® sampler. The soil was screened for visual, olfactory, and instrumental evidence of a chemical or petroleum release, and was visually classified for soil type, grain size, texture, and moisture content. Instrument screening for the presence of organic vapors was performed using a photoionization detector (PID) equipped with a 10.6 electron volt (eV) lamp. Following sample collection, borings were backfilled with soil cuttings that did not display evidence of environmental impacts, and patched with concrete; or borings were converted to groundwater monitoring wells.

Concentrations of semivolatile organic compounds (SVOCs) above the Part 375 6 NYCRR Unrestricted Use (UU) Soil Cleanup Objectives (SCOs) were detected at borings RSB07 and RSB13 between 7 to 8 feet below cellar grade. To further define the extent of SVOC impacts in these locations, a supplemental investigation was completed. During the supplemental investigation, a boring was advanced adjacent to the original RSB07 and RSB13 boring locations (RSB07_R and RSB13_R). Three soil borings were advanced in three cardinal directions around the re-drilled boring at the original boring location, and a sample was collected from 7 to 8 feet below cellar grade to delineate the extent of SVOC-impacted soil.

2.1.2 Groundwater Investigation

A Langan field engineer documented conversion of fifteen soil borings into permanent groundwater monitoring wells by Eastern. One groundwater sample was collected from each monitoring well to characterize groundwater conditions and to investigate potential groundwater impacts associated with the AOCs. Two duplicate groundwater samples were also collected.

Soil borings were converted into groundwater monitoring wells by inserting 10 feet of 1- or 2-inch diameter, schedule 40, 0.01-inch slotted polyvinyl chloride (PVC) screen at the base of the well, and attached PVC riser to grade. The annulus of each groundwater monitoring well was filled with No. 2 sand to a depth of about 2 feet above the top of the screen followed by a bentonite seal to grade surface. Following installation, the groundwater monitoring wells were developed using a peristaltic pump until the water ran clear. Purged groundwater was containerized in labeled 55-gallon drums awaiting disposal at a permitted facility.

The top of casing elevations of monitoring wells RMW01 through RMW09, were surveyed by Langan on April 16, 2018. Synoptic groundwater levels were measured using a Solinst 122 oil/water interface probe on May 9, 2018. Remaining monitoring wells did not need to be surveyed to develop a representative groundwater contour of the site.

2.1.3 Soil Vapor Investigation

A Langan field engineer documented installation of eight soil vapor probes by Eastern. The soil vapor probes were installed about 2 feet above the water table (2.5 to 3 feet below cellar grade). Eastern used a direct push Geoprobe® 6610DT track-mounted drill rig or an electric hand drill to install the soil vapor probes.

Soil vapor probes were installed in accordance with the 2006 NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York and were comprised of polyethylene implants (1/2-inch diameter and 1-7/8-inch long) threaded into 3/16-inch-diameter polyethylene tubing. The annulus of each probe was filled with No. 2 sand to a depth of about 4 inches above top of screen followed by a hydrated bentonite seal to surface grade.

Soil boring, monitoring well, and soil vapor probe locations are shown on Figure 2.

2.1.4 Samples Collected

A total of 96 soil samples, including 5 duplicate samples, were collected for laboratory analysis. Soil samples from borings RSB01 through RSB15 were generally collected at the 0- to 2-foot depth interval (i.e., shallow fill), the groundwater interface, or, when encountered, the greatest degree of petroleum-impacts. Samples from sixteen soil borings were collected and analyzed for VOCs and SVOCs to delineate the extents of the petroleum plume in the south-central part of the site. Samples from these borings were collected from the interval of greatest observed petroleum impacts and the interval below observed impacts, or if impacts were not encountered, samples were only collected from the groundwater interface. At the request of the NYSDEC, samples from eight borings were collected for emerging contaminant sampling and analyzed for per- and poly-fluoroalkyl substances (PFAS) and 1,4-dioxane. One sample from RSB09A was collected and analyzed for PFAS via Total Oxidizable Precursor (TOP) Assay.

Fifteen groundwater samples and two duplicate samples were collected at least one week following well development. Samples were collected in accordance with the United States Environmental Protection Agency's (USEPA) low-flow groundwater sampling procedure ("Low Stress [low-flow] Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Wells", dated July 30, 1996 and revised January 19, 2010) to allow for collection of representative samples.

Eight soil vapor samples were collected into laboratory-supplied, batch-certified, 2.7-Liter Summa® canisters that were calibrated for a sampling rate of about 0.05 liters per minute (L/min) over about 120 minutes of sampling. For quality assurance/ quality control (QA/QC) purposes, one indoor ambient air sample was collected in the stairwell in the southeast corner of the cellar site.

Soil, groundwater, and soil vapor samples were submitted for laboratory analysis to Alpha Analytical Inc., an NYSDOH Environmental Laboratory Approval Program (ELAP)-certified laboratory located in Westborough, Massachusetts.

2.1.5 Chemical Analysis

The laboratory analyses performed on the soil, groundwater, soil vapor, and indoor air samples are summarized below by media.

Soil samples collected from borings RSB01 through RSB15 were analyzed for the following parameters:

- Part 375-listed volatile organic compounds (VOCs) via USEPA Method 8260C
- Part 375-listed SVOCs via USEPA Method 8270D
- Polychlorinated biphenyls (PCBs) via USEPA Method 8082A
- Part 375-listed pesticides via USEPA Method 8081B
- Part 375-listed herbicides via USEPA Method 8151A
- Part 375-listed metals including hexavalent and trivalent chromium via USEPA Methods 6010C, 7471B, and 7196A
- Total cyanide via USEPA Method 9010C/9012B

Soil samples collected from borings RSB16 through RSB22 and RSB25 through RSB33 were analyzed for the following parameters:

- Part 375-listed VOCs via USEPA Method 8260C
- Part 375-listed SVOCs via USEPA Method 8270D

Soil samples collected from delineation borings surrounding RSB07 and RSB17 were analyzed for Part 375-listed SVOCs via USEPA Method 8270D. Additional soil samples were collected from borings RSB16 and RSB20 to support the identification and evaluation of remediation alternatives. Two grab samples were collected and analyzed for soil parameters including grain size, total organic carbon (TOC), and/or total petroleum hydrocarbons (TPH).

Soil samples collected from RSB03A, RSB05A, RSB06A, RSB07A, RSB08A, RSB09A, RSB14A and RSB15A were analyzed for PFAS and 1,4-dioxane via USEPA Method 537 and 8270D-SIM. One sample from RSB09A was analyzed for PFAS via TOP Assay.

Groundwater samples collected from RMW01 through RMW09 were analyzed for the following parameters:

- Target Compound List (TCL) VOCs and 1,4-dioxane via USEPA Method 8260C
- TCL SVOCs via USEPA Method 8270D

- PCBs via USEPA Method 8082A
- Pesticides via USEPA Method 8081B
- Herbicides via USEPA Method 8151A
- Target Analyte List (TAL) metals (total and dissolved) via USEPA Methods 6020A and 7470A
- PFAS via USEPA Method 537

Groundwater samples collected from monitoring wells RMW16, RMW18, RMW28, RMW30, MW32, and MW33 were analyzed for the following parameters:

- TCL VOCs via USEPA Method 8260C
- TCL SVOCs via USEPA Method 8270D

The groundwater sample collected from RMW16 was also analyzed for TOC.

Soil vapor and indoor air samples were analyzed for VOCs via USEPA Method TO-15.

2.1.6 Remedial Investigation Findings Summary

The findings summarized herein are based on qualitative data (field observations and instrumental readings) and laboratory analytical soil, groundwater, and soil vapor sample results. Cross-sectional diagrams showing inferred soil profiles are included as Figures 3a and 3b. Soil sample results are summarized on Figure 4a and 4b, groundwater sample results are summarized on Figure 5, and soil vapor sample results are summarized on Figure 6.

1. Stratigraphy: Historic fill predominantly consisting of brown, fine- to medium-grained sand with varying amounts of silt, gravel, and concrete was encountered across the site from below the cellar slab to depths ranging from about 2 to 7.5 feet below cellar grade (9 to 19.5 feet bgs). Native soil encountered below historic fill predominantly consists of fine- to medium-grained sand with varying amounts of gravel and silt. Bedrock was encountered during a geotechnical investigation performed by Langan in April and May 2018 and consists of gneiss, mica schist, and marble. The top of bedrock varies from about 30 to 88 feet below cellar grade. The bedrock surface is irregular and generally slopes down to the west and to the north. Boring data indicates bedrock is shallowest within the southeastern part of the site.

2. Hydrogeology: Synoptic groundwater measurements were collected on May 9, 2018 from nine of the monitoring wells installed during the April 2018 RI. Groundwater elevations range between el 20.62 to el 21.6 feet, which corresponds to depths of about

4.4 to 5.3 feet below cellar grade (about 11.4 to 17.38 feet bgs). Groundwater flow is to the northeast. Underground utilities and other subsurface structures may locally influence the direction of groundwater flow.

3. Petroleum Impacts in Soil, Groundwater and Soil Vapor: Petroleum impacts were identified across an area of roughly 12,500 square feet within the southern part of the site, occupying about 25% of the site. Petroleum-related VOCs were detected above the UU and/or Restricted Use-Restricted Residential (RURR) SCOs in soil samples collected between 6 and 10 feet below cellar grade (about 13 to 22 feet bgs) within this area. PID headspace readings of up to 875 ppm, petroleum-like odors, and petroleum-related VOCs above the SGVs were detected at monitoring well locations within the petroleum-impacted area. Petroleum-related contamination was localized to the south-central part of the site, which formerly contained three, 550-gallon gasoline underground storage tanks (USTs) and a petroleum tank room. Petroleum-related VOCs in soil and groundwater are related to the historical petroleum bulk storage at the site, but may also be related to the historical use of the site as an automotive service facility.

4. Historic Fill: Laboratory analytical results indicate that the historic fill contains SVOCs, metals, and PCBs at concentrations above the UU and/or RURR SCOs. The deepest samples exceeding the SCOs were found between 7 and 8 feet below cellar grade (14 to 20 feet bgs). PFAS were detected in historic fill samples.

5. Native Soil: Mercury and seven polyaromatic hydrocarbons (PAHs) were detected above UU and/or RURR SCOs in a native soil sample collected between 7 to 8 feet below cellar grade (14 to 20 feet bgs) in soil boring RSB07; however, these detections are likely a result of infiltration of historic fill material into the borehole during sample collection. Manganese and acetone were also detected above the UU SCOs; however, manganese is a naturally occurring metal, and acetone is a common laboratory contaminant.

6. Soil Vapor: The soil vapor samples contained chlorinated volatile organic compound (CVOC) concentrations which were not detected in the indoor air sample. The tetrachloroethylene (PCE) and trichloroethylene (TCE) concentrations detected in soil vapor may be indicative of a chemical release associated with historical site use, or may be related to the historical use of the southern-adjoining property as a dry cleaning facility. The petroleum-related VOCs detected in the sub-slab soil vapor are likely related to the open petroleum spill in the south-central part of the site. The petroleum-related VOCs detected in indoor air may be related to either the open on-site spill in the south-central part of the site, or to automotive emissions from the former use as a parking garage.

2.2 Significant Threat

The RI Report (RIR) was approved by the NYSDEC and NYSDOH on December 11, 2020. The NYSDEC and NYSDOH has determined that this site does not pose a significant threat to human health and the environment.

2.3 Site History

2.3.1 Past Uses and Ownership

The site was an undeveloped vacant lot until at least 1928. By 1928 the existing two-story building was constructed across the entire footprint of the site and was occupied by an automotive garage and service facility. By 1968, the northern part of the building was occupied by offices with an elevator in the northwestern corner, and the southern part of the building remained as an automotive garage and service facility. Two gasoline tanks are shown in the southwestern corner of the building in Sanborn maps from 1977 through 1994. According to NYSDEC Petroleum Bulk Storage (PBS) database records, three 550-gallon gasoline underground storage tanks (USTs) were removed from the site in August 2009. Additionally, two No.2 fuel oil USTs (one 5,000-gallon and one 2,500-gallon) and one 5,000-gallon No. 4 fuel oil above ground storage tank (AST) were removed from the site in 1998. The site is listed under NYSDEC PBS Facility ID 2-077666.

2.3.2 Previous Environmental Reports

Previous environmental reports were reviewed as part of this RAWP and are summarized in chronological order below. The environmental reports are included in Appendix C.

Phase I Environmental Site Assessment, dated February 21, 2003, prepared by Soil Mechanics Environmental Services (SMES)

SMES prepared a Phase I Environmental Site Assessment (ESA) on behalf of Acadia Realty Trust in accordance with the previous ASTM E-1527-00 standards. The northern part of the first and second floors of the site was formerly occupied by offices for the NYC Human Resources Administration, and the cellar and southern part of the first and second floors contained a parking garage. SMES did not specify Recognized Environmental Conditions (RECs); however, the following potential environmental concerns were discussed:

- Automotive sales and service activity at the site between 1928 and the 1950's
- Petroleum bulk storage, including one active 5,000-gallon fuel oil AST, a closed and removed 5,000-gallon fuel oil UST), a closed and removed 2,500-gallon fuel oil UST, and three closed-in-place 550-gallon gasoline USTs;

- Waste oil drums, oil-like staining on the floor slab, and oil discharge into a floor drain inside the sub-cellar; and
- A dry-cleaning facility (Henry's Cleaners) located at a southern adjoining property.

SMES recommended the following actions:

- Phase II investigation to identify potential subsurface impacts from historical automotive service activity and petroleum storage
- Trace dye analysis of interior floor drains to confirm discharge points
- Registration and decommissioning of the former petroleum storage tanks in accordance with New York State regulations
- Improvement of housekeeping for the storage of used oil drums, active fuel oil tank, and compressed gas cylinders, and containment of potential discharges from parked cars. SMES concluded that nearby off-site petroleum storage facilities and commercial businesses were not environmental concerns, based on their relative locations and the absence of reported spills.

Asbestos Survey Report, dated January 21, 2005, prepared by CNS Management Corp. (CNS)

CNS performed a site-wide asbestos survey on behalf of Acadia Realty Trust in January 2005. CNS identified asbestos containing material (ACM) on the roof, in the cellar, and in the northern part of the building, which was occupied by NYC Human Resources Administration offices. ACM was identified in floor tile, floor tile mastic, pipe insulation, spray-on fireproofing, roofing materials, duct tar, and roof mounted cooling towers. CNS recommended that the ACM be properly removed prior to renovations, or managed in-place with an Operations and Management (O&M) Plan.

Limited Phase II Subsurface Investigation, dated April 21, 2005, prepared by CNS

In January 2004, CNS was retained by Acadia Realty Trust to complete a subsurface investigation that included five soil borings in the cellar around the perimeter of the sub-cellar. Borings west of the sub-cellar terminated at 2 and 8 feet below the cellar slab. Borings east of the sub-cellar were terminated within a clay layer at 15 and 18 feet below the cellar slab. Subsurface soil was described as brown fine loamy sand above clay or bedrock. Groundwater was encountered in two borings east of the sub-cellar at a depth of about 6 feet below the cellar slab. Petroleum staining, odors, and PID measurements between 56 parts per million (ppm) and 356 ppm were observed in one boring located east of the sub-cellar. Staining, odors, or other indications of petroleum impacts were not identified in the other borings.

Five soil samples and one groundwater sample were collected and analyzed for VOCs and SVOCs. The analytical results were compared to NYSDEC Technical Administrative Guidance Memorandum (TAGM) #4046 Allowable Soil Concentrations, Recommended Soil Cleanup Objectives (RSCOs), and Groundwater Standards, which were the applicable standards in 2005. Soil collected from the 4- to 7-foot and 15- to 18-foot depth intervals in one boring east of the sub-cellar contained the petroleum-related VOCs at concentrations above the TAGM RSCOs. Acetone, a common laboratory artifact, was the only compound detected in the groundwater sample above the New York State Groundwater Standards.

The report concluded that the source of the VOC impacts may be the closed-in-place, 550-gallon gasoline USTs. The report recommended a geophysical survey to locate and evaluate the closed USTs as a contaminant source.

Petroleum Bulk Storage Registration letter, dated September 28, 2005, prepared by CNS

In response to an August 2005 filing violation issued by the New York City Fire Department (FDNY), CNS updated the ownership information for the existing 5,000-gallon fuel oil AST and provided supporting documentation for the removal of two historical fuel oil ASTs. According to the registration application, the AST contained No. 4 fuel oil and was installed on an impervious surface.

Asbestos Operations and Maintenance Manual, dated October 1, 2005, prepared by CNS

Following the recommendations of the January 2005 Asbestos Survey Report, CNS completed an Asbestos O&M Manual to establish guidelines mitigating ACM exposure for occupants of the building.

Asbestos Abatement Specifications, dated July 30, 2007 and November 2, 2007, prepared by CNS

On behalf of Acadia P/A Sherman Avenue LLC, CNS solicited bids to remove the ACM identified in the January 2005 Asbestos Survey Report.

Air Monitoring Compliance Report, dated May 14, 2009, prepared by CNS

On behalf of Acadia P/A Sherman Avenue LLC, CNS monitored the abatement of asbestos identified in the January 2005 Asbestos Survey Report. Delta Environmental conducted the abatement between April 28, 2008 and April 2, 2009. A total of 534 cubic yards of ACM waste was removed and transported off-site for disposal. Following abatement, final air monitoring and visual inspections were performed. Sampling results indicated that all airborne asbestos fiber levels were below the regulatory limit for re-occupation of 0.01 fibers per cubic centimeter.

Lead-Based Paint Survey Report, dated May 25, 2009, prepared by CNS

CNS was retained by Acadia Realty Trust to conduct a site-wide survey for lead-based paint (LBP) in April 2009. CNS identified LBP on the interior perimeter walls of the parking garage (southern part of the site) and on the walls of the vehicle ramps from the cellar to the second floor. CNS concluded that the LBP surfaces were in good condition and could remain in place for management under an O&M Program if unaffected by renovation. CNS recommended lead abatement prior to renovation or demolition of the LBP containing surfaces.

Remedial Action Plan, dated June 12, 2009, prepared by CNS

On behalf of Acadia P/A Sherman Avenue LLC, CNS prepared a Remedial Action Plan (RAP) to address petroleum impacts associated with former USTs at the site. The RAP describes an investigation conducted between March 30 and April 1, 2009, which included excavation of 11 test pits on the southern part of the property, east of the boiler room at cellar grade. The test pits were excavated to expose three closed, 550-gallon gasoline USTs and delineate petroleum contamination in soil and groundwater.

Soil observed in the test pits consisted of sandy loam extending about 10 feet below the cellar slab and underlain by clay to about 12 feet below the slab. Soil in the test pits exhibited petroleum odors and organic vapor readings up to 1,153 ppm. Groundwater was encountered between 5 and 10 feet below the cellar slab. Eighteen soil samples were collected from the test pits and analyzed for VOCs and SVOCs. Petroleum-related VOCs were detected above the TAGM RSCOs in soil samples collected from five test pits. SVOCs were not detected at concentrations above the TAGM RSCOs.

In May 2009, CNS installed four groundwater monitoring wells near the USTs and collected groundwater samples for VOC and SVOC analysis. The analytical results indicated that the following petroleum-related VOCs were detected in each sample at concentrations above the NYSDEC groundwater standards, which were misidentified in the RAP as "TAGM #4046 Groundwater Standards": 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, ethylbenzene, isopropylbenzene, naphthalene, n-butylbenzene, n-proplbenzene, p-isopropyltoluene, and xylenes.

Based on the investigation findings, NYSDEC was notified and subsequently assigned Spill No. 0902240 to the spill. CNS concluded that the contaminants were delineated and proposed (i) the removal of the three 550-gallon gasoline USTs, (ii) excavation and removal of surrounding petroleum-impacted soil, and (iii) injections of chemical oxidizers to remediate groundwater.

New York City Department of Environmental Protection (NYCDEP) Groundwater Discharge letter, dated July 8, 2009, prepared by CNS

CNS installed two observation wells (OW-A and OW-B) in the northern part of the cellar in May 2009. CNS collected groundwater samples from each well for analysis of parameters required NYCDEP sewer discharge permitting. VOCs, PCBs, and petroleum-related SVOCs were not detected in the groundwater samples.

Remediation Report, dated October 22, 2009, prepared by CNS

On behalf of Acadia P/A Sherman Avenue LLC, CNS implemented the spill remediation as proposed in the June 2009 RAP. From August 5 to 16, 2009, the three closed 550-gallon gasoline USTs were removed along with 1,610 gallons of liquid product waste. The surrounding impacted soil was excavated to about 6 feet below the floor slab and transported off site for disposal. Analytical results from five confirmation sidewall and bottom soil samples indicated that petroleum-related VOCs and SVOCs were below the state regulatory guidelines. Following the removal of the USTs and surrounding petroleum impacted soil, CNS injected 300 pounds of RegenOx®, a chemical oxidant, into three of the existing monitoring wells. Post injection groundwater samples contained petroleum-related VOCs and SVOCs at concentrations above state regulatory standards.

CNS requested that no further action be required for soil and recommended continued quarterly groundwater monitoring through 2009.

Groundwater Monitoring Reports, dated December 2009 through January 2016, prepared by CNS

CNS prepared 18 quarterly groundwater monitoring reports from December 2009 through January 2016. The reports summarize the collection of groundwater samples from four on-site wells for analysis of petroleum-related VOCs and SVOCs. A fifth well was installed in the cellar down-gradient of the remediation area, and was sampled during quarterly events between

October 2014 and January 2016. As of the most recent January 2016 report, VOCs and SVOCs were detected above applicable state standards.

Phase I Environmental Site Assessment, dated May 2014, prepared by Langan

Langan prepared a Phase I ESA in accordance with the ASTM E-1527-13 standards. The report was prepared for Washington Square Partners, Inc., a consultant for Acadia P/A Sherman Avenue LLC. The following RECs were identified:

- The site was formerly identified as a garage and service station and contained a 2,500-gallon fuel oil UST, a 5,000-gallon fuel oil UST, a 5,000-gallon AST, and three 550-gallon gasoline USTs. During removal of the 550-gallon USTs, impacted soil and groundwater were observed, and NYSDEC Spill No 0902240 was assigned. Following injection of RegenOx®, and continued groundwater monitoring, elevated concentrations of petroleum-related VOCs and SVOCs were detected above regulatory standards, and the spill remained open.
- A gasoline filling station, and manufacturing facility were located proximate to the site, at 4706 Broadway, and 1 Sherman Avenue, respectively. NYSDEC Spill No. 0809967 was assigned to 1 Sherman Avenue, and administratively closed in 2013. However, records indicate that impacted soil and groundwater remain at the site.

Aboveground Storage Tank Removal Report, dated February 17, 2016, prepared by CNS

CNS performed the removal of a 5,000-gallon fuel oil AST, on behalf of Acadia P/A Sherman Avenue LLC. The report indicates that the former AST rested on a competent concrete slab in the cellar, and no staining was observed. The tank was emptied prior to the removal. Field activities included the removal of the cinderblock vault containment, steel tank and all piping components. An affidavit was filed with the NYC FDNY documenting the tank removal.

Phase I Environmental Site Assessment, dated March 2018, prepared by Langan

Langan prepared a Phase I ESA for the site in accordance with the ASTM E-1527-13 standards. The report was prepared for FBE Limited LLC. The following RECs were identified:

- Petroleum-impacted soil and groundwater were documented near three historical gasoline USTs and a former petroleum tank room in the southern part of the cellar in 2004 and 2009. NYSDEC Spill No. 0902240 was reported, and the USTs and petroleum-impacted soil were subsequently removed. Endpoint sampling results indicate that soil impacts were remediated; however, quarterly monitoring performed through January

2016 indicates that petroleum contamination persists in groundwater and may impact soil vapor.

- Vehicle repair was conducted at the site between about 1928 and at least 1950. Undocumented releases of petroleum, solvents, and/or other hazardous substances may have adversely impacted soil, groundwater, and/or soil vapor.
- A former petroleum spill and historical dry cleaning facility were located on the southern adjoining property at 107 Ellwood Street/7 Sherman Avenue. NYSDEC Spill No. 0809967 was associated with soil and groundwater contamination originating from a petroleum tank release in 2008. Although the spill was closed in 2013, endpoint groundwater sampling was not documented. A commercial dry cleaning facility was also located at the site between 2001 and 2008. Residual petroleum impacts from the former spill and undocumented releases of chlorinated solvents from the drycleaner may have adversely impacted soil vapor and groundwater at the site.

Phase II Environmental Site Investigation Report, dated March 2018, prepared by Langan

The Phase II Environmental Site Investigation (ESI) was conducted to further investigate the RECs identified in the March 2018 Phase I ESA. The Phase II ESI included a geophysical survey, advancement of eight soil borings, installation of four groundwater monitoring wells and four soil vapor probes, and collection of soil, groundwater, and soil vapor samples for laboratory analysis. The following observations were made during the March 2018 Phase II ESI:

- The geophysical survey did not identify subsurface anomalies indicative of a UST.
- Fill material, generally consisting of brown, medium-grained sand with varying amounts of fine sand, silt, and gravel was identified from surface grade to depths of up to 4 feet below the cellar slab across the site footprint. Native soil, typically consisting of brown, fine-grained sand with varying amounts of silt and clay, was identified across the site footprint beneath the fill layer to depths ranging from 4 to 12 feet below cellar grade. Groundwater was encountered at depths ranging from about 4 to 7 feet below cellar grade.
- Petroleum impacts were identified at the groundwater interface in soil and groundwater samples in sample location SB02. Concentrations of several VOCs were detected above the 6 NYCRR UU and/or RURR SCO and NYSDEC Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1 Ambient Water Quality Standards and Guidance Values for Drinking Water (class GA) (collectively referred to as the Standards and Guidance Values [SGVs]). These impacts are related to historical releases from the

three 550-gallon gasoline USTs formerly located in this area, documented as NYSDEC Spill No. 0902240. Monitoring of this open spill is ongoing.

- Lead was detected at a concentration above the UU SCO in soil sample SB05_1-2. This concentration is typical of historic fill material in New York City. Dissolved metals, including magnesium, manganese, mercury, and sodium, were detected at concentrations exceeding SGVs. Magnesium, manganese, and sodium are naturally occurring and are not indicative of a release. The groundwater sample containing dissolved mercury was collected within the fill material, which typically contains metals at concentrations exceeding SGVs.

The Phase II ESI soil boring, monitoring well, and soil vapor probe locations are shown on Figures 4A, 4B, 5, and 6, respectively. Soil, groundwater, and soil vapor laboratory analytical results are appended to the RIR.

2.4 Geology and Hydrogeology

Geologic and hydrogeologic observations are described below. Cross-sectional diagrams showing inferred soil profiles are included as Figures 3a and 3b. Soil boring logs, groundwater contour map, and groundwater monitoring well construction logs are appended to the RIR.

2.4.1 Historic Fill Material

Historic fill material was encountered beneath the cellar slab to depths ranging from about 2 to 7.5 feet below cellar grade (9 to 19.5 feet bgs). The historic fill predominantly consists of brown, fine- to medium-grained sand with varying amounts of silt, gravel, and concrete.

2.4.2 Native Soil

Historic fill was underlain by glacial till that predominantly consists of fine- to medium-grained sand with varying amounts of gravel and silt. The glacial till extends to the termination depth at each RI boring.

2.4.3 Bedrock

Bedrock was not encountered during the April 2018 RI; however, bedrock was encountered during a Geotechnical Investigation performed by Langan in April and May 2018. Bedrock consists of gneiss, mica schist, and marble. The top of bedrock varies from about 30 to 88 feet below cellar grade. The bedrock surface is irregular and generally slopes down to the west and to the north. Boring data indicates bedrock is shallowest within the southeastern part of the site.

2.4.4 Hydrogeology

Synoptic groundwater measurements were collected on May 9, 2018 from nine groundwater monitoring wells (RMW01 through RMW09). Groundwater elevations range from el 20.62 to el 21.6 feet, which corresponds to depths of about 4.4 to 5.3 feet below cellar grade (about 11.4 to 17.38 feet bgs). Groundwater flows northeast towards the Harlem River. Underground utilities and other subsurface structures may locally influence the direction of groundwater flow.

2.5 Contaminant Conditions

2.5.1 Conceptual Site Model

A conceptual site model (CSM) has been developed based on the findings of the RI. The purpose of the CSM is to develop 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 include historical petroleum bulk storage at the site, historic fill, the historical site use as an automotive service facility, a petroleum spill at an adjoining property, and the historical use of an adjoining property as a dry cleaning facility.

Historic fill material encountered beneath surface cover to depths ranging from about 2 to 7.5 feet below cellar grade (9 to 19.5 feet bgs) originated from unidentified source areas and was placed as backfill at an unknown time, prior to the development of the current on-site building. Total PCBs detected at a concentration above the UU SCO collected near the site's southern perimeter is likely related to the historic fill. SVOCs, specifically PAHs, detected at concentrations above the UU and/or RURR SCOs may be related to the nature of historic fill. Metals detected at concentrations above the Part 375 UU and/or RURR SCOs are related to the historic fill. PAHs and mercury were detected above UU and/or RURR SCOs in one native soil sample collected from the 7 to 8 foot interval below cellar grade in soil boring RSB07; however, these detections are likely a result of infiltration of historic fill material into the borehole during sample collection.

Evidence of petroleum-related contamination observed in the south-central part of the site is related to a historical release from three, 550-gallon gasoline tanks, which were removed in August 2009. Evidence of petroleum-related SVOCs in the groundwater may be related to the petroleum-spill at the southern adjoining property.

The perfluorooctanoic acid (PFOA) detection in groundwater may be related to the historical use of the site as an automotive service facility, or may be related to an off-site source.

PCE and TCE detections in soil vapor may be indicative of a chemical release associated with the historical use of the site as an automotive service facility, or may be related to the historical use of the southern adjoining property as a dry cleaning facility.

Exposure Media

The impacted media include soil, groundwater, and soil vapor. Petroleum-related VOCs and SVOCs in soil and groundwater were detected above standards in the southern-central part of the site. Historic fill-related metals were detected in soil across the site. PAHs were identified in historic fill material in the northeast corner of the site (RSB07 and RSB13), and total PCBs were identified in historic fill material near the southern site perimeter (RSB03). PCE and TCE were detected in four soil vapor samples collected throughout the site footprint.

Receptor Populations

The site is currently vacant; the former parking garage was demolished between September and November 2021. Current receptor populations include investigation workers. During site development, human receptors will be limited to construction and remediation workers, authorized guests visiting the site, and the public and pedestrians adjacent to the site. Under future conditions, receptors will include the residential and commercial use occupants, employees, and the nearby community, including children.

2.5.2 Description of Areas of Concern (AOC)

Based on site observations, site development history, and the findings of the Phase I ESA, five AOCs were identified. This section discusses the results of the Phase II ESI and RI with respect to the AOCs. AOCs are shown on Figure 2.

2.5.2.1 AOC 1: On-Site Open Petroleum Spill

Petroleum-related contamination was observed in the south-central part of the site, which formerly contained three, 550-gallon gasoline USTs and a petroleum tank room. Based on field observations and laboratory analytical results, the petroleum-impacts within this area are limited to groundwater and soil from about 6 to 10 feet below cellar grade, with the exception of RSB02 and SB02, which identified impacts starting at top of cellar grade. The depth of petroleum impacts were delineated vertically (as evidenced by the absence of visual/olfactory observations, PID readings above background, and/or analytical data indicating petroleum-related VOCs or SVOCs) at RSB01, RSB02, RSB03A, RSB04, RSB09, RB12, RSB16, RSB17, RSB21, RSB22, RSB26, RSB27, and RSB29.

The horizontal extent of petroleum impacts from the former gasoline tanks in the southern-central part of the site was delineated to the southern site boundary, and extends to the following boring locations in which petroleum impacts were absent: SB/MW01, SB/MW03, SB06, SB07, RSB08/MW08, RSB09/RMW09, RSB13, RSB13_S2, RSB20, RSB28, RSB30, RS31, RSB32/MW32, and RSB33/MW33. Petroleum-related contamination is related to the historical petroleum bulk storage at the site.

Petroleum-related VOCs were detected in soil vapor and indoor air samples at the site. Petroleum-related VOCs in soil vapor samples are likely associated with the open on-site spill, and the petroleum-related VOCs in the indoor air may be related to either the open on-site spill in the south central portion of the site, or to automotive emissions from the former use as a parking garage.

2.5.2.2 AOC 2: Historic Fill

Historic fill, which is ubiquitous across the site footprint, was encountered to depths ranging from 2 to 7.5 feet below cellar grade (9 to 19.5 feet bgs). SVOCs, metals, and PCBs were detected at concentrations above the UU and/or RURR SCOs in samples of historic fill, with the deepest exceedances found between 7 and 8 feet below cellar grade (14 to 20 feet bgs). SVOCs and mercury were detected above UU and/or RURR SCOs in one native soil sample collected from the 7 to 8 foot interval below cellar grade in soil boring RSB07. Manganese and acetone were also detected in native soil above the UU SCOs; however, manganese is a naturally occurring metal, and acetone is a common laboratory contaminant. Antimony, arsenic, beryllium, chromium, copper, lead, nickel, and selenium were not detected in groundwater samples at dissolved concentrations; therefore, the detections in unfiltered samples are likely the result of suspended solids in groundwater derived from historic fill. Iron, magnesium, manganese, and sodium were detected in dissolved groundwater samples above SGVs and are characteristic of naturally-occurring groundwater conditions.

Based on the analytical data, it is not likely that the PAHs in historic fill within the northeast part of the site are the source of PAHs detected in groundwater within the south-central part of the site.

2.5.2.3 AOC 3: Historical Use of the Site

An automotive service facility was located at the site from approximately 1928 to 1968. Three, 550-gallon gasoline USTs associated with the automotive service facility were removed from the site in August 2009. Contaminants of concern (COCs) associated with AOC 3 include chlorinated solvents, and petroleum products. Petroleum impacts are addressed in AOC 1.

Dissolved metals (including iron, magnesium, manganese, and sodium) were detected at concentrations above the SGVs in groundwater samples collected throughout the site. PCE and TCE were detected at concentrations above indoor air concentrations in six soil vapor samples collected throughout the site. PFOA was detected in the groundwater sample collected from RMW03 at a concentration above the USEPA health advisory and the NYSDEC PFAS guidance value of 10 nanograms per liter (ng/L). Products frequently used in the automotive industry such as polishes, waxes, paints, varnishes, lubricants, and cleaning products may have contained PFOA.

Iron, magnesium, manganese, and sodium are naturally occurring and are not indicative of a release. CVOCs detected in soil vapor may be related to degreasing and cleaning operations performed during the historical use of the site as an automotive service facility. The PFOA detections in groundwater may be related to chemicals formerly handled during the historical site use as an automotive service facility.

2.5.2.4 AOC 4: Petroleum Spill at Adjoining Property

A former petroleum spill was located on the southern-adjoining property at 107 Ellwood Street/7 Sherman Avenue. NYSDEC Spill No. 0809967 was associated with soil and groundwater contamination originating from a petroleum tank release in 2008. Although the spill was closed in 2013, endpoint groundwater sampling was not documented. Petroleum-related SVOCs were detected at concentrations above the SGVs in groundwater samples collected from RMW04 and MW32.

Evidence of petroleum-related contamination associated with the on-site spill is localized in the south-central part of the site. Based on the southern-adjoining location of NYSDEC Spill No. 0809967 and the absence of SVOCs in soil samples collected from borings RSB04 and RSB32, the petroleum-related SVOCs detected above SGVs in groundwater, are likely associated with the closed petroleum spill at the adjoining property.

2.5.2.5 AOC 5: Historical Use of Adjoining Property

A dry cleaning facility was located on the southern-adjoining property at 107 Ellwood Street/7 Sherman Avenue between 2001 and 2008. COCs associated with AOC 5 include PCE and its daughter products (i.e., TCE, cis-1,2-dichloroethene, and vinyl chloride). PCE has the potential to infiltrate groundwater and can readily migrate to surrounding properties. PCE and TCE were detected in six soil vapor samples collected throughout the site during the April 2018 RI. PCE was also detected in three soil vapor samples collected from the southern part of the site during the March 2018 Phase II ESI. Cis-1,2-dichloroehtene and vinyl chloride were not detected in soil vapor samples. Soil vapor samples with PCE and TCE concentrations may be indicative of a chemical release associated with historical use of the site as an auto repair facility or the southern adjoining property as a dry cleaning facility.

2.5.3 Nature and Extent of Contamination

This section evaluates the nature and extent of soil, groundwater, and soil vapor contamination. The nature and extent of the contamination is derived from a combination of field observations and analytical data. Soil sample results are summarized on Figures 4A and 4B, groundwater sample results are summarized on Figure 5, and soil vapor sample results are summarized on Figure 6.

2.5.3.1 Soil Contamination

Historic fill predominantly consisting of brown, fine- to medium-grained sand with varying amounts of silt, gravel, and concrete was encountered across the site beneath the surface cover to depths ranging from about 2 to 7.5 feet below cellar grade (9 to 19.5 feet bgs). SVOCs detected at concentrations above the UU and/or RURR SCOs in the northeastern part of the site may be related to the nature of historic fill.

Petroleum-related contamination in the south-central part of the site was identified from about 6 to 10 feet below cellar grade, with the exception of RSB02 and SB02, which identified impacts starting at top of cellar grade. The depth of petroleum impacts were delineated vertically (as evidenced by the absence of visual/olfactory observations, PID readings above background, and/or analytical data indicating petroleum-related VOCs or SVOCs) in twelve soil borings.

The horizontal extent of the petroleum impacts in the southern-central part of the site was delineated to the southern site boundary, and is defined by petroleum impacts, or lack thereof, identified in soil and groundwater at various soil boring and/or groundwater monitoring well locations. The petroleum impacted area is roughly 12,500 square feet and occupies about 25% of the site. Petroleum-related contamination is related to the historical petroleum bulk storage at the site.

Metals, which were detected at concentrations above the UU and/or RURR SCOs in samples of historic fill, are likely related to the nature of historic fill material.

Total PCBs were detected at a concentration above the UU SCO in one sample and are likely related to the nature of the historic fill material.

PFAS were detected in twelve samples and are likely related to the nature of historic fill material. Based on the data collected during the RI there does not appear to be any soil contamination migrating off-site.

2.5.3.2 Groundwater Contamination

PID headspace readings of up to 875 ppm, petroleum-like odors, and petroleum-related VOCs and/or SVOCs above SGVs were observed at eight monitoring well locations. Petroleum impacts to groundwater were delineated horizontally by the absence of visual/olfactory observations, PID headspace readings above background, and/or petroleum-related VOCs above SGVs in seven monitoring wells surrounding the petroleum-impacted area. Petroleum-related VOCs were localized to the southern-central part of the site and are related to the historical petroleum bulk storage at the site.

1,2-Dichloroethane (1,2-DCA) was identified in groundwater in one location at the site above the SGV. A source of 1,2-DCA was not identified at the site and 1,2-DCA is not related to historic on-site operations.

Dissolved metals (including iron, magnesium, manganese, and sodium) were detected at concentrations above the SGVs in groundwater samples collected throughout the site. Iron, magnesium, manganese, and sodium are naturally occurring and are not indicative of a release.

Based on the data collected during the RI groundwater impacts appear to be isolated to an area in the southern part of the site. In addition, this area has been treated via chemical injection and is being monitored to assess the performance of the remedy.

2.5.3.3 Soil Vapor Contamination

The soil vapor samples contained PCE and TCE at concentrations in soil vapor that may be indicative of a chemical release associated with historical site use, or may be related to the historical use of the site as an auto repair facility or the southern-adjoining property as a dry cleaning facility. The petroleum-related VOCs detected in the soil vapor are likely related to the open petroleum spill in the south-central part of the site. The petroleum-related VOCs in the indoor air may be related to either the open on-site petroleum spill or the automotive emissions from the former use of the site as a parking garage. Based on the RI data, detected concentrations do not indicate any potential for off-site soil vapor contamination. In addition, all soil above the groundwater (i.e., any potential soil vapor sources) will be removed as part of remedial and development excavation.

2.6 Environmental and Public Health Assessments

2.6.1 Qualitative Human Exposure Assessment

Human health exposure risk was evaluated for both current and future site and off-site conditions, in accordance with DER-10. The assessment includes an evaluation of potential sources and migration pathways of site contamination, potential receptors, exposure media, and receptor intake routes and exposure pathways.

2.6.1.1 Potential Exposure Pathways – On-Site

<u>Current Conditions</u>

The site is covered by an impervious surface (the concrete building slab). Human exposure to contaminated soil through dermal absorption, inhalation, and ingestion is minimal and controlled through the presence of the impervious surface. There is a potential exposure pathway through dermal absorption, inhalation, and ingestion during soil sampling and test pit excavations associated with site investigation, but it is controlled through implementation of the Health and Safety Plan (HASP).

As groundwater in this area of New York City is not used as a potable water source, a complete exposure pathway to groundwater under current site conditions is unlikely. There is a potential exposure pathway through dermal absorption and ingestion during groundwater sampling associated with site investigation, but it is controlled through implementation of the HASP. The indoor air sample collected in the former parking garage contained concentrations of petroleum-related VOCs that may be related to automotive emissions from the former use as a parking garage, or to vapors emanating through preferential pathways in the concrete foundation slab; therefore, there may be a potential exposure pathway to contaminated vapors in the indoor air through inhalation. Because the site is vacant, the inhalation of site-related contaminants due to soil vapor intrusion does not represent a current concern.

There is a potential exposure pathway to soil vapor through inhalation during soil, groundwater, and soil vapor sampling associated with site investigation. This pathway is controlled through implementation of the HASP.

<u>Construction/Remediation Condition</u>

Construction and remediation may result in potential exposures to site contaminants in the absence of a Health and Safety Plan (HASP) and a Community Air Monitoring Plan (CAMP). Construction and remedial activities include demolition, the excavation and off-site disposal of impacted soil and construction of foundation components. In the absence of a HASP and CAMP, this scenario presents the potential for exposure of soil COCs to construction and remediation workers via dermal absorption, ingestion, and inhalation of vapors and particulate matter. This exposure pathway will be marginalized through the implementation of the HASP, CAMP, and vapor and dust suppression techniques.

Groundwater may be encountered during excavation by workers, and there is potential for exposure to groundwater COCs, in the absence of a HASP, to construction workers via dermal absorption or ingestion. This exposure pathway will be marginalized through the implementation of the HASP.

During site development, construction and remediation workers and the surrounding community could be exposed to soil vapor COCs and contaminated soil via inhalation. Exposure to soil vapor and dust will be limited through the implementation of a HASP, CAMP, and dust and vapor suppression techniques.

<u>Proposed Future Conditions</u>

The site will be developed with the use of institutional controls (ICs) and engineering controls (ECs), as necessary, to control exposure to future tenants, visitors and workers to residual contamination. The following ECs and ICs are planned for the proposed development:

1. If residual groundwater contamination is present after the remedy is implemented, the waterproofing/vapor barrier membrane system incorporated into the new building foundation under future build conditions will serve as an EC to mitigate exposure to residual soil vapor and contaminated groundwater.

2. Deed restrictions on use of groundwater, allowable uses of the site, and vegetable farming will be placed on the property as part of remediation.

3. There is no risk of ingesting groundwater COCs because the site and surrounding area will continue to obtain their drinking water supply from surface water reservoirs located upstate and not from groundwater.

2.6.1.2 Potential Exposure Pathways – Off-Site

<u>Current Conditions</u>

The site is covered with continuous impervious surface cover (concrete building slab), therefore exposure to dust emanating from site soil is unlikely. Contaminated soil vapor that may migrate through cracks would be expected to dissipate readily in ambient air and not present an exposure risk to off-site receptors. The groundwater impacts identified on-site could potentially migrate off-site, but since groundwater in the surrounding area is not used as a potable water source, no complete exposure pathway exists.

Construction/Remediation Condition

Contaminated soil has the potential to be transported off-site by wind in the form of dust or by the tires of vehicles or equipment leaving the site during development, and create an exposure risk to the public adjacent to the site during construction. Contaminated soil vapor would be expected to dissipate readily in ambient air and not present an exposure risk to off-site receptors. Nonetheless, air monitoring will be conducted for particulates (i.e., dust) and VOCs during all intrusive activities as part of a CAMP. Dust and/or vapor suppression techniques will be employed to limit the potential for off-site migration of soil and vapors. Vehicle tires and undercarriages will be washed as necessary prior to leaving the site to prevent tracking material off-site. A soil erosion/sediment control plan will be implemented during construction to control off-site migration of soil. An in-situ groundwater remedy was implemented and has improved the overall water quality pre-construction. The groundwater impacts identified on-site could potentially migrate off-site during development, but since groundwater in the surrounding area is not used as a potable water source, no complete exposure pathway exists. If groundwater is removed during construction, groundwater will be pre-treated and discharged to the New York City sewer system, per NYCDEP permit requirements. Therefore, the potential for public exposure to groundwater on adjacent sites will be minimized.

2.6.1.3 Evaluation of Human Health Exposure

Based on the CSM and the review of environmental data, complete on-site exposure pathways appear to be present, in the absence of ECs, in current and construction-phase conditions. The complete exposure pathways indicate there is a risk of exposure to humans from site contaminants via exposure to soil, groundwater, and soil vapor if mitigation and controls are not implemented.

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, PCBs and PFAS; petroleum-impacted soil and groundwater containing varying concentrations of VOCs and SVOCs; and soil vapor with CVOCs.

Contaminant release and transport mechanisms include potential release and transport during penetration of the site cover for soil, groundwater, and soil vapor sampling. The potential receptor is the on-site sampling personnel and the nearby public. Under current conditions, the likelihood of exposure to humans is limited due to the following:

- The site footprint is covered by a continuous concrete building slab, which prevents direct contact with soil, groundwater, and soil vapor.
- Sampling activities are completed in accordance with a HASP and CAMP that is designed to monitor and prevent exposure to soil, groundwater, and soil vapor contaminants.
- Groundwater at the site is not a potable water source.

Construction/Remediation Activities

During the excavation and foundation construction stage of redevelopment, which includes remediation, points of exposure include disturbed and exposed soil during excavation, dust and potential organic vapors generated during excavation, and contaminated groundwater encountered during excavation and/or dewatering operations. Routes of exposure include ingestion and dermal absorption of contaminated soil and groundwater, inhalation of potential organic vapors arising from contaminated soil vapor and groundwater, and inhalation of dust originating 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 can be avoided or minimized by applying appropriate health and safety measures during construction and remediation, such as monitoring the air for organic vapors and dust, using vapor and dust suppression measures, cleaning truck undercarriages and securing tarp covers before they leave the site to prevent off-site soil tracking, maintaining site security, and wearing the appropriate personal protective equipment (PPE).

A HASP, a RAWP, and a CAMP that include measures such as conducting an air-monitoring program, donning PPE, covering soil stockpiles, altering work sequencing, maintaining a secure construction entrance, proper housekeeping, and applying vapor and dust suppression measures to prevent off-site migration of contaminants during construction will be implemented. Such measures will prevent completion of potential migration pathways for soil, groundwater, and soil vapor.

Proposed Future Conditions

For the proposed future conditions, residual contaminants may remain on-site. If residual impacts exist and ECs/ICs are not implemented, points of exposure could include potential cracks in the foundation of the proposed development, exposure during any future ground-intrusive work, or inhalation of vapors entering the building. The receptor population includes residential and commercial use occupants, employees, and the nearby community, including children. The possible routes of exposure can be avoided or mitigated by removal of contaminated soil or construction and maintenance of a site capping system (e.g., concrete building slab or at least 2 feet of clean soil), installation of a waterproofing/vapor barrier, and implementation of a Site Management Plan (SMP), if necessary depending on the remedy.

Human Health Exposure Assessment Conclusions

1. Human exposure to site contaminants is limited under current conditions due to the surface cover, and access is limited to investigation workers. The primary exposure pathways are dermal contact, ingestion, and inhalation of soil, groundwater, or soil vapor by site investigation workers and, to a lesser extent, the nearby public. The exposure risks can be avoided or minimized by following the appropriate HASP and vapor and dust suppression measures, and by implementing a CAMP during investigation activities.
2. In the absence of mitigation and controls, there is potential for exposure during the construction-phase 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 implementing CAMP and by following the appropriate HASP, vapor and dust suppression, site security measures, and following a NYSDEC-approved RAWP.
3. The existence of a complete exposure pathway for site contaminants to human receptors during proposed future conditions is unlikely, as contaminated soil will be excavated and transported to an off-site disposal facility, groundwater will be remediated, and residual soil will be capped, if required, with an impermeable cover or 2 feet of clean soil. Regional groundwater is not used as a potable water source in New York City. The potential pathway for soil vapor intrusion into the building would be addressed by installation of a waterproofing/vapor barrier, which will minimize soil vapor infiltration. A sub-membrane

depressurization system cannot be installed since the foundation will be beneath the water table.

4. It is possible that a complete exposure pathway exists for the migration of site contaminants to off-site human receptors during current, construction-phase, and future conditions. Monitoring and control measures have been and will continue to be used during investigation and construction to prevent completion of this pathway. Under future conditions, the site will be remediated and ECs/ICs will be implemented, if necessary, to prevent completion of this pathway.

2.6.2 Fish and Wildlife Remedial Impact Analysis

In addition to the human health exposure assessment, DER-10 requires an on-site and off-site Fish and Wildlife Resources Impact Analysis (FWRIA) if certain criteria are met. Based on the requirements stipulated in Section 3.10 and Appendix 3C of DER-10, there was no need to prepare an FWRIA for the site. The same qualitative human health exposure assessment for the site is also presented in the RIR.

2.7 Interim Remedial Measures

An in-situ chemical oxidation (ISCO) program was implemented between April and August 2019 in accordance with the March 4, 2019 Interim Remedial Measures Work Plan (IRMWP). The purpose of the program was to treat groundwater impacted with petroleum-related VOCs.

VOC-impacted groundwater was treated via direct push injection points located in a rough grid pattern to spread chemicals evenly across the treatment area. Summit Drilling Company of Bridgewater, New Jersey, and Regenesis of San Clemente, California, implemented the IRMWP under the observation of Langan. Injection points were advanced using a Geoprobe® direct-push drilling rig over a 12,500 square foot petroleum plume. Injection point locations were divided into two groups, Area A (source area) and Area B (residual petroleum impacted area). The chemicals were injected at a rate of 10 to 35 pounds per square inch (psi) through a 1.5-inch-diameter steel rod equipped with either a 2-foot- or 3-foot-long slotted screen. At each injection point, the steel rod was advanced to about 12 feet below cellar grade and injections were made using a "bottom-up" approach, beginning at the deepest 2-foot or 3-foot interval, and raised in 2-foot or 3-foot intervals to roughly 4 to 5 feet below cellar grade (roughly the groundwater surface).

The treatment program began with an initial round of injections of a PersulfOx® and RegenOx® mixture to Areas A and B between April 8 and April 18, 2019. After about 1 month, the second round of injection of the PersulfOx® and RegenOx® mixture was completed in Area A only between May 13 and May 17, 2019. On August 5, 2019, a groundwater sample was collected from RMW04 to evaluate the efficacy of the first two rounds of injections.

A third round of injections was completed between August 5 and August 29, 2019 and included injections of PlumeStop® (a liquid activated carbon substrate) and ORC-Advanced® ([ORC-A] an oxygen release compound). In addition, based on the groundwater observations at RMW04, 17 Petrofix® injections were added to the scope of the third round of injections treatment program in Area A only. Petrofix® is a water-based activated carbon solution that is designed to sorb petroleum hydrocarbons in groundwater while enhancing natural biodegradation of the sorbed contaminants. The NYSDEC was notified of the change in an email dated May 29, 2019. A treatment area location plan, including injection point locations, is included as Figure 7A.

Performance monitoring consists of baseline and post-injection monitoring. The baseline sampling was conducted prior to injections during the 2018 RI. Baseline samples were collected from five on-site monitoring wells and one off-site monitoring well. Quarterly post-injection sampling began in March 2020 at the selected post-injection monitoring wells (RMW01, RWM02, RWM03, RWM04, RMW16 and MW32) and seven (Q1-Q7) quarterly sampling events have been performed to date. Monitoring well RMW03 was inaccessible during the Q1 and Q2 sampling events. Monitoring will continue for a minimum of two years per the NYSDEC-approved March 2019 In-Situ Treatment Remedial Design Plan.

When compared to groundwater concentrations observed during the RI, petroleum-related VOCs have generally decreased by one order of magnitude. Petroleum-related VOCs were not detected above the SGVs in RMW04, RMW16, and off-site monitoring well MW32 during the Q1 through Q7 sampling events. VOC concentrations gradually decreased in RWM03 between Q1 through Q5, and no VOCs were detected above the SGVs during Q6. Rebound concentrations above the SGVs for three VOCs were observed in RWM03 during Q7, however, the concentrations decreased by up to 98% when compared to the baseline results. Generally, significant reduction (up to 92%) in targeted petroleum-related VOCs has been observed in RMW01 and RWM02. Review of geochemical parameters recorded during the quarterly sampling events, including ORP and DO, indicate that subsurface conditions are favorable for breakdown of petroleum-related compounds, and some further degradation is anticipated.

In preparation for site remediation and in accordance with the approved IRMWP, the existing building was abated of hazardous materials, including ACM, LBP, and any other identified universal and miscellaneous hazardous waste articles in July 2021. Building demolition was completed between September and November 2021, therefore, access for the collection of additional groundwater samples will be limited until site excavation occurs. An eighth round of groundwater sampling will be completed prior to installation of the site cap at groundwater monitoring wells where VOC concentrations have not met the Remedial Action Objectives (RAOs) for groundwater. If needed, permanent wells will be installed to continue groundwater monitoring until RAOs have been achieved. The post-injection monitoring wells and analytical result trends are presented in Figure 7B and Figure 7C, respectively, and the analytical results are presented in Table 1. Previous quarterly groundwater monitoring reports are included in Appendix C.

2.8 Supplemental Soil Investigation within IRM Treatment Zone

A supplemental soil investigation was performed between March 22 and 25, 2021 in accordance with the NYSDEC-approved March 11, 2021 Supplemental Soil Investigation Work Plan. The purpose of the investigation was to determine the effectiveness of the 2019 IRM on reduction of petroleum-related VOC concentrations in soil within the 12,500-square-foot petroleum-impacted area.

A Langan field engineer documented the advancement of 14 soil boings by AARCO Environmental Services Corporation (AARCO) of Lindenhurst, New York. Boring locations were selected to provide sufficient coverage within the petroleum-impacted area, at a frequency of about one boring per every 900 square feet. The borings were advanced using a direct-push Geoprobe® 6610DT track-mounted drill rig to depths ranging between 8 and 12 feet below cellar grade (between 15 and 24 feet bgs).

Samples were collected into 4-foot-long acetate liners using a 2-inch diameter Macro-Core® sampler. The soil was screened for staining, odors, and VOCs using a PID. Following sample collection, borings were backfilled with soil cuttings that did not display evidence of environmental impacts, and patched with concrete. Observations of petroleum-like odors, staining, and/or elevated PID readings are listed below:

Soil Boring	Depth Interval (feet below cellar grade)	Maximum PID (ppm)	Observations	Depth Interval of Collected Samples (feet below cellar grade)
TZ02	5 to 6	0	Odors and staining present	5 to 6 and 8 to 9
TZ03	5 to 6	0.8	Odors and staining present	5 to 6 and 8 to 9
TZ08	7 to 9	57.9	Odors Present	8 to 9
TZ11	5.5 to 12	4,143	Odors and staining present	8 to 9
TZ12	3 to 9	4,908	Odors and staining present	8 to 9
TZ13	4.5 to 10	3,370	Odors and staining present	8 to 9
TZ14	5 to 7.5	173	Odors and staining present	8 to 9

A total of 16 soil samples were collected, submitted to Alpha, and analyzed for VOCs. Soil samples were collected from the center of the vertical groundwater treatment zone (about 3 feet below the groundwater table) within the 7.5- to 9-foot depth interval in each sample. Two soil samples were also collected from soil borings TZ02 and TZ03 within the 5- to 6-foot depth interval, where petroleum-like staining and/or odors were observed.

Concentrations of acetone exceeded the UU and Protection of Groundwater (PGW) SCOs in two samples (TZ02_5-6 and TZ03_5-6), and total xylenes exceeded the UU and PGW SCOs in one sample (TZ08_8-9). Acetone was not previously detected above the UU, PGW, and/or RURR SCOs in soil within the petroleum-impacted area during the RI and is likely related to laboratory contamination. Supplemental soil boring locations are shown in Figure 8 and analytical results are presented in Table 2. Boring logs, category B laboratory reports, and a Data Usability Summary Report (DUSR) are included as Appendix D.

2.9 Remedial Action Objectives

Based on the results of the RI and emerging contaminant sampling, the following RAOs have been identified for this site.

2.9.1 Soil

Remedial Action Objectives (RAOs) for Public Health Protection:

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

RAOs for Environmental Protection:

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

2.9.2 Groundwater

RAOs for Public Health Protection:

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

RAOs for Environmental Protection:

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

2.9.3 Soil Vapor

RAOs for Public Health Protection:

- Mitigate impacts to public health resulting from existing, or the potential for, soil vapor intrusion into building(s) at the site

3.0 SUMMARY OF REMEDIAL ACTION PLAN

This Section presents an analysis of two remedial action alternatives that can potentially be achieved under the BCP. The proposed SCOs will be the UU SCOs for Alternative I and the lower of the PGW and RURR SCOs for Alternative II. The remediation extents for Alternatives I and II are shown on Figures 9 and 10, respectively.

In preparation for site remediation, the existing building was abated of hazardous materials, including ACM, LBP, and any other identified universal and miscellaneous hazardous waste articles in July 2021. Following abatement of hazardous materials, building demolition was completed between September and November 2021 to facilitate site remediation.

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 Alternative I – Technical Description

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

- Development and implementation of a HASP and CAMP for the protection of on-site workers, the community, and the environment during the remediation phase of development
- Support of excavation (SOE) installation as necessary to facilitate removal of soil exceeding the UU SCOs and/or soil with petroleum-related nuisance conditions
- Excavation, stockpiling, off-site transport, and disposal of all soil exceeding the UU SCOs, which is estimated to be about 6,700 cubic yards from four hotspot locations and the petroleum-impacted area in the northern and southern parts of the site, respectively.
- Dewatering and treatment as necessary to facilitate removal of soil exceeding the UU SCOs
- Removal of 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 Commissioner's Policy (CP)-51, and other applicable NYSDEC UST closure requirements
- Continue quarterly post-injection groundwater sampling for a minimum of two years from the first event (March 2020) per the NYSDEC-approved March 2019 In-Situ Treatment Remedial Design Plan within the petroleum-impacted area

- Collection and analysis of confirmation soil samples to verify UU SCOs have been achieved
- Backfilling of remediated areas to development sub-grade with certified-clean material (i.e., material meeting UU SCOs), virgin stone, or recycled concrete aggregate (RCA). If RCA is used to backfill remediated areas, it must be in accordance with a beneficial use determination (BUD).

The Alternative I remediation extent is shown on Figure 9 and is based on data presented in the RIR, and from the findings of the supplemental soil investigation. The requirements for each of the Alternative I tasks are described below.

<u>On-Site Worker, Public Health, and Environmental Protection</u>

A site-specific HASP will be enforced during excavation and foundation construction to protect on-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, respectively. Both instruments shall be capable of recording data and calculating 15-minute averages. A field engineer, scientist, or geologist will monitor site perimeters for visible dust and odors. The environment will be protected by implementing and enforcing the appropriate soil erosion prevention measures.

<u>Excavation, SOE, and Fill and Soil Removal</u>

VOCs, SVOCs, metals, PCBs, and petroleum-related nuisance conditions were detected in historic fill at concentrations that exceed the UU SCOs. To achieve Track 1, soil removal and disposal will extend from surface grade to depths ranging from about 2 feet below cellar grade to about 9 feet below cellar grade (about 9 to 21 feet below sidewalk grade) within four hotspots located in the northern part of the site, and to about 12 feet below cellar grade (about 19 to 24 feet below sidewalk grade) within the petroleum-impacted area in the southern part of the site. The estimated volume of material requiring removal and off-site disposal for a Track 1 cleanup is about 6,700 cubic yards. This estimate is based on vertical excavation limits derived from the laboratory analytical results and field observations of nuisance petroleum conditions encountered during the RI and/or supplemental soil investigation. UU SCOs are included in Table 3. The excavation depth required to remove hotspots and the petroleum-impacted area will extend below the top of the regional water table and will require localized SOE and dewatering. Remedial excavation is not proposed within the sub-cellar footprint.

Excavation Dewatering and Treatment

Dewatering of groundwater will be required to accommodate excavation of soil to reach the proposed remedial subgrade depth and excavation of soil that exceeds UU SCOs and/or exhibits petroleum-related nuisance conditions. The Contractor will be responsible for dewatering in accordance with applicable NYCDEP and NYSDEC 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.

Tank Removal

Two 40-gallon, 1.5-foot-diameter by 3-foot-long USTs were identified along the northern property boundary during a geotechnical test pit investigation performed in January/February 2021. These USTs, and any other USTs and/or associated appurtenances (e.g., fill lines, vent line, and electrical conduit) encountered during site excavation will be decommissioned and disposed of off-site in accordance with DER-10, 6 NYCRR Part 613.9, NYSDEC CP-51, and other applicable NYSDEC UST closure requirements. Any impacted soil will be excavated, stockpiled separately, characterized, and disposed of off-site at a permitted facility. Following removal of any drums and USTs and associated grossly-impacted soil, confirmation soil samples will be collected from the base and sidewalls of the excavation in accordance with DER-10. If the excavation is enlarged horizontally beyond the dimensions of the tank, additional confirmation soil samples will be collected as required. Following removal of encountered USTs, the NYSDEC PBS registration will be updated. Closure documentation, such as contractor affidavits, bills of lading for sludge disposal, and tank disposal receipts, will be provided as appendices in the Final Engineering Report (FER).

Post-Injection Groundwater Monitoring

Seven quarterly post-injection groundwater monitoring sampling events have been performed since completion of the in-situ injection program to assess treatment effectiveness and remaining groundwater contamination within the petroleum-impacted area. Six performance monitoring wells installed during the RI (RMW01, RMW02, RMW03, RMW04, RMW16, and MW32) were sampled during each of the monitoring events performed between March 2020 and August 2021, with the exception of RMW03 which was inaccessible during the Q1 and Q2 quarterly sampling events. Quarterly post-injection groundwater sampling will continue for a minimum of two years from the first event (March 2020) per the NYSDEC-approved March 2019 In-Situ Treatment Remedial Design Plan. Groundwater monitoring will be performed, as determined by the NYSDOH and NYSDEC, until residual groundwater contaminations are found to be below NYSDEC standards or have become asymptotic over an extended period of time. Quarterly post-injection groundwater sampling analytical results are discussed further in Section 2.7.

Confirmation Soil Sampling

Per NYSDEC DER-10, confirmation soil samples will be collected at a frequency of one bottom sample per 900 square feet of excavation base and one sidewall sample per 30 linear feet of internal sidewall. Sidewall samples will not be collected along the site perimeter because the excavation will extend across the site footprint and the foundation walls will preclude access to perimeter sidewalls. An estimated 53 base-of-excavation and 28 sidewall confirmation soil samples around hotspot areas, plus QA/QC samples, would be collected to confirm remedial performance and will be analyzed for the Part 375 list of VOCs, SVOCs, PCBs, pesticides, cyanide, metals including hexavalent and trivalent chromium, and per- and PFAS and 1,4-dioxane.

Excavation Backfill

Areas of the site requiring over-excavation to achieve UU SCOs will be backfilled to the grade required for the foundation. An estimated 3,700 cubic yards of material will be required to raise the excavated hotspots to development grade upon completion of the Track 1 remediation. Excavation backfill will 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.

Material will consist of on-site soil and/or imported clean fill that meets UU SCOs, or other acceptable fill material such as virgin stone from a quarry or RCA. If RCA is imported to the site, it will 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 will 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.

3.2 Alternative II – Technical Description

Alternative II, a Track 4 remedy, will include the following tasks:

- Development and implementation of a HASP and CAMP for the protection of on-site workers, the community, and the environment during the remediation phase of development

- Excavation of all soils in the upper 2 feet and any soil above the groundwater table which exceeds the PGW SCOs for contaminants of concern in groundwater (about 3,500 cubic yards). The site will be further excavated to about 5 feet below cellar grade as part of site development. Following soil removal, an engineered composite cover system will be installed.
- Removal of 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
- Continue quarterly post-injection groundwater sampling for a minimum of two years from the first event (March 2020) per the NYSDEC-approved March 2019 In-Situ Treatment Remedial Design Plan.
- Collection and analysis of documentation soil samples at the excavation bottom for re-development (about 5 feet below cellar grade)
- Installation of an engineered composite cover system (i.e., reinforced concrete building foundation) underlain by a minimum 20-mil vapor barrier/waterproofing membrane of a building foundation
- Establishment of use restrictions (institutional controls [IC]) including prohibitions on the use of groundwater from the site and prohibitions on sensitive site uses, such as farming or vegetable gardening, to eliminate future exposure pathways
- Establishment of an approved Site Management Plan to ensure long-term management of ECs and ICs, including the performance of periodic inspections and certification that the controls are performing as they were intended
- Recording of an Environmental Easement (EE) to memorialize the remedial action and the ECs and ICs to ensure that future owners of the site continue to maintain these controls as required

The Alternative II extent is shown on Figure 10 and is based on data presented in the RIR and the proposed development plans. The requirements for each of the Alternative II tasks are described below.

<u>On-Site Worker, Public Health, and Environmental Protection</u>

A site-specific HASP (Appendix E) will be enforced during excavation and foundation construction to protect on-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, respectively. The CAMP meters will be capable of recording data and calculating 15-minute averages. A field engineer, scientist, or geologist will monitor site perimeters for visible dust and odors. The environment will be protected by implementing and enforcing the appropriate soil erosion prevention measures.

Fill and Soil Removal

All soils in the upper 2 feet (about 3,500 cubic yards) and any soil above the groundwater table which exceeds the PGW SCOs for contaminants of concern in groundwater will be excavated and transported off-site for disposal. The site will be further excavated to about 5 feet below cellar grade as part of site development. Soil exceeding the PGW and/or RURR SCOs and soil exhibiting petroleum-related nuisance conditions above the groundwater table will be removed excavated as part of remediation. Soil exceeding the PGW and/or RURR SCOs and soil exhibiting petroleum-related nuisance conditions deeper than 5 feet below cellar grade has been treated via ISCO and any residual contamination will remain in place. Following soil removal, an engineered composite cover system will be installed. The lower of the PGW and RURR SCOs are presented in Table 4. Remedial excavation is not proposed within the sub-cellar footprint.

Tank Removal

Two 40-gallon, 1.5-foot-diameter by 3-foot-long USTs were identified along the northern property boundary during a geotechnical test pit investigation performed in January/February 2021. These USTs, and any other USTs and/or associated appurtenances (e.g., fill lines, vent line, and electrical conduit) encountered during site excavation will be decommissioned and disposed of off-site in accordance with DER-10, 6 NYCRR Part 613.9, NYSDEC CP-51, and other applicable NYSDEC UST closure requirements. Any impacted soil will be excavated, stockpiled separately, characterized, and disposed of off-site at a permitted facility. Following removal of any drums and USTs and associated grossly-impacted soil, confirmation soil samples will be collected from the base and sidewalls of the excavation in accordance with DER-10. If the excavation is enlarged horizontally beyond the dimensions of the tank, additional confirmation soil samples will be collected as required. Following removal of encountered USTs, the NYSDEC PBS registration will be updated. Closure documentation, such as contractor affidavits, bills of lading for sludge disposal, and tank disposal receipts, will be provided as appendices in the FER.

Post-Injection Groundwater Monitoring

Seven quarterly post-injection groundwater monitoring sampling events have been performed since completion of the in-situ injection program to assess treatment effectiveness and remaining groundwater contamination within the petroleum-impacted area. Six performance monitoring wells installed during the RI (RMW01, RMW02, RMW03, RMW04, RMW16, and MW32) were sampled during each of the monitoring events performed between March 2020 and August 2021, with the exception of RMW03 which was inaccessible during the Q1 and Q2 quarterly sampling events. Quarterly post-injection groundwater sampling will continue for a minimum of two years from the first event (March 2020) per the NYSDEC-approved March 2019 In-Situ Treatment Remedial Design Plan. Groundwater monitoring will be performed, as determined by the NYSDOH and NYSDEC, until residual groundwater contaminations are found to be below NYSDEC standards or have become asymptotic over an extended period of time. Permanent groundwater monitoring wells will be re-installed as necessary in locations where RAOs have not been achieved following remedial excavation. Quarterly post-injection groundwater analytical results to date are discussed further in Section 2.7.

Documentation Soil Sampling

Per NYSDEC DER-10, documentation soil samples will be collected at a frequency of one bottom sample per 900 square feet of excavation base. Sidewall samples will not be collected along the site perimeter because the excavation will extend across the site footprint and the foundation walls will preclude access to soil sidewalls. An estimated 53 base-of-excavation documentation soil samples, plus QA/QC samples, will be collected to confirm remedial performance and will be analyzed for the Part 375 list of VOCs, SVOCs, PCBs, pesticides, cyanide, metals including hexavalent and trivalent chromium, and per- and PFAS and 1,4-dioxane. Proposed documentation endpoint sample locations are shown on Figure 11.

ICs, ECs, and SMP

An EE will be recorded to impose the ICs and ECs that are part of the selected remedy and which will be binding upon all subsequent owners and occupants of the property. The ICs will restrict the site’s use to restricted-residential use and include notice-of-use restrictions regarding excavation requirements related to site soil and groundwater monitoring. The ECs that will be included in the easement will include maintenance of the composite cover system, consisting of a building foundation installed at about 2 feet below existing cellar grade (el 24.0), and proper soil and groundwater management during excavation work. The SMP would identify all use restrictions and long-term monitoring and maintenance requirements to ensure the ICs and/or ECs remain in place and are effective.

3.3 Evaluation of Remedial Alternatives

The following is an evaluation of the proposed remedy based on the 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 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 Human Health and the Environment

Under each alternative, the IRM has treated the on-site petroleum-impacted source material and groundwater. Potential exposure pathways for any residual petroleum-impacted soil and groundwater will be eliminated through the installation/construction of a composite cover system.

Alternative I – The remedy will eliminate exposure pathways from on-site contaminated media. Remediating the site to Track 1 standards will result in the removal of all on-site soil that exceeds UU SCOs. Encountered tanks would be decommissioned, removed, and disposed of off-site. The RAOs for public health and environmental protection will be met through the removal of contaminated media, which will eliminate the possibility for ingestion, inhalation, or dermal contact. Since no ECs or ICs will 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 4 remedy will provide overall protection to public health and the environment. In the event that the PGW and/or RURR SCOs cannot be achieved after soil is removed for construction of the engineered composite cover system, the building foundation will serve as a cap to prevent exposure to any residual soil contamination. Exposure would be further limited by the establishment of ICs including an EE, governed by an SMP. The RAOs for public health and environmental protection would be met through the combination of contaminant removal, ECs including site capping, and ICs including an EE and SMP.

Public health will be protected during remediation under both remedial alternatives by implementing and enforcing dust, odor, and organic vapor control and monitoring procedures when needed. The environment will be protected by implementing and enforcing soil management controls during future site excavation and any other ICs and ECs by implementation of the SMP and through enforcement of the EE.

3.3.2 Compliance with Standards, Criteria, and Guidance

Alternative I – Remediating the site to UU SCOs will comply with all applicable SCGs listed in Section 4.4.1 because of the removal of all impacted on-site soil and treatment of site groundwater. However, Alternative I will require excavation below the proposed re-development depth and groundwater table, which will result in additional time, costs and energy consumption related to SOE and dewatering design, installation and maintenance.

Alternative II – Under a Track 4 cleanup, remediation includes removal of site soil to facilitate installation of an engineered composite cover system, which will prevent exposure of future site occupants to residual contaminated soil that may not be removed as part of site development. Compliance with Track 4 will result in less time, materials and energy consumption.

Both remedial alternatives will be protective of human health and the environment by implementing and enforcing a site-specific HASP during implementation of the remedy. Occupational Safety and Health Administration (OSHA) requirements for on-site construction safety will be followed by any site contractors performing work under Alternative I or II. The future development will also be equally protective of future building occupants.

3.3.3 Short-Term Effectiveness and Impacts

Alternative I – The most significant short-term adverse impacts and risks to the community will be associated with soil removal to achieve Track 1. This will include additional SOE installation and dewatering which may impact surrounding structures and will result in additional energy consumption and carbon emissions, relative to the Track 4 alternative. Additionally, there may be noise associated with additional SOE installation. There will also be additional truck traffic, truck exhaust and operational noise levels associated with additional soil removal. The operation is estimated to require 268 25-cubic-yard capacity truck trips to haul soil for export.

Truck traffic will be routed on the most direct course using major thoroughfares where possible and flaggers will be used to protect pedestrians at site entrances and exits. Waiting times associated with analysis of confirmation sampling and resampling may delay construction, leaving soil exposed for a longer time resulting in a potential increase in dust, odors, and/or organic vapor from the excavation and construction-related noise. The effects of these potential adverse impacts to the community, workers, and the environment will 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 related to soil removal but for a shorter duration than Alternative I. The operation is estimated to require about 140 25-cubic-yard capacity truck trips to haul soil for export (approximately 48% fewer truck trips than Alternative I). Implementing Alternative II would require a shorter implementation period, resulting in fewer potential impacts to the community, such as a shorter period of truck traffic and less potential for exposure to contaminated media. Additionally, enhanced dewatering and SOE would not be required and less energy will be consumed, resulting in less carbon emissions.

Under both remedial alternatives, dust will be controlled by the on-site application of water spray as needed. Best management practices, such as slowing the pace of work, applying foam suppressant, and/or covering portions of the excavation will be used to minimize vapors and suppress odors 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.

3.3.4 Long-Term Effectiveness and Permanence

Alternative I – The Track 1 remedy will remove all soil exceeding UU SCOs. Petroleum-impacted groundwater was treated via the in-situ injection program under the IRMWP. Residual contaminated groundwater would be treated through monitored natural attenuation. In addition, groundwater in this area of New York City is not used for drinking water. Because an EE and SMP are not required as part of the Track 1 remedy, Article 141 of the NYSDOH code will be relied upon to prevent ingestion of groundwater, which prohibits potable use of groundwater without prior approval. Future site use will be unrestricted; therefore, the long-term effectiveness of this remedy will eliminate environmental risks and satisfy the objectives of this criterion.

Alternative II - Although contaminants in soil may remain present at concentrations above the PGW and/or RURR SCOs, exposure pathways will be eliminated with the installation of the building foundation. ECs and ICs, including an EE, will be implemented limiting site use to restricted-residential use and preventing exposure to residual soil and groundwater contamination, with an engineered composite cover system governed by an SMP. The long-term effectiveness of this remedy will eliminate risks and satisfy the objectives of this criterion.

3.3.5 Reduction of Toxicity, Mobility, or Volume of Contaminated Material

Petroleum-impacted groundwater was treated via the in-situ injection program under the IRMWP; thereby reducing the toxicity, mobility and volume of petroleum-impacted groundwater.

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

Alternative II – The Track 4 remedy will reduce the toxicity, mobility, and volume of contamination, through removal of soil for construction of the EC and implementation of ECs and ICs, including an EE and SMP. Soil exceeding the PGW and/or RURR SCOs, and soil exhibiting petroleum-related nuisance conditions may remain in place below the re-development depth (about 5 feet below cellar grade); however, exposure will be eliminated by installation of an engineered composite cover system.

3.3.6 Implementability

Implementing both alternatives is feasible, however, Alternative I will present logistical challenges because of required dewatering and construction requirements associated with support of excavation. In addition, Alternative I will require consumption of additional energy, resulting in greater carbon emissions than Alternative II. Conventional construction measures, including the use of standard bucket excavators, can be used to achieve the targeted depth of excavation for the Track 1 (up to 12 feet below cellar grade) and Track 4 (up to 2 feet below cellar grade) remedies. Contractors experienced in implementing both remedies are readily available in the area of the site.

The technical feasibility of implementing the Alternative II remedy is greater than that of Alternative I, as excavation would be significantly reduced and an enhanced SOE and dewatering system, which would result in additional carbon emissions, would not be required under a Track 4 cleanup.

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 $6.8 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. This alternative is the most costly because of additional time and costs associated with handling and disposal of fill and soil above the UU SCOs, enhanced SOE design and installation, and increased dewatering volume and system operation. Table 5 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 4 cleanup is approximately $5.6 million. This alternative will cost $1.2 million less than an Alternative I cleanup, as the costs for additional soil excavation and disposal, SOE, and dewatering will not be incurred. Alternative II is the most cost effective alternative. Table 6 outlines the individual cost-components used to arrive at this cost estimate.

3.3.8 Community Acceptance

Both remedial alternatives should be acceptable to the community because the potential exposure pathways to on-site contamination will be addressed upon completion of the respective remedies and the site will be remediated to allow for a higher level use. The selected remedy will be subject to a 45-day public comment period in accordance with the Citizen Participation Plan (CPP), included as Appendix F. Any substantive public comments received will be addressed before the remedy is approved.

3.3.9 Land Use

The current, intended, and reasonably anticipated future mixed residential and commercial land use of the site and its surroundings are compatible with both remedial alternatives. The site is located within the R7-2 residential district for medium-density apartment buildings, and the southern portion of the site (within 100 feet of Sherman Avenue) is situated within a C2-4 commercial district. The proposed development will include construction of a mixed-use institutional and residential building with one cellar level. The surrounding area is primarily residential and commercial, but also includes public parks, day care centers, and schools.

3.4 Selection of the Preferred Remedy

Both alternatives will be protective of human health and the environment and meet the remedy selection criteria. Alternative II would achieve all of the remedial action goals established for the re-development project, and would be more effective in the short-term. Alternative I further reduces contaminant mobility in the elimination 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, ECs, an EE, and associated future costs that would be required under Alternatives II; however, the technical challenges and additional costs associated with constructing the SOE and dewatering coupled with the additional energy consumption and carbon emissions make this alternative less feasible than Alternative II.

Alternative I would be preferred over Alternative II if it could be feasibly and practically implemented at a similar cost; however, the implementation of Alternative I is neither practical nor economically feasible. Alternative II is similarly protective of human health and the environment. If ICs and ECs are required, these controls should be easily implementable long term pursuant to an SMP and EE.

Alternative II is the selected remedy. Figure 10 depicts the Alternative II cleanup plan.

3.4.1 Zoning

The current site use conforms to applicable zoning laws and maps, as does the reasonably anticipated future mixed commercial and residential use of the site.

3.4.2 Applicable Comprehensive Community Master Plans or Land Use Plans

The site is within the bounds of the R7-2 residential district and C2-4 commercial district, and the proposed development is consistent with community land use plans.

3.4.3 Surrounding Property Uses

The current, intended, and reasonably anticipated future land use of the site and its surroundings are compatible with the selected remedy. The reasonably anticipated future use of the site and the use of its surroundings have been documented by the Volunteer. The construction of a mixed-use commercial/residential development conforms to recent development patterns in the area.

3.4.4 Citizen Participation

The CPP is discussed in Section 4.1.9.

3.4.5 Environmental Justice Concerns

Per the "Potential Environmental Justice Areas in Northern New York County, New York" map, the site is located in a potential environmental justice area.

3.4.6 Land Use Designations

There are no federal or state land use designations.

3.4.7 Population Growth Patterns

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

3.4.8 Accessibility to Existing Infrastructure

Upon completion of the proposed development, water, sewer, electrical, and gas services will be provided. The site is accessible to the NYCTA subway "A" and "1" lines, and bus routes.

3.4.9 Proximity to Cultural Resources

The site is not in close proximity to a registered landmark. The nearest cultural landmark is the Gould Memorial Library at Bronx Community College, which is located about 0.9 miles from the site, across the Harlem River in the Bronx, NY.

3.4.10 Proximity to Natural Resources

With the exception of Fort Tryon Park and the Hudson River, located approximately 60 and 1,400 feet west of the site, respectively, the site is not located in close proximity 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 Fort Tryon Park, which is across the street from the site, south of Broadway.

3.4.11 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.

3.4.12 Proximity to Floodplains

According to preliminary Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) No. 3604970081F (revised December 5, 2013), the site falls within Zone X, which is designated for areas of 0.2 percent annual chance of flood; areas of one percent annual chance flood with average depths of less than one foot or with drainage areas less than one square mile; and areas protected by levees from one percent annual chance flood.

3.4.13 Geography and Geology of the Site

The site geology is described in Section 2.4.

3.4.14 Current Institutional Controls

There are no current ICs for the site.

3.5 Summary of the Selected Remedial Action

In preparation for site remediation and in accordance with the approved IRMWP, the existing building was abated of hazardous materials, including ACM, LBP, and any other identified universal and miscellaneous hazardous waste articles in July 2021. Following abatement of hazardous materials, building demolition was completed between September and November 2021 to facilitate site remediation.

The selected remedy will be implemented and will include the following:

- Development and implementation of a HASP and CAMP for the protection of on-site workers, the community, and the environment during the remediation phase of development
- Excavation of all soils in the upper 2 feet and any soil above the groundwater table which exceeds the PGW SCOs for contaminants of concern in groundwater (about 3,500 cubic yards). The site will be further excavated to about 5 feet below cellar grade as part of site development. Following soil removal, an engineered composite cover system will be installed.
- Removal of 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
- Continue quarterly post-injection groundwater sampling for a minimum of two years from the first event (March 2020) per the NYSDEC-approved March 2019 In-Situ Treatment Remedial Design Plan.
- Collection and analysis of documentation soil samples at the excavation bottom for re-development (about 5 feet below cellar grade)
- Installation of an engineered composite cover system (i.e., reinforced concrete building foundation) underlain by a minimum 20-mil vapor barrier/waterproofing membrane of a building foundation
- Establishment of use restrictions (ICs) including prohibitions on the use of groundwater from the site and prohibitions on sensitive site uses, such as farming or vegetable gardening, to eliminate future exposure pathways

- Establishment of an approved Site Management Plan to ensure long-term management of ECs and ICs, including the performance of periodic inspections and certification that the controls are performing as they were intended
- Recording of an EE to memorialize the remedial action and the ECs and ICs to ensure that future owners of the site continue to maintain these controls as required

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.

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 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 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, Resource Conservation and Recovery Act (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 Protocol dated January 2021

4.1.2 Site-Specific Health & Safety Plan

The Remedial Engineer (RE) prepared a site-specific HASP (Appendix E). The HASP will apply to all remedial and construction-related work on site. The HASP provides a mechanism for establishing on-site safe working conditions, safety organization, procedures, and PPE requirements during implementation of the remedy. The HASP meets the requirements of 29 CFR 1910 and 29 CFR 1926 (which includes 29 CFR 1910.120 and 29 CFR 1926.65, respectively). The HASP 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
- Contingency 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 a HASP and for performance of the work according to the HASP and applicable laws.

The HASP and requirements defined in this RAWP pertain to remedial and ground-intrusive work performed at the site until the issuance of a Certificate of Completion. The Site Safety Coordinator will be William Bohrer, for whom a resume is included in Appendix G. If required, confined space entry will comply with OSHA requirements to address the potential risk posed by combustible and toxic gasses.

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 and RAOs and is completed in accordance with the design specifications. The QAPP is provided as Appendix H 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, and 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 employed so 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 through building construction, the Contractor and Construction Manager will have the primary responsibility to provide construction quality. The CQAP procedures are discussed below in Section 4.2.1.

4.1.5 Soil/Materials Management Plan

The RE prepared a Soil/Materials Management Plan (SMMP) that includes detailed plans for managing soils/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

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 for soil erosion and sediment control will be selected to minimize erosion and sedimentation off-site from the onset of remediation to the completion of development. Stormwater pollution prevention will be implemented as described below in Section 5.4.10. A Stormwater Pollution Prevention Plan (SWPPP) is required because the project will disturb more than one acre of land. During construction, the site must operate in accordance with the New York City generic stormwater pollution discharge elimination system (SPDES) permit.

4.1.7 Community Air Monitoring Program

A CAMP was prepared for the site as part of the HASP (Appendix E of this RAWP). The CAMP is detailed in Section 5.4.12 below.

4.1.8 Contractors Site Operations Plan

The RE will review plans and submittals for this remedial project (including those listed above and contractor and subcontractor document submittals) and will confirm that 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 the NYSDEC and NYSDOH in a timely manner and prior to the start of work associated with the remedial document.

4.1.9 Citizen Participation Plan

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 completion of the Remedial Action with a summary of the FER and 2) 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. The approved CPP for this project is included in Appendix F.

Document repositories were established at the following locations and contain the applicable project documents:

Inwood Public Library
4790 Broadway
New York, NY 10034
Phone: (212) 942-2445
Hours (call to confirm):

Monday - Thursday:	10:00 a.m. to 7:00 p.m.
Friday - Saturday:	10:00 a.m. to 5:00 p.m.
Sunday:	1:00 p.m. to 5:00 p.m.

Manhattan Community Board 12
530 West 166th Street, 6th Floor
New York, NY 10032
Phone: (212) 568-8500

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

This section presents the anticipated project organization and associated roles, including key personnel, descriptions of duties, and lines of authority in the management of this RAWP. The following project personnel are anticipated for oversight of the RAWP implementation. Project personnel resumes are provided in Appendix G.

Remediation Engineer (RE):	Jason J. Hayes, P.E.
Project Manager:	Brian Gochenaur, QEP
Langan Health & Safety Manager:	Tony Moffa, CHMM
Site Health & Safety Officer	William Bohrer, PG
Qualified Environmental Professional	Michael Burke, P.G, CHMM
Field Team Leader	Lamees Esmail, E.I.T
Quality Assurance Officer	Michael Burke, P.G, CHMM

A field engineer, scientist, or geologist under the direct supervision of the Qualified Environmental Professional and the RE will be on-site during implementation of the RAWP 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.

A field engineer, scientist, or geologist will meet with the Construction Superintendent on a daily basis to discuss the plans for that day and schedule upcoming activities. The field engineer, scientist, or geologist 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.

A field engineer, scientist, or geologist will screen excavations with a PID during ground-intrusive work. PID readings, including specifically elevated readings, will be recorded in the project field book (or on separate logs) and reported to the NYSDEC and NYSDOH in the daily reports. A field engineer, scientist, or geologist under the direct supervision of the 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.

4.2.2 Remediation Engineer (RE)

The RE for this project will be Jason J. Hayes, P.E. The RE is a registered professional engineer licensed by the State of New York. The RE will have primary direct responsibility for implementation of the remedial program at 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 this RAWP and any other relevant provisions of ECL 27-1419 have been achieved in accordance with the RAWP.

The RE will document the work of other contractors and subcontractors involved in aspects of the in-situ groundwater treatment system, remedial construction, including soil excavation, stockpiling, confirmation sample collection, air monitoring, emergency spill response services, import of backfill, and management of waste transport and disposal. The RE will be responsible for appropriate communication with the 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 below in Section 8.1.

4.2.3 Remedial Action Construction Schedule

The remedial action construction schedule is discussed below in Section 9.0 and included in Appendix I. 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 either conform to the requirements of the New York City Department of Buildings (NYCDOB) construction code or to a site-specific variance 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 restricted points of entry in accordance with the 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 along Sherman Avenue and Broadway. 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 deal with potential unexpected discovery of additional contaminated media or USTs.

<u>Discovery of Additional Contaminated Soil</u>

During remediation and construction, soil will be continuously monitored by the RE's field representatives via visual, olfactory, and instrumental field screening techniques to identify additional soil that may not be suitable for disposal at the NYSDEC-approved disposal facility. If such soil is identified, the suspected impacts will be confirmed by collecting and analyzing samples in accordance with the NYSDEC-approved facility's requirements. If the previously approved facility is not permitted to receive the impacted soil, the soil will be excavated to the extent practicable and disposed of off-site at a permitted facility that can 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.

<u>Discovery of USTs</u>

Two 40-gallon, 1.5-foot-diameter by 3-foot-long USTs were identified along the northern property boundary during a geotechnical test pit investigation performed in January/February 2021. These USTs, and any other USTs encountered during remedial activities, will be decommissioned in accordance with 6 NYCRR Part 612.2 and 613.9 and NYSDEC DER-10 Section 5.5. After the tank, its contents, and associated piping are removed, post-excavation soil samples will be collected per NYSDEC DER-10 requirements. If encountered, petroleum-impacted soil will be excavated, stockpiled separately, and disposed of off-site at a permitted facility in accordance with applicable regulations. UST closure documentation, including contractor affidavits, bills of lading for sludge disposal, and tank disposal receipts, will be included as appendices to the FER (see Section 8.0). NYSDEC PBS registration requirements will be complied with as necessary based on the type, number, and capacity of the discovered USTs.

If 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 include Part 375 VOCs, SVOCs, PCBs, pesticides, cyanide, and metals including trivalent and hexavalent chromium. Analyses will not be otherwise limited without NYSDEC approval.

If other 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.

4.2.8 Worker Training and Monitoring

Worker training and monitoring will be conducted in accordance with the site-specific HASP, which is included in Appendix E.

4.2.9 Agency Approvals

The Volunteers have addressed all State Environmental Quality Review Act (SEQRA) requirements for this site. Permits or government approvals required for remedial construction 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 City Planning. A Certificate of Completion will not be issued for the project unless conformance with the zoning designation is demonstrated. Local, regional, and national governmental permits, certificates or other approvals or authorizations required to perform the remedial and development work will be acquired prior to the start of remediation.

A list of all local, regional and national governmental permits, certificates or other approvals or authorizations required to perform the remedial and development work is provided below:

- NYCDOB Demolition Permit (NYC Building Code) – NYCDOB: 212-566-5000
- NYCDOB New Building Permit (NYC Building Code) – NYCDOB: 212-566-5000

This list includes a citation of the law, statute or code to be complied with, the originating agency and phone number in that agency. Considering the system is online, direct contacts of reviewers are not provided. This list will be updated in the FER.

No remedial or construction work will be conducted in regulated wetlands or adjacent areas.

4.2.10 Pre-Construction Meeting with the NYSDEC

Prior to the start of remedial construction, a meeting will be held between the NYSDEC, RE, Volunteer, Construction Manager, and remediation contractor to discuss project roles, responsibilities, and expectations associated with this RAWP.

4.2.11 Emergency Contact Information

An emergency contact sheet that defines the specific project contacts (with names and phone numbers) for use by NYSDEC and NYSDOH in the case of an emergency (day or night) is included in the HASP (Appendix E).

4.2.12 Remedial Action Costs

The total estimated cost of the Track 4 Remedial Action is $5.6 million. An itemized and detailed summary of estimated costs for the remedy is provided in Table 6.

4.3 Site Preparation

4.3.1 Mobilization

Prior to commencing remedial construction, the remediation contractor will mobilize to the site and prepare for remedial activities. Mobilization and site preparation activities may include the following:

- Identifying the location of aboveground and underground utilities (e.g., power, gas, water, sewer, and telephone), equipment, and structures as necessary to implement remediation
- Mobilizing necessary remediation personnel, equipment, and materials to the site
- Constructing one or more stabilized construction entrances consisting of non-hazardous material 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 temporary fencing or other temporary barriers to limit unauthorized access to areas where remediation will be conducted

4.3.2 Monitoring Well Decommissioning

Existing groundwater monitoring wells will be properly decommissioned, in accordance with NYSDEC CP-43, when no longer required or prior to excavation. The only exception to this 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 engineer, scientist, or geologist. Decommissioning documentation will be provided in the FER. All former wells will be properly closed or removed prior to or during remedial excavation, and re-installed as necessary for continued groundwater monitoring.

4.3.3 Erosion and Sedimentation Controls

Since the planned earthwork activities will be below the adjacent sidewalk grade, full-time erosion and sedimentation measures are not anticipated. Best management practices for soil erosion will be selected and implemented, as needed, to minimize erosion and sedimentation off site.

4.3.4 Temporary Stabilized Construction Entrance(s)

Temporary stabilized construction entrances will be installed at the existing curb cuts along Sherman Avenue and Broadway. The entrances will be covered with gravel or RCA and graded so that runoff water will be directed on site. Vehicles exiting construction areas will be cleaned using clean water or dry brushing, as needed, 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 the identification of utilities and/or easements that might be affected by 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 the work performed under this RAWP. The Volunteer and its contractors must obtain the necessary local, state, and/or federal permits or approvals that may be required to perform the work detailed in this RAWP. Approval of this RAWP by the NYSDEC does not constitute satisfaction of these requirements.

4.3.6 Sheeting and Shoring

Appropriate management of the structural stability of on-site or off-site structures during site activities is the sole responsibility of the Volunteer and its contractors. The Volunteer and its contractors are solely responsible for the safe execution of the work performed under this RAWP. The Volunteer and its contractors must obtain the necessary local, state, and/or federal permits or approvals that may be required to perform the work detailed in this RAWP. Additionally, the Volunteer and its contractors are solely responsible for the implementation of the required, appropriate, or necessary health and safety measures during performance of work conducted under this 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 work 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 usage 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. 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.

If the contractor uses high pressure washing methods, the contractor shall provide splash protection around the vehicle decontamination facility. Splash protection shall minimize potential contamination from splatter and mist movement 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.

Accumulated truck rinsate and decontamination materials will be collected and commingled with other waste streams for discharge or disposal, as appropriate. The contractor will maintain the decontamination pad(s) throughout the duration of the remediation. Prior to demobilization, the contractor will deconstruct the pads and dispose of materials as required.

4.3.9 Site Fencing

The site perimeter will be secured with gated, signed, plywood fencing 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

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

4.4.1 Daily Reports

Daily reports will be submitted to the NYSDEC and NYSDOH Project Managers by the end of each day, or at a frequency acceptable to them, following the reporting period and will include:

- 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
- An explanation of notable site conditions

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

4.4.2 Monthly Reports

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

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	Manage environmental complaints from the community regarding remediation
Implementation Strategy/Mitigation Measures	Complaints will be documented on a complaint register. The register will be maintained as an ongoing record. Each entry will include the 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 including action taken and signature of the responsible person Each complaint will be investigated as soon as practicable in relation to the requirements.
Monitoring	A representative from the Volunteer will follow up on the complaint within two weeks of receipt to ensure it is resolved.
Reporting	Upon receipt and following 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 of 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 according to results of investigation

4.4.5 Deviations from the RAWP

Necessary deviations from the RAWP will be coordinated with the NYSDEC in advance. 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

Remediation will include the excavation of all soils in the upper 2 feet (about 3,500 cubic yards) and any soil above the groundwater table which exceeds the PGW SCOs for contaminants of concern in groundwater or exhibits nuisance conditions above the groundwater. The site will be further excavated to about 5 feet below existing cellar grade as part of re-development. Soil exceeding the PGW and/or RURR SCOs and soil exhibiting petroleum-related nuisance conditions deeper than 5 feet below cellar grade has been treated via ISCO and any residual contamination will remain in place. Following soil removal, an engineered composite cover system will be installed to protect building occupants from any residual contamination.

5.1 Soil Cleanup Objectives

The Track 4 SCOs will be the lower of the PGW and RURR SCOs based on the soil data obtained from the RI and supplemental soil investigation. The lower of the PGW and RURR SCOs are listed in Table 4. Soil and materials management will be conducted in accordance with the SMMP as described below.

5.2 Remedial Performance Evaluation (Confirmation Sampling)

5.2.1 Soil Sampling Frequency

One documentation soil sample will be collected for every 900 square feet of excavation base in accordance with NYSDEC DER-10, or at an alternative frequency approved by NYSDEC. Sidewall documentation samples will not be collected from the site perimeter because excavation will extend across the site footprint and support of excavation measures (e.g., sheeting, lagging) will preclude collection of sidewall samples. An estimated 53 base of excavation documentation soil samples, plus QA/QC samples, will be collected to document remedial performance.

5.2.2 Methodology

Documentation soil samples will be collected from the base and sidewalls of the excavation (as applicable) 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, and metals including hexavalent and trivalent chromium, PFAS, and 1,4-dioxane.

Additional sampling may be required should the excavation area be over-excavated. Should additional soil sampling be deemed necessary (e.g., additional tank closure, unknown environmental condition through visual evidence of a remaining source), documentation sampling will be conducted in accordance with NYSDEC DER-10.

5.2.3 QA/QC

Quality control procedures for confirmation soil sampling are included in the QAPP (refer to Appendix H). Confirmation 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. DUSRs will be prepared by Ms. Marla Miller, a qualified data validator, and the findings will be reported in the FER. Ms. Miller's resume is included in Appendix G.

5.2.5 Reporting

Analytical laboratories that analyze confirmation soil samples, prepare results, and perform contingency sampling will be NYSDOH ELAP-certified laboratories.

5.3 Estimated Material Removal Quantities

The estimated volume of soil requiring removal and off-site disposal for a Track 4 cleanup is about 3,500 cubic yards to facilitate installation of the site cover system. Further excavation will be required to achieve development depth. Over-excavation and import of backfill material is not anticipated; however some import may be needed for sub-base material and site ramps.

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. A field engineer, scientist, or geologist, 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. A field engineer, scientist, or geologist, 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.

- Nonhazardous Historic Fill Material – This material refers to historic fill that contains historic fill-related contaminants above the PGW and/or RURR SCOs and will not be reused on-site. This material will be excavated to depths of up to 5 feet below cellar grade as part of re-development. 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 selected disposal facilities. Samples will be collected from the base of the excavation to document concentrations of contaminants in soil remaining in place.

- Petroleum Impacted Historic Fill and Native Material – This material refers to historic fill and native material that contains petroleum-related VOCs above the PGW and/or RURR SCOs and will not be reused on site. Petroleum-impacted soil was encountered during the RI and supplemental soil investigation between 0 and 12 feet below cellar grade. Petroleum-impacted historic fill excavated for site development will not be reused on-site and 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 selected disposal facilities. Samples will be collected from the base of the excavation to document concentrations of contaminants in soil remaining in place.

5.4.1 Soil Screening Methods

Visual, olfactory, and instrumental soil screening and assessment will be performed by an engineer, geologist, or scientist under the direction of the RE during remediation and development-related excavations into known or potentially contaminated material. Soil screening will be performed regardless of when the invasive work is done and will include all excavation and invasive work performed during the remedy and during the development phase, such as excavations for foundations and utility work, prior to issuance of the Certificate of Completion.

Resumes will be provided for personnel responsible for field screening (i.e., those representing the RE) the excavation and other ground-intrusive work performed during remediation and development.

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 6 mil low-permeability liner of sufficient strength and thickness to prevent puncture during use; separate stockpiles will be created where material types are different (e.g., petroleum-impacted material stockpiled in a contaminated soil area). The use of multiple layers of thinner liners is permissible.
- Equipment and procedures will be used to place and remove the soil that will minimize the potential to jeopardize the integrity of the liner.
- Stockpiles will be covered 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 field engineer, scientist, or geologist under the supervision of the RE 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 will be operated on site. The RE will be responsible for documenting that outbound trucks will be washed at the truck wash, as necessary, 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 Volunteer and associated parties preparing the remedial documents submitted to New York State, and the parties performing this work, are responsible for the safe performance of ground-intrusive work, the structural integrity of excavations, and for structures that may be affected by excavations (such as building foundations and bridge footings).

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 (including, but not limited to, tanks and hotspots) 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.

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 headed to disposal facilities will travel north on Broadway to Interstate 95, or other routes approved by NYSDEC. Truck transport routes are shown on Figure 12.

Trucks loaded with site materials will exit the vicinity of the site using approved truck routes. 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
- Prohibiting 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.

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 3,500 cubic yards of historic fill is expected to be disposed off-site. Soil/fill/solid waste excavated and removed from the site will be treated as contaminated and regulated material and will be disposed in accordance with local, state (including 6NYCRR 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 (6NYCRR 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 Volunteer to the receiving facility describing the material to be disposed of and requesting formal written acceptance of the material. This letter will state that material to be disposed of is contaminated material generated at an environmental remediation site located 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 chemical data for the material being transported (including waste characterization and RI data); and

(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 off-site will be handled, at a minimum, as a solid waste per 6 NYCRR Part 360. 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 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. This material is prohibited from being sent or redirected to a New York Part 360 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.

Hazardous wastes derived from on-site, if any, will be stored, transported, and disposed of in full 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.

Waste characterization will be performed 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

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 lower of the PGW or RURR SCOs. 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. 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.

5.4.8 Demarcation

It is anticipated that the site will be remediated to a Track 4 remedy, and contaminated soil with petroleum nuisance conditions has been treated via ISCO. The concrete slab will serve as a demarcation barrier for any residual contaminated soil left in place.

5.4.9 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 requirements of 6 NYCRR Part 375-6.7(d) and NYSDEC DER-10 Section 5.4(e), Table 5.4(e)10, and Appendix 5. 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. 80 sieve. RCA is not acceptable for and will not be used as cover or drainage material. A site-specific BUD will be obtained by the NYSDEC for import of RCA for use as backfill in over-excavated areas to development depth.

Imported soil (i.e., clean fill) will meet the lower of the PGW or RURR SCOs. Non-compliant soil 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, and metals including trivalent and hexavalent chromium, and PFAS 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.

Soil that meets 'exempt' fill requirements under 6 NYCRR Part 360, but do not meet backfill or cover soil objectives for this site and 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.

5.4.10 Stormwater Pollution Prevention

Silt fence 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 maintained at the site and available for inspection by the NYSDEC. Necessary repairs to silt fence and/or hay bales will be made immediately. Accumulated sediments will be removed as required to keep the barrier and hay bale check functional. Undercutting or erosion of the silt fence toe anchor will be repaired immediately with appropriate materials. Manufacturer's recommendations will be followed for replacing silt fence damaged due to weathering. Erosion and sediment control measures identified in the RAWP will be observed to ensure that they are operating correctly. Where discharge locations or points are accessible, they will be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to the sewer system.

5.4.11 Contingency Plan

As discussed above in Section 4.2.7, 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 VOCs, SVOCs, PCBs, pesticides, 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.

5.4.12 Community Air Monitoring Plan

Community air monitoring will be conducted in compliance with the NYSDOH Generic CAMP outlined below.

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 field engineer, scientist, or geologist under the supervision of the RE. The work zone is defined as the general area in which machinery is operating in support of remediation. A portable PID will be used to monitor the work zone and for periodic monitoring of total VOC levels during work such as soil sampling. The site perimeter will be visually monitored for fugitive dust emissions.

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

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

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

- If the downwind particulate 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.

5.4.13 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."

Odor Control Plan

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

Necessary means will be employed to prevent on- and off-site nuisances. At a minimum, procedures will include: (a) limiting the area of open excavations; (b) shrouding open excavations with tarps and other covers; and (c) using foams to cover exposed odorous soils. If odors develop and cannot be otherwise controlled, additional means to eliminate odor nuisances will include: (d) direct load-out of soils to trucks for off-site disposal; (e) use of chemical odorants in spray or misting systems; and (f) 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.

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, on-site water truck for road wetting, or an alternate source with suitable supply and pressure for use in dust control.
- Gravel will be used for on-site roads to provide a clean and dust-free road surface.
- On-site roads will be limited in total area to minimize the area required for water spraying.

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 Soil Vapor Intrusion Evaluation

Historic fill and native soil will be excavated into the water table to accommodate site development (about 5 feet below cellar grade). A concrete building foundation and waterproofing membrane, which will sit at the water table, will cover the entire site footprint. These barriers will prevent direct human exposure to residual impacted groundwater.

A soil vapor intrusion evaluation will be conducted as part of the remedy, and will be documented in the FER and SMP. Since the entire building foundation will sit at the water table, sub-slab samples will not be able to be collected from beneath the building slab; therefore, indoor air samples will be collected following completion of the building to assess indoor air quality. Any potential indoor air quality issues would be addressed through the future building's heating, ventilation, and air conditioning (HVAC) system which will be installed in accordance with NYCDOB requirements, or through other acceptable measures.

6.0 RESIDUAL CONTAMINATION TO REMAIN ON-SITE

Soil exceeding the PGW and/or RURR SCOs, and soil exhibiting petroleum-related nuisance conditions may remain on-site after the Track 4 cleanup is complete. Exposure to residual contaminated soils will be prevented by an engineered, composite cover system that will be built across the site footprint. The FER will report the results of post-excavation documentation soil samples in tabular and map form. The FER will also include surveyed limits of excavation and location of all final documentation samples.

Since residual contaminated soil will exist beneath the site after the remedy is complete, ECs and ICs are required to protect human health and the environment. These ECs and ICs are described hereafter. Long-term management of EC/ICs and of residual contamination will be executed under a site-specific SMP that will be developed and included in the FER.

ECs will be implemented to protect public health and the environment by appropriately managing residual contamination. The Controlled Property (the site) will have one primary EC system, consisting of a concrete building slab.

7.0 ENGINEERING CONTROLS

Following completion of the remedy, it is anticipated that the site will meet Track 4 SCOs. Long-term engineering controls will be required as part of the remedial action. Exposure to residual contaminated soils will be prevented by an engineered, composite cover system that will be built across the site footprint. An engineered composite cover system will consist of a concrete building slab that will be underlain by a minimum 20-mil vapor barrier/waterproofing membrane.

The composite cover system will be a permanent EC. The composite cover will be inspected and its performance certified at specified intervals as required by this RAWP and the SMP. The SMP (to be included in the FER) will outline maintenance requirements and the procedures to be followed in the event that the composite cover system is disturbed after the remedial action is complete.

An SMMP will be included in the SMP and will outline the procedures to be followed in the event that the composite cover system and underlying residual contamination are disturbed after the remedial action is complete.

8.0 INSTITUTIONAL CONTROLS

After the remedy is complete, the site will have residual contamination remaining in place. ECs for the residual contamination have been incorporated into the remedy to render the overall site remedy protective of public health and the environment. Two elements have been designed to ensure continual and proper management of residual contamination in perpetuity: an EE and an SMP.

A site-specific EE will be recorded with New York County to provide an enforceable means of ensuring the continual and proper management of residual contamination and protection of public health and the environment in perpetuity or until released in writing by NYSDEC. It requires that the grantor of the EE and the grantor's successors and assigns adhere to all ECs and ICs placed on this site by this NYSDEC-approved remedy. ICs provide restrictions on site usage and mandate operation, maintenance, monitoring and reporting measures for all ECs and ICs. The SMP describes appropriate methods and procedures to ensure compliance with all ECs and ICs that are required by the EE. Once the SMP has been approved by the NYSDEC, compliance with the SMP is required by the grantor of the EE and grantor's successors and assigns.

8.1 Environmental Easement

An EE, as defined in Article 71 Title 36 of the Environmental Conservation Law, is required when residual contamination above UU SCOs is left on-site after the remedial action is complete. If the site will have residual contamination after completion of all remedial actions, then an EE is required. As part of this remedy, an EE approved by NYSDEC will be filed and recorded with the New York County Clerk. The EE will be submitted as part of the FER.

The EE renders the site a Controlled Property. The EE must be recorded with the New York County Clerk or City Register before the Certificate of Completion can be issued by NYSDEC. A series of ICs is required under this remedy to implement, maintain and monitor the EC systems, prevent future exposure to residual contamination by controlling disturbances of the subsurface soil and restricting the use of the site to restricted-residential, industrial and commercial use(s) only. These ICs are requirements or restrictions placed on the site that are listed in, and required by, the EE. ICs can, generally, be subdivided between controls that support ECs, and those that place general restrictions on site usage or other requirements. ICs in both of these groups are closely integrated with the SMP, which provides all of the methods and procedures to be followed to comply with this remedy.

Under the Track 4 scenario, the EC will be in the form of a long-term composite cover (i.e., concrete building foundation). The ICs that support the ECs are:

- On-site environmental monitoring devices, including but not limited to, groundwater monitor wells, must be protected and replaced as necessary to ensure proper functioning in the manner specified in the SMP;
- Compliance with the EE by the Grantee and the Grantee's successors and adherence of all elements of the SMP is required.
- All ECs must be operated and maintained as specified in the SMP.
- All ECs on the Controlled Property must be inspected and certified at a frequency and in a manner defined in the SMP. A composite cover system consisting of concrete building slabs must be inspected, certified and maintained as required in the SMP;
- Environmental or public health monitoring must be performed as defined in the SMP.
- Data and information pertinent to Site Management for the Controlled Property must be reported at the frequency and in a manner defined in the SMP.
- ECs may not be discontinued without an amendment or extinguishment of the EE. The EE may be extinguished only by release by the Commissioner of NYSDEC, or the Commissioner's designee, and filed with the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

Adherence to these ICs for the site is mandated by the EE and will be implemented under the SMP (discussed in the next section).

The Controlled Property (site) will also have a series of ICs in the form of site restrictions and requirements. The site restrictions that apply to the Controlled Property are:

- Vegetable gardens and farming in residual site soil on the Controlled Property are prohibited.
- Use of groundwater underlying the Controlled Property is prohibited without treatment rendering it safe for intended purpose as approved by NYSDOH and NYSDEC.
- All future activities on the Controlled Property that will disturb residual contaminated material, if present, are prohibited unless they are conducted in accordance with the soil management provisions in the SMP.
- The Controlled Property may be used for restricted-residential, commercial and industrial use only (as allowed by zoning), provided the long-term ECs and ICs included in the SMP are employed.

- The Controlled Property may not be used for a higher level of use, such as unrestricted or residential (single family) use without an amendment or extinguishment of this EE.

Grantor agrees to submit to NYSDEC a written statement that certifies, under penalty of perjury, that: (1) controls employed at the Controlled Property are unchanged from the previous certification or that any changes to the controls were approved by the NYSDEC; and, (2) nothing has occurred that impairs the ability of the controls to protect public health and environment or that constitute a violation or failure to comply with the SMP. NYSDEC retains the right to access such Controlled Property at any time in order to evaluate the continued maintenance of any and all controls. This certification shall be submitted annually, or an alternate period of time that NYSDEC may allow. This statement must be certified by an expert that the NYSDEC finds acceptable.

8.2 Site Management Plan

Site Management is the last phase of remediation and begins with the approval of the FER and issuance of the Certificate of Completion for the Remedial Action. The SMP is submitted as part of the FER but will be written in a manner that allows its use as a complete and independent document. Site Management continues in perpetuity or until released in writing by NYSDEC. The property owner is responsible to ensure that all Site Management responsibilities defined in the EE and the SMP are performed.

The SMP is intended to provide a detailed description of the procedures required to manage residual contamination left in place at the site following completion of the remedial action in accordance with the BCA with the NYSDEC. This includes: (1) development, implementation, and management of all ECs and ICs; (2) development and implementation of monitoring systems and a Monitoring Plan; (3) development of a plan to operate and maintain any treatment, collection, containment, or recovery systems (including, where appropriate, preparation of an Operation and Maintenance Manual); (4) submittal of Site Management Reports, performance of inspections and certification of results, and demonstration of proper communication of site information to NYSDEC; and (5) defining criteria for termination of treatment system operation, if applicable.

To address these needs, this SMP will include four plans: (1) an Engineering and Institutional Control Plan for implementation and management of IC/ECs; (2) a Monitoring Plan for implementation of Site Monitoring; (3) an Operation and Maintenance Plan for implementation of remedial collection, containment, treatment, and recovery systems; and (4) a Site Management Reporting Plan for submittal of data, information, recommendations, and certifications to NYSDEC. The SMP will be prepared in accordance with the requirements in NYSDEC Draft DER-10 Technical Guidance for Site Investigation and Remediation and the guidelines provided by

NYSDEC. The SMP will include a provision for evaluation of the potential for soil vapor intrusion for any occupied buildings on the site, including a provision for implementing actions recommended to address exposures related to soil vapor intrusion.

Site management, reporting, and IC/EC certification will be scheduled on a certification period basis. The certification period will be annual, unless otherwise approved by NYSDEC. The SMP will be based on a calendar year and will be due for submission to NYSDEC by three months following the end of the reporting period.

If groundwater monitoring is required after the remedial action is complete, the SMP will include a monitoring plan for groundwater to evaluate site-wide performance of the remedy. No exclusions for handling of remaining contaminated soil will be provided in the SMP. All handling of remaining contaminated material will be subject to provisions contained in the SMP.

9.0 FINAL ENGINEERING REPORT

An FER will be submitted to the NYSDEC following implementation of the remedy 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 has been 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 constructed elements, certifications, manifests, and bills of lading
- A description of the changes to 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
- An itemized tabular description of actual costs incurred during implementation of the remedy
- Sufficient information to show that remaining soil left on-site meets the PGW and/or RURR SCOs.
- A summary of remaining contamination that exceeds the PGW and/or RURR SCOs, or exhibits petroleum-related nuisance conditions. A table and a map that shows remaining contamination in excess of the PGW and/or RURR 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.

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).

9.1 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 4650 Broadway (NYSDEC Brownfield Cleanup Agreement Index No. C231123-11-18, Site No. C231123).

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 4650 Broadway site.

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 qualified environmental professionals 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.

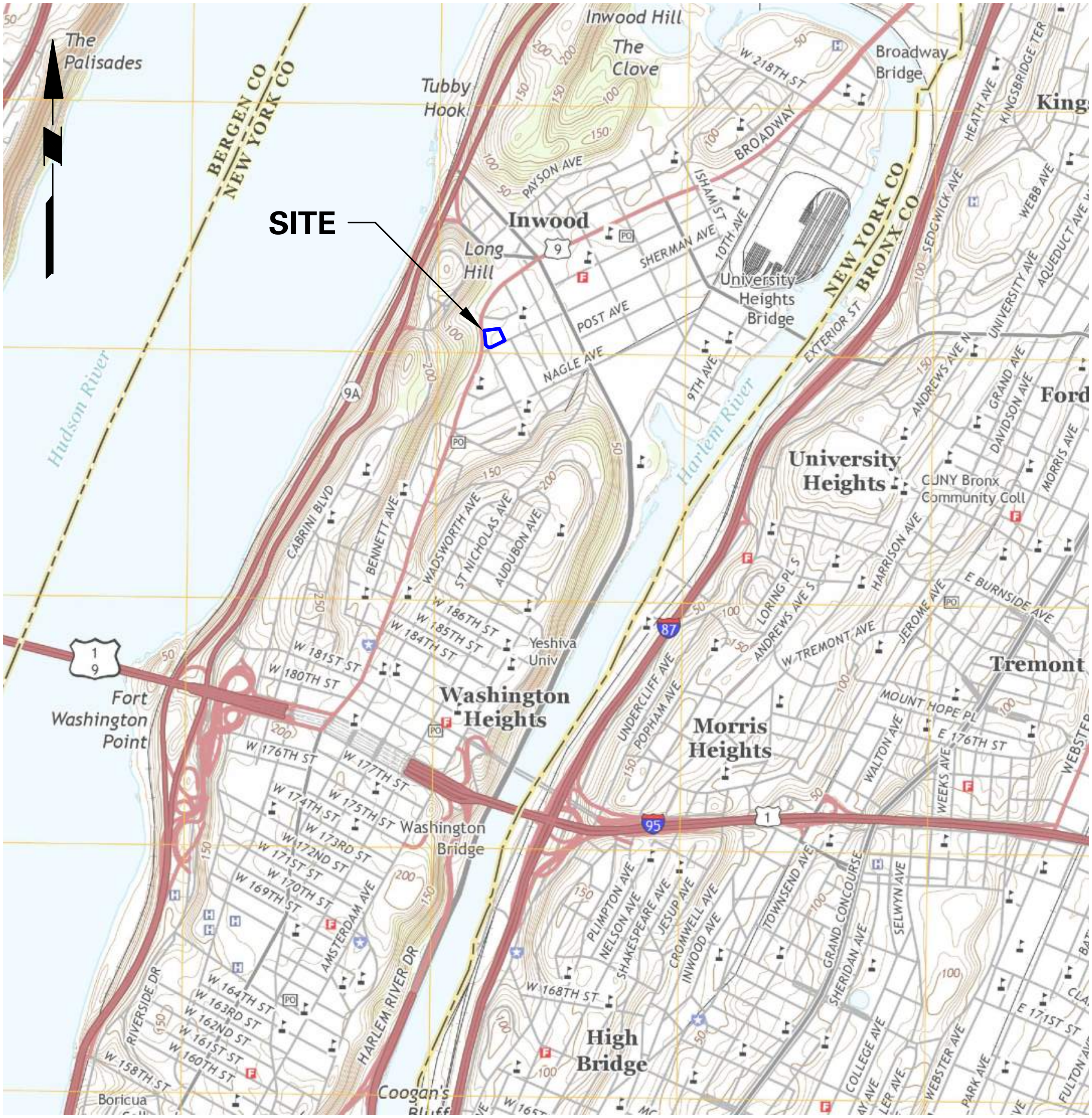
I certify that all information and statements in this certification are true. I understand that a false statement made herein is punishable as Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law.

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.

10.0 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 continue. The remedy, which will be implemented in accordance with this RAWP, is anticipated to take about 3 months to complete. After completion of the remedy, a FER will be submitted to the NYSDEC for review and approval. A detailed project schedule is included in Appendix I.

FIGURES



LEGEND:

APPROXIMATE SITE BOUNDARY

NOTE:

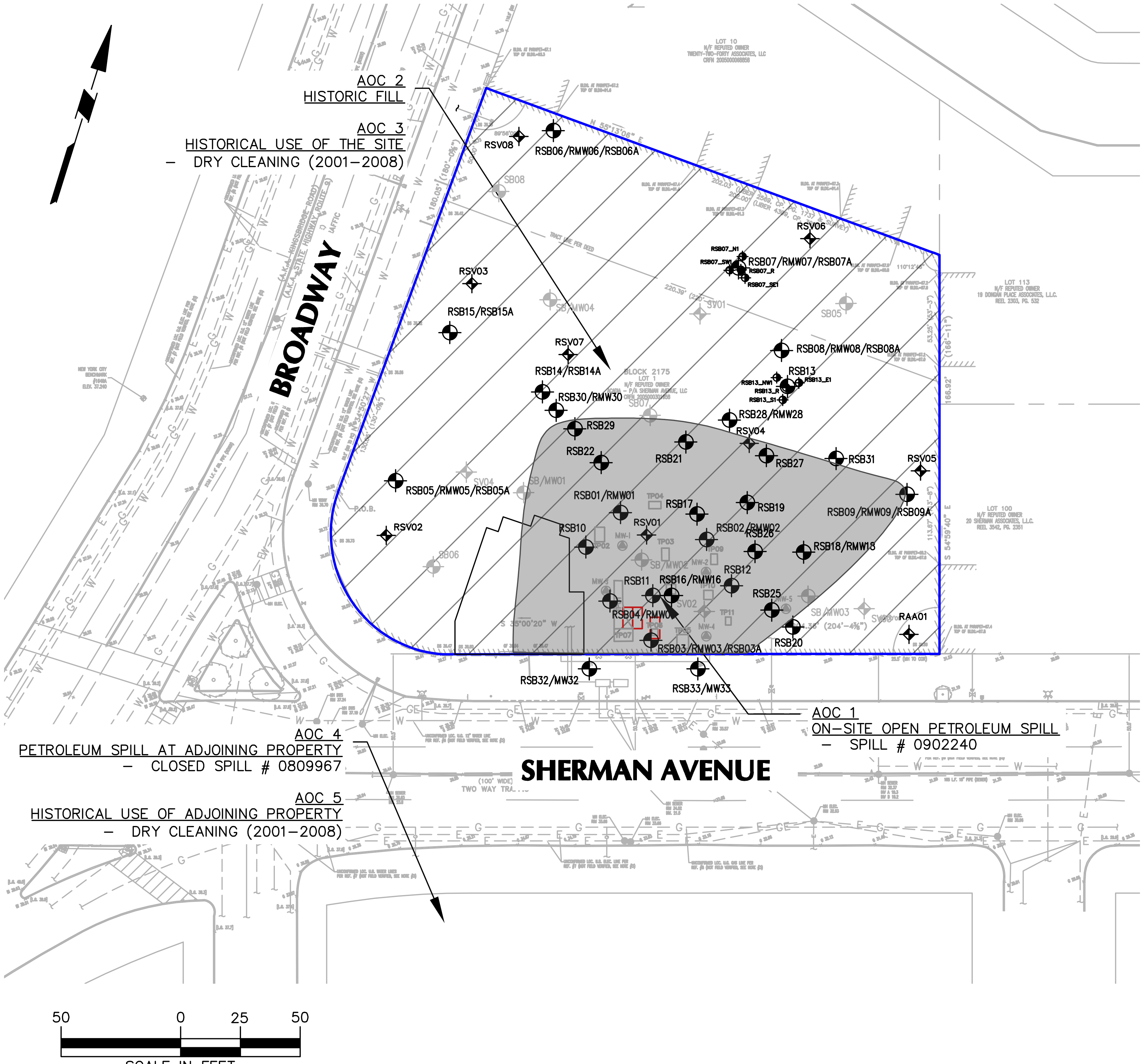
BASEMAP REFERENCE: USGS 7.5-MINUTE SERIES QUADRANGLE MAP OF CENTRAL PARK, NY, DATED 2016

2000 0 1000 2000

SCALE IN FEET

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

LANGAN	Project	Figure Title	Project No.	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	**4650 BROADWAY** BLOCK No. 2175 LOT No. 1 NEW YORK NEW YORK	**SITE LOCATION MAP**	170505501 Date 01/29/2021 Drawn By JG Checked By JL	**1**



LEGEND:

- APPROXIMATE SITE BOUNDARY
- RSB10 — RI SOIL BORING LOCATION
- RSB01/RMW01 — RI SOIL BORING AND MONITORING WELL LOCATION
- RSB13_NW2 — RI SVOC DELINEATION BORING
- RSV04 — RI SOIL VAPOR SAMPLE POINT
- RAA01 — RI INDOOR AIR SAMPLE LOCATION
- SB02 — PHASE II ESI SOIL BORING LOCATION
- SB/MW01 — PHASE II ESI SOIL BORING AND MONITORING WELL LOCATION
- SV01 — PHASE II ESI SOIL VAPOR POINT
- PREVIOUS TEST PIT (CNS, 2009)
- PREVIOUS MONITORING WELL (CNS, 2009)
- FORMER GASOLINE UST LOCATION (CNS, 2009)
- AOC 1
- AOC 2 AND 3

AREAS OF CONCERN

AOC 1 - ON-SITE OPEN PETROLEUM SPILL
AOC 2 - HISTORIC FILL
AOC 3 - HISTORICAL USE OF THE SITE
AOC 4 - PETROLEUM SPILL AT ADJOINING PROPERTY
AOC 5 - HISTORICAL USE OF THE ADJOINING PROPERTY

NOTES:

1. BASEMAP: BOUNDARY & TOPOGRAPHIC SURVEY, PREPARED BY CONTROL POINT ASSOCIATES INC., DATED OCTOBER 14, 2005.
2. ELEVATIONS ARE BASED UPON THE BOROUGH OF MANHATTAN DATUM, APPROXIMATELY 2.750 FEET ABOVE MEAN SEA LEVEL AT SANDY HOOK.
3. BORING LOCATIONS ARE APPROXIMATE.
4. ESI = ENVIRONMENTAL SITE INVESTIGATION
5. RI = REMEDIAL INVESTIGATION
6. AOC = AREA OF CONCERN
7. CNS = CNS MANAGEMENT CORP.
8. SVOC = SEMIVOLATILE ORGANIC COMPOUND

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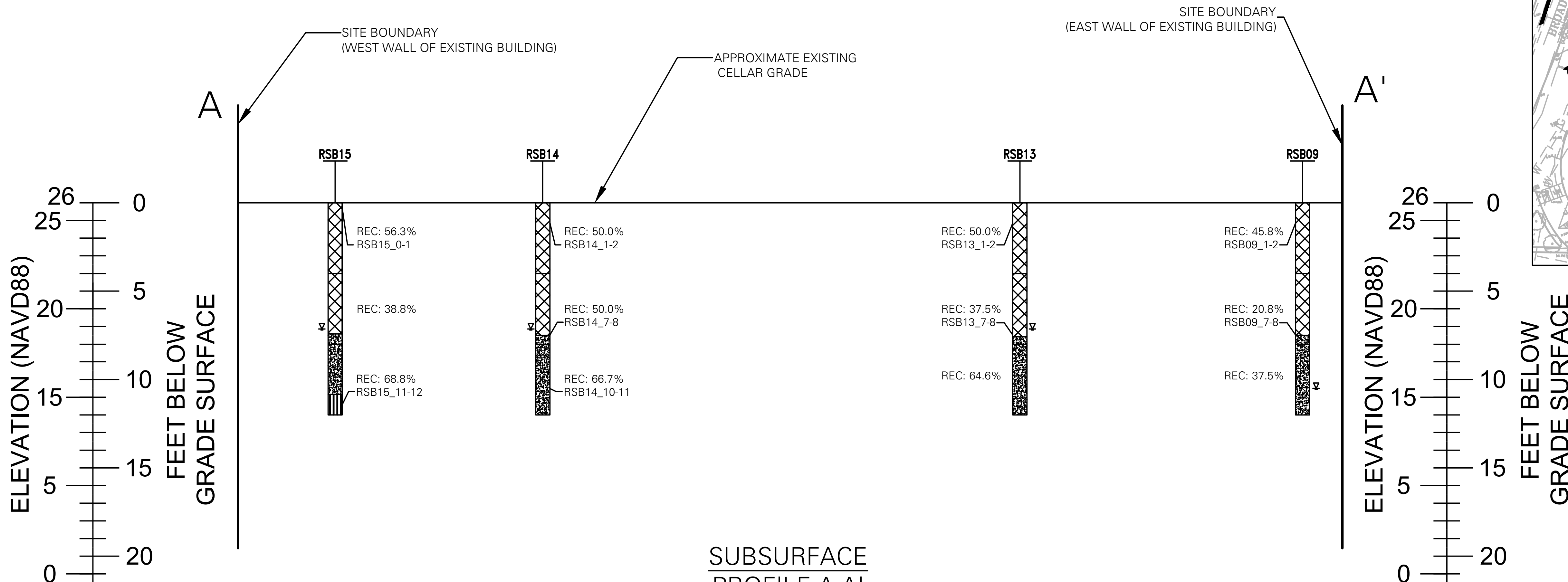
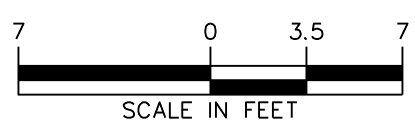
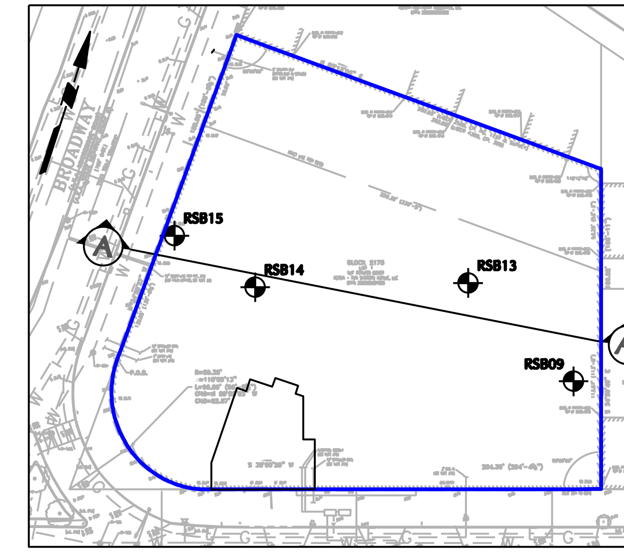
LANGAN Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C. 21 Penn Plaza, 360 West 31st Street, 8th Floor New York, NY 10001 T: 212.479.5400 F: 212.479.5444 www.langan.com	Project **4650 BROADWAY** BLOCK No. 2175, LOT No. 1 NEW YORK NEW YORK	Figure Title **AREAS OF CONCERN AND SAMPLE LOCATION MAP**	Project No. 170505501 Date 02/08/2021 Drawn By JG Checked By JL	Figure No. **2**



SUBSURFACE
PROFILE A-A'
(SCALE: 1" = 7')





KEY MAP
(SCALE: 1" = 100')

LEGEND:

APPROXIMATE SITE BOUNDARY

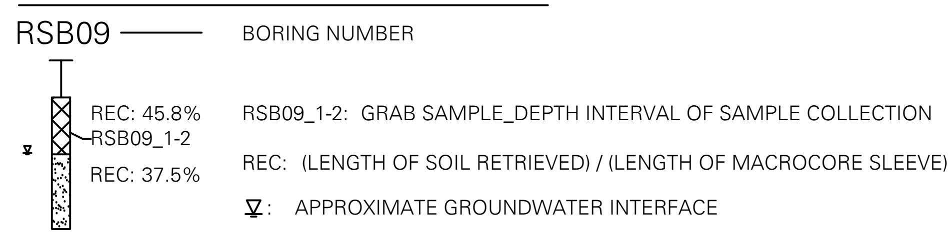
RSB14 SOIL BORING LOCATION

HISTORIC FILL MATERIAL

SAND

SILT

BORING KEY DIAGRAM AND NOTES



NOTES

1. THE BASE MAP IS REFERENCED FROM THE BOUNDRAY AND TOPOGRAPHIC SURVEY PREPARED BY CONTROL POINT ASSOCIATES INC., DATED OCTOBER 14, 2005.
2. BORING LOCATIONS ARE BASED ON FIELD MEASUREMENTS.
3. BORINGS WERE ADVANCED FROM THE CELLAR LEVEL BETWEEN APPROXIMATELY 7 AND 12 FEET BELOW SIDEWALK GRADE.
4. SUBSURFACE STRATIGRAPHY INTERPRETED FROM RECOVERED SOIL SAMPLES. REFER TO BORING LOGS (APPENDIX D) FOR ADDITIONAL INFORMATION.
5. MACROCORE SLEEVES WERE 4 FEET LONG.
6. ELEVATIONS ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).

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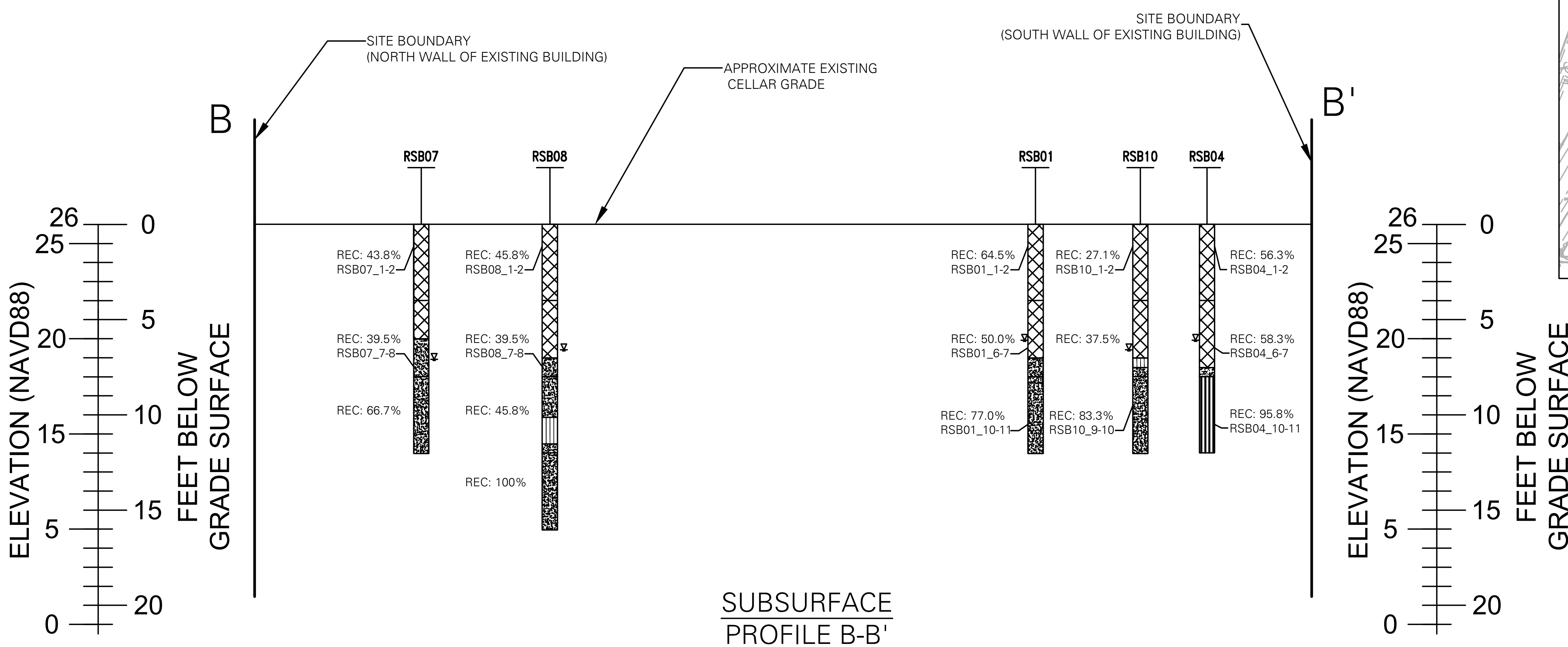
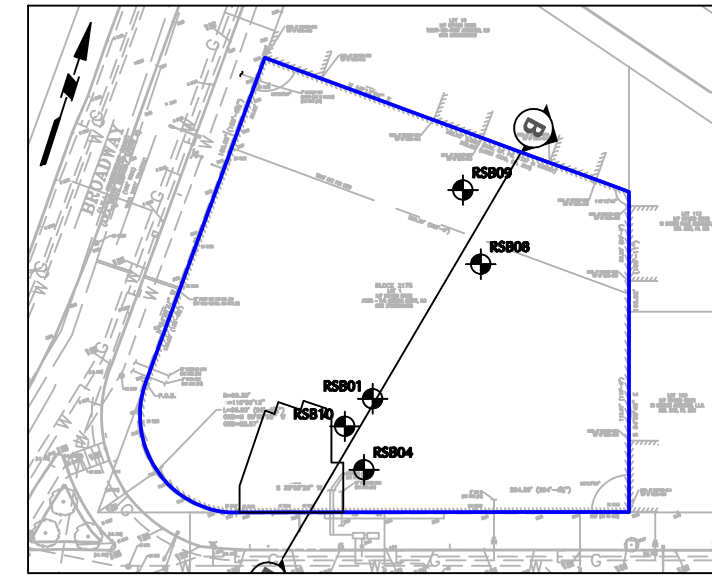
Project	Figure Title	Project No.	Figure No.
4650 BROADWAY BLOCK No. 2175, LOT No. 1 NEW YORK NEW YORK	**SUB-SURFACE PROFILE A-A'**	170505501 Date 05/10/2018 Drawn By JFY Checked By BG	**3A**



SUBSURFACE
PROFILE B-B'
(SCALE: 1" = 7')

7 0 3.5 7

SCALE IN FEET



KEY MAP
(SCALE: 1" = 100')

LEGEND:

APPROXIMATE SITE BOUNDARY

RSB01 SOIL BORING LOCATION

HISTORIC FILL MATERIAL

SAND

SILT

BORING KEY DIAGRAM AND NOTES

RSB04 — BORING NUMBER

REC: 56.3%
RSB04_1-2
REC: 58.3%

RSB04_1-2: GRAB SAMPLE_DEPTH INTERVAL OF SAMPLE COLLECTION

REC: (LENGTH OF SOIL RETRIEVED) / (LENGTH OF MACROCORE SLEEVE)

NOTES

1. THE BASE MAP IS REFERENCED FROM THE BOUNDRAY AND TOPOGRAPHIC SURVEY PREPARED BY CONTROL POINT ASSOCIATES INC., DATED OCTOBER 14, 2005.
2. BORING LOCATIONS ARE BASED ON FIELD MEASUREMENTS.
3. BORINGS WERE ADVANCED FROM THE CELLAR LEVEL BETWEEN APPROXIMATELY 7 AND 12 FEET BELOW SIDEWALK GRADE.
4. SUBSURFACE STRATIGRAPHY INTERPRETED FROM RECOVERED SOIL SAMPLES. REFER TO BORING LOGS (APPENDIX D) FOR ADDITIONAL INFORMATION.
5. MACROCORE SLEEVES WERE 4 FEET LONG.
6. ELEVATIONS ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).

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Project	Figure Title	Project No. / Date / Drawn By / Checked By	Figure No.
4650 BROADWAY BLOCK No. 2175, LOT No. 1 NEW YORK NEW YORK	SUB-SURFACE PROFILE B-B'	Project No. 170505501 Date 10/05/2021 Drawn By JFY Checked By BG	3B

Sample Location	RSB15		
Sample ID	RSB15_0-1	RSB15_7-8	RSB15_11-12
Sampling Depth (ft bgs)	0-1	7-8	11-12
Sample Date	4/10/2018	4/10/2018	4/10/2018
VOCs (mg/kg)			
Acetone	ND	ND	**0.077 J**
SVOCs (mg/kg)			
Total SVOCs	NE	ND	ND
PCBs (mg/kg)			
Total PCBs	ND	ND	ND
Pesticides (mg/kg)			
Total Pesticides	ND	ND	ND
Herbicides (mg/kg)			
Total Herbicides	ND	ND	ND
Metals (mg/kg)			
Manganese	NE	**2080 J**	NE

Sample Location	RSB14		
Sample ID	RSB14_1-2	RSB14_7-8	RSB14_10-11
Sampling Depth (ft bgs)	1-2	7-8	10-11
Sample Date	4/9/2018	4/9/2018	4/9/2018
VOCs (mg/kg)			
Total VOCs	ND	NE	NE
SVOCs (mg/kg)			
Total SVOCs	ND	ND	ND
PCBs (mg/kg)			
Total PCBs	ND	ND	ND
Pesticides (mg/kg)			
Total Pesticides	ND	ND	ND
Herbicides (mg/kg)			
Total Herbicides	ND	ND	ND
Metals (mg/kg)			
Total Metals	NE	NE	NE

Sample Location	RSB21	
Sample ID	RSB21_8-9	RSB21_11-12
Sample Depth (ft bgs)	8-9	11-12
Sample Date	7/30/2018	7/30/2018
VOCs (mg/kg)		
Total Xylenes	**0.86**	NE
SVOCs (mg/kg)		
Total SVOCs	NE	ND
PCBs (mg/kg)		
Total PCBs	NA	NA
Pesticides (mg/kg)		
Total Pesticides	NA	NA
Herbicides (mg/kg)		
Total Herbicides	NA	NA
Metals (mg/kg)		
Total Metals	NA	NA

Sample Location	RSB07	
Sample ID	RSB07_1-2	RSB07_7-8
Sampling Depth (ft bgs)	1-2	7-8
Sample Date	4/10/2018	4/10/2018
VOCs (mg/kg)		
Total VOCs	ND	NE
SVOCs (mg/kg)		
Benzo(a)Anthracene	NE	**2.7**
Benzo(a)Pyrene	NE	**2.2**
Benzo(b)Fluoranthene	NE	**3.2**
Benzo(k)Fluoranthene	ND	**0.88**
Chrysene	NE	**2.6**
Dibenz(a,h)Anthracene	ND	**0.35**
Indeno(1,2,3-c,d)Pyrene	NE	**1.7**
PCBs (mg/kg)		
Total PCBs	NE	ND
Pesticides (mg/kg)		
Total Pesticides	ND	ND
Herbicides (mg/kg)		
Total Herbicides	ND	ND
Metals (mg/kg)		
Mercury	NE	**0.29**

Sample Location	RSB08		
Sample ID	RSB08_14-15	RSB08_14-15	RSB08_14-15
Sampling Depth (ft bgs)	1-2	7-8	14-15
Sample Date	4/10/2018	4/10/2018	4/10/2018
VOCs (mg/kg)			
Acetone	ND	ND	**0.06 J**
SVOCs (mg/kg)			
Total SVOCs	NE	NE	ND
PCBs (mg/kg)			
Total PCBs	ND	ND	ND
Pesticides (mg/kg)			
Total Pesticides	ND	ND	ND
Herbicides (mg/kg)			
Total Herbicides	ND	ND	ND
Metals (mg/kg)			
Total Metals	NE	NE	NE

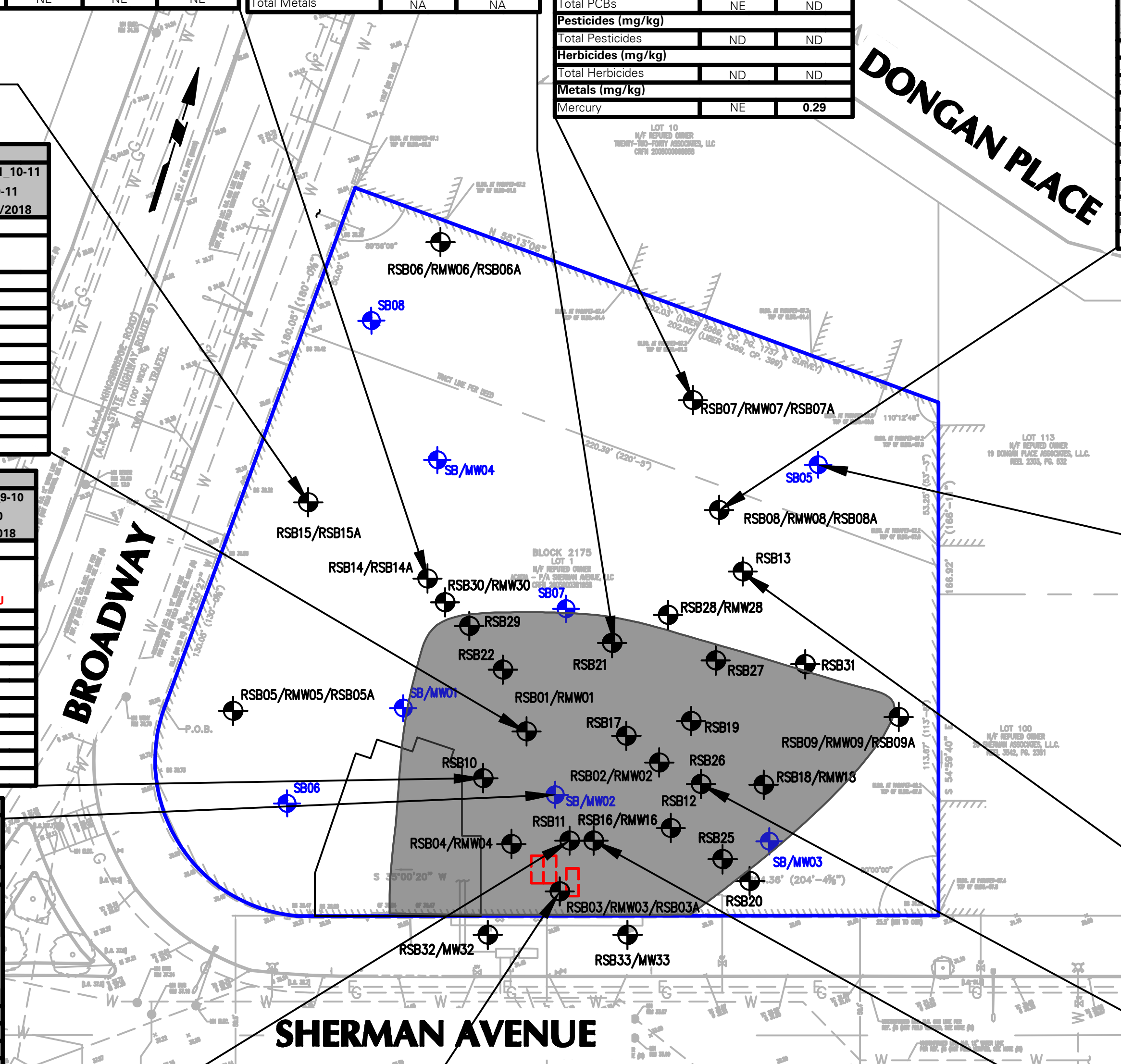
Sample Location	RSB01			
Sample ID	RSB01_1-2	RSBDUP02_041118	RSB01_6-7	RSB01_10-11
Sampling Depth (ft bgs)	1-2	1-2	6-7	10-11
Sample Date	4/11/2018	4/11/2018	4/11/2018	4/11/2018
VOCs (mg/kg)				
1,2,4-Trimethylbenzene	NE	NE	**6.4**	NE
Total Xylenes	NE	NE	**9.4**	NE
SVOCs (mg/kg)				
Total SVOCs	NE	NE	NE	NE
PCBs (mg/kg)				
Total PCBs	ND	ND	ND	ND
Pesticides (mg/kg)				
Total Pesticides	ND	ND	ND	ND
Herbicides (mg/kg)				
Total Herbicides	ND	ND	NE	ND
Metals (mg/kg)				
Total Metals	NE	NE	NE	NE

Sample Location	SB05
Sample ID	SB05_1-2
Sample Depth	1-2
Sample Date	3/12/2018
VOCs (mg/kg)	
Total VOCs	NE
SVOCs (mg/kg)	
Total SVOCs	NE
PCBs (mg/kg)	
Total PCBs	ND
Pesticides (mg/kg)	
Total Pesticides	NA
Herbicides (mg/kg)	
Total Herbicides	NA
Metals (mg/kg)	
Lead	**104**

Sample Location	RSB10		
Sample ID	RSB10_1-2	RSBDUP01_040918	RSB10_9-10
Sampling Depth (ft bgs)	1-2	1-2	9-10
Sample Date	4/9/2018	4/9/2018	4/9/2018
VOCs (mg/kg)			
1,2,4-Trimethylbenzene	NE	NE	**28**
1,3,5-Trimethylbenzene (Mesitylene)	NE	ND	**10**
Total Xylenes	ND	ND	**2.1 J**
SVOCs (mg/kg)			
Total SVOCs	ND	ND	ND
PCBs (mg/kg)			
Total PCBs	ND	NE	NE
Pesticides (mg/kg)			
Total Pesticides	ND	ND	ND
Herbicides (mg/kg)			
Total Herbicides	ND	ND	ND
Metals (mg/kg)			
Lead	**622 J**	NE	NE

Sample Location	RSB13	
Sample ID	RSB13_1-2	RSB13_7-8
Sampling Depth (ft bgs)	1-2	7-8
Sample Date	4/10/2018	4/10/2018
VOCs (mg/kg)		
Total VOCs	NE	NE
SVOCs (mg/kg)		
Benzo(a)Anthracene	**1.8**	NE
Benzo(a)Pyrene	**1.5**	NE
Benzo(b)Fluoranthene	**1.9**	**1.2**
Chrysene	**1.7**	NE
Indeno(1,2,3-c,d)Pyrene	**1.1**	**0.64**
PCBs (mg/kg)		
Total PCBs	ND	ND
Pesticides (mg/kg)		
Total Pesticides	ND	ND
Herbicides (mg/kg)		
Total Herbicides	ND	ND
Metals (mg/kg)		
Total Metals	NE	NE

Sample Location	SB02
Sample ID	SB02_6-7
Sampling Depth	6-7
Sample Date	3/12/2018
VOCs (mg/kg)	
1,2,4-Trimethylbenzene	**730**
1,3,5-Trimethylbenzene (Mesitylene)	**220**
Ethylbenzene	**110**
n-Butylbenzene	**21**
n-Propylbenzene	**77**
Toluene	**23**
Total Xylenes	**1200**
SVOCs (mg/kg)	
Naphthalene	**14**
PCBs (mg/kg)	
Total PCBs	ND
Pesticides (mg/kg)	
Total Pesticides	NA
Herbicides (mg/kg)	
Total Herbicides	NA
Metals (mg/kg)	
Total Metals	NE



Sample Location	RSB11		
Sample ID	RSB11_1-2	RSB11_5-6	RSB11_8-9
Sampling Depth (ft bgs)	1-2	5-6	8-9
Sample Date	4/9/2018	4/9/2018	4/9/2018
VOCs (mg/kg)			
1,2,4-Trimethylbenzene	NE	NE	**530**
1,3,5-Trimethylbenzene (Mesitylene)	NE	ND	**160**
n-Butylbenzene	ND	ND	**30**
n-Propylbenzene	ND	ND	**67**
Sec-Butylbenzene	ND	ND	**14**
Total Xylenes	ND	ND	**2.8 J**
SVOCs (mg/kg)			
Total SVOCs	ND	NE	NE
PCBs (mg/kg)			
Total PCBs	ND	ND	ND
Pesticides (mg/kg)			
Total Pesticides	ND	ND	ND
Herbicides (mg/kg)			
Total Herbicides	ND	ND	ND
Metals (mg/kg)			
Total Metals	NE	NE	NE

Sample Location	RSB03	
Sample ID	RSB03_0-1	RSB03_7-8
Sampling Depth (ft bgs)	0-1	7-8
Sample Date	4/11/2018	4/11/2018
VOCs (mg/kg)		
Total VOCs	NE	NE
SVOCs (mg/kg)		
Total SVOCs	NE	NE
PCBs (mg/kg)		
Total PCBs	**0.12 J**	NE
Pesticides (mg/kg)		
Total Pesticides	ND	ND
Herbicides (mg/kg)		
Total Herbicides	ND	ND
Metals (mg/kg)		
Zinc	**183**	NE

Sample Location	RSB16		
Sample ID	RSB16_6-8	RSB16_13-14	RSBDUP03_072718
Sample Depth (ft bgs)	6-8	13-14	13-14
Sample Date	7/26/2018	7/27/2018	7/27/2018
VOCs (mg/kg)			
1,2,4-Trimethylbenzene	**200**	ND	ND
1,3,5-Trimethylbenzene (Mesitylene)	**68**	ND	ND
Ethylbenzene	**2.4**	ND	ND
Methylene Chloride	**3.4 J**	ND	ND
n-Propylbenzene	**29**	ND	ND
Total Xylenes	**31**	ND	ND
SVOCs (mg/kg)			
Total SVOCs	NE	ND	ND
PCBs (mg/kg)			
Total PCBs	NA	NA	NA
Pesticides (mg/kg)			
Total Pesticides	NA	NA	NA
Herbicides (mg/kg)			
Total Herbicides	NA	NA	NA
Metals (mg/kg)			
Total Metals	NA	NA	NA

Location	RSB26	
Sample ID	RSB26_7-8	RSB26_10-11
Sample Depth (ft bgs)	7-8	10-11
Sample Date	7/31/2018	7/31/2018
VOCs (mg/kg)		
Total Xylenes	**0.76**	NE
SVOCs (mg/kg)		
Total SVOCs	NE	ND
PCBs (mg/kg)		
Total PCBs	ND	NA
Pesticides (mg/kg)		
Total Pesticides	ND	NA
Herbicides (mg/kg)		
Total Herbicides	ND	NA
Metals (mg/kg)		
Total Metals	ND	NA

60 0 20 40 60

SCALE IN FEET

LEGEND:

APPROXIMATE SITE BOUNDARY

RSB10 RI SOIL BORING LOCATION

RSB01/RMW01 RI SOIL BORING AND MONITORING WELL LOCATION

SB/MW01 PHASE II ESI SOIL BORING AND MONITORING WELL LOCATION

SB07 PHASE II ESI BORING LOCATION

FORMER GASOLINE UST LOCATION (CNS, 2009)

APPROXIMATE EXTENT OF SUB-CELLAR

NOTES:

1. BASEMAP: BOUNDARY & TOPOGRAPHIC SURVEY, PREPARED BY CONTROL POINT ASSOCIATES INC., DATED OCTOBER 14, 2005.
2. ELEVATIONS ARE BASED UPON THE BOROUGH OF MANHATTAN DATUM, APPROXIMATELY 2.750 FEET ABOVE MEAN SEA LEVEL AT SANDY HOOK.
3. MONITORING WELL LOCATIONS ARE APPROXIMATE.
4. BORINGS SB01 THROUGH SB08, RSB01 THROUGH RSB22, RSB25 THROUGH RSB31, WERE ADVANCED FROM CELLAR GRADE, WHICH IS APPROXIMATELY BETWEEN 7 AND 12 FEET BELOW SIDEWALK GRADE. BORINGS RMW32 AND RMW33 WERE ADVANCED FROM SIDEWALK GRADE.
5. SOIL SAMPLE ANALYTICAL RESULTS ARE COMPARED TO TITLE 6 OF THE NEW YORK CODES, RULES, AND REGULATIONS (NYCRR) PART 375 UNRESTRICTED USE (UU), RESTRICTED USE- RESTRICTED RESIDENTIAL (RURR) SOIL CLEANUP OBJECTIVES (SCOs).
6. ANALYTES DETECTED IN SOIL THAT WERE ALSO DETECTED IN EXCEEDANCE OF THE NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION (NYSDEC) TECHNICAL AND OPERATIONAL GUIDANCE SERIES (TOGS) 1.1.1 AMBIENT WATER QUALITY STANDARDS (AWQS) AND GUIDANCE FOR DRINKING WATER (CLASS GA) COLLECTIVELY REFERRED TO AS THE STANDARDS AND GUIDANCE VALUES (SGVS) IN GROUNDWATER WERE COMPARED TO THE NYCRR PART 375 PROTECTION OF GROUNDWATER (PGW) SCOs.
7. RESULTS EXCEEDING UU SCOs ARE BOLDED.
8. RESULTS EXCEEDING RURR SCOs ARE SHADED AND BOLDED.
9. RESULTS EXCEEDING PGW SCOs ARE RED.
10. ONLY RESULTS WITH DETECTED CONCENTRATIONS ABOVE UU, RRU AND/OR PGW SCOs ARE SHOWN. SOIL SAMPLE ANALYTICAL RESULTS FROM BORINGS RSB02, RSB04, RSB05, RSB06, RSB09, RSB12, RSB14, RSB17, RSB18, RSB19, RSB20, RSB22, RSB25, RSB27, RSB28, RSB29, RSB30, RSB31, RSB32, RSB33, RSB07_N1, RSB07_SE1, RSB07_SW1, RSB13_NW1, RSB13_E1, RSB13_S1, SB01, SB03, SB04, SB06, SB07, AND SB08 DID NOT EXCEED SCOs, AND ARE NOT SHOWN ON THIS FIGURE.
11. SOIL SAMPLES WERE COLLECTED AT CELLAR GRADE, WHICH IS BETWEEN 7 AND 12 FEET BELOW SIDEWALK GRADE.
12. mg/kg = MILLIGRAMS PER KILOGRAM
13. VOCs = VOLATILE ORGANIC COMPOUNDS
14. RI = REMEDIAL INVESTIGATION
15. SVOCs = SEMIVOLATILE ORGANIC COMPOUNDS
16. PCBs = POLYCHLORINATED BIPHENYLS
17. NE = NO EXCEEDANCES
18. ND = NOT DETECTED
19. NA = NOT ANALYZED
20. UST = UNDERGROUND STORAGE TANK
21. J= THE ANALYTE WAS DETECTED ABOVE THE METHOD DETECTION LIMIT (MDL), BUT BELOW THE REPORTING LIMIT (RL); THEREFORE, THE RESULT IS AN ESTIMATED CONCENTRATION.
22. FT BGS = FEET BELOW CELLAR GRADE SURFACE
23. ESI = ENVIRONMENTAL SITE INVESTIGATION

Analyte	CAS Number	NYSDEC UU SCOs	NYSDEC RURR SCOs	NYSDEC PGW SCOs
VOCs (mg/kg)				
1,2,4-Trimethylbenzene	95-63-6	3.6	52	3.6
1,3,5-Trimethylbenzene (Mesitylene)	108-67-8	8.4	52	8.4
Acetone	67-64-1	0.05	100	0.05
Ethylbenzene	100-41-4	1	41	1
Methylene Chloride	75-09-2	0.05	100	0.05
n-Butylbenzene	104-51-8	12	100	12
n-Propylbenzene	103-65-1	3.9	100	3.9
Sec-Butylbenzene	135-98-8	11	100	11
Toluene	108-88-3	0.7	100	0.7
Total Xylenes	1330-20-7	0.26	100	1.6
SVOCs (mg/kg)				
Benzo(a)anthracene	56-55-3	1	1	1
Benzo(a)pyrene	50-32-8	1	1	~
Benzo(b)fluoranthene	205-99-2	1	1	1.7
Benzo(k)fluoranthene	207-08-9	0.8	3.9	~
Chrysene	218-01-9	1	3.9	1
Dibenz(a,h)anthracene	53-70-3	0.33	0.33	~
Indeno(1,2,3-cd)pyrene	193-39-5	0.5	0.5	~
Naphthalene	91-20-3	12	100	12
PCBs (mg/kg)				
Total PCBs	1336-36-3	0.1	1	~
Metals (mg/kg)				
Lead	7439-92-1	63	400	450
Manganese	7439-96-5	1600	2000	2000
Mercury	7439-97-6	0.18	0.81	~
Zinc	7440-66-6	109	10000	~

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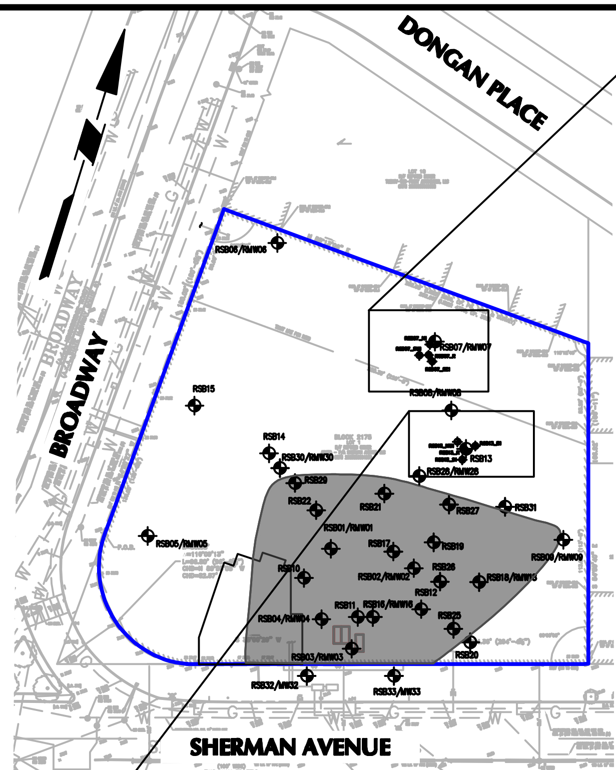
Project: **4650 BROADWAY**
BLOCK No. 2175, LOT No. 1
NEW YORK NEW YORK

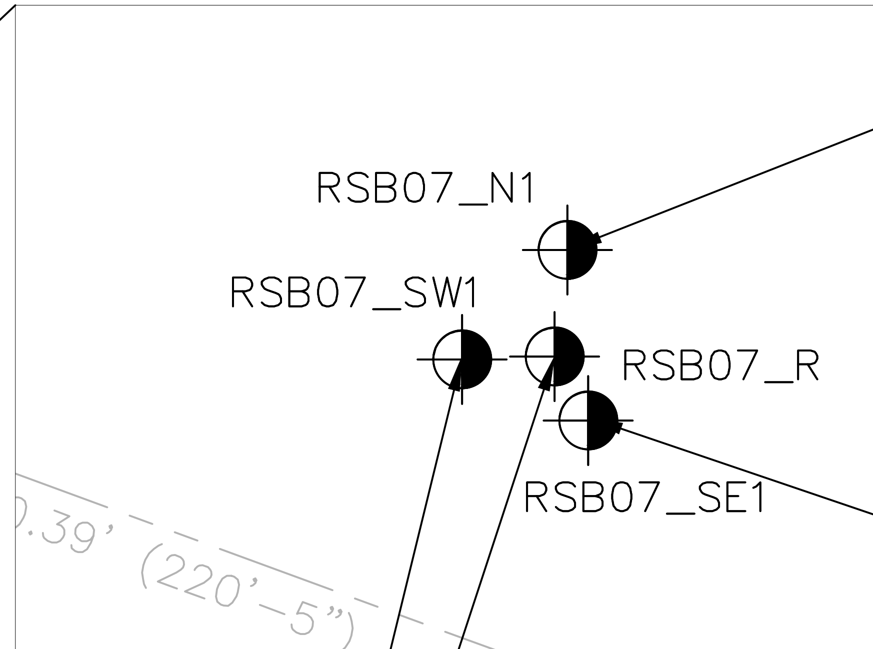
Figure Title: **SOIL SAMPLE ANALYTICAL RESULTS MAP**

Project No. 170505501
Date 02/03/2021
Drawn By JG
Checked By JL
Figure No. **4A**

Filename: \\langan.com\data\NYC\data5\170505501\Project Data\CAD\01\SheetFiles\Environmental\RAWP\Figure 4A - Soil Sample Analytical Results Map.dwg Date: 2/10/2021 Time: 15:23 User: jgolding Style Table: Langan.stb Layout: ANSIB-BL



KEY MAP
(SCALE 1" = 100')

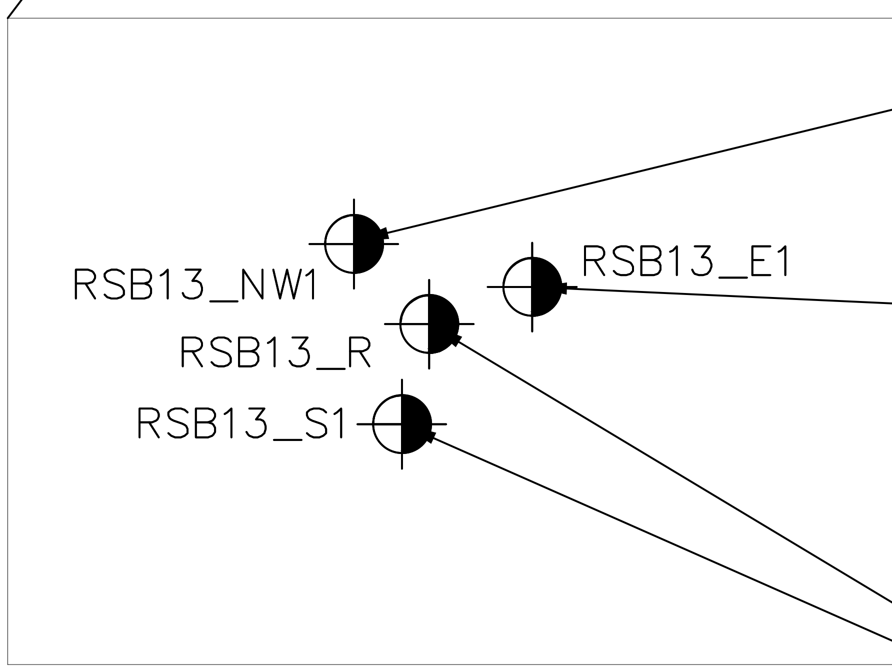


Sample Location	RSB07N1
Sample ID	RSB07_N1-7-8
Sample Depth (ft bgs)	7 to 8
Sample Date	7/26/2018
SVOCs (mg/kg)	
Total SVOCs	NE

Sample Location	RSB07SE1
Sample ID	RSB07_SE1-7-8
Sample Depth (ft bgs)	7 to 8
Sample Date	7/26/2018
SVOCs (mg/kg)	
Total SVOCs	NE

Sample Location	RSB07SW1
Sample ID	RSB07_SW1-7-8
Sample Depth (ft bgs)	7 to 8
Sample Date	7/26/2018
SVOCs (mg/kg)	
Total SVOCs	NE

Sample Location	RSB07R				
Sample ID	RSB07_1-2	RSB07_7-8	RSB07R_5-7	RSB07R_7-8	RSB07R_8-10
Sample Depth (ft bgs)	1-2	7-8	5 to 7	7 to 8	8 to 10
Sample Date	4/10/2018	4/10/2018	7/26/2018	7/26/2018	7/26/2018
SVOCs (mg/kg)					
Benzo(a)Anthracene	NE	**2.7**	NE	ND	ND
Benzo(a)Pyrene	NE	**2.2**	NE	ND	ND
Benzo(b)Fluoranthene	NE	**3.2**	NE	ND	ND
Benzo(k)Fluoranthene	ND	**0.88**	NE	ND	ND
Chrysene	NE	**2.6**	NE	ND	ND
Dibenz(a,h)Anthracene	ND	**0.35**	ND	ND	ND
Indeno(1,2,3-c,d)Pyrene	NE	**1.7**	NE	ND	ND



Sample Location	RSB13E1
Sample ID	RSB13_E1-7-8
Sample Depth (ft bgs)	7 to 8
Sample Date	7/26/2018
SVOCs (mg/kg)	
Total SVOCs	NE

Sample Location	RSB13NW1
Sample ID	RSB13_NW1-7-8
Sample Depth (ft bgs)	7 to 8
Sample Date	7/26/2018
SVOCs (mg/kg)	
Total SVOCs	NE

Sample Location	RSB13R			
Sample ID	RSB13_1-2	RSB13_7-8	RSB13R_7-8	RSB13R_8-10
Sample Depth (ft bgs)	1-2	7-8	7 to 8	8 to 10
Sample Date	4/10/2018	4/10/2018	7/26/2018	7/26/2018
SVOCs (mg/kg)				
Benzo(a)Anthracene	**1.8**	NE	ND	ND
Benzo(a)Pyrene	**1.5**	NE	ND	ND
Benzo(b)Fluoranthene	**1.9**	**1.2**	ND	ND
Chrysene	**1.7**	NE	ND	ND
Indeno(1,2,3-c,d)Pyrene	**1.1**	**0.64**	ND	ND

Sample Location	RSB13S1	
Sample ID	RSB13_S1-7-8	RSBDUP04_072618
Sample Depth (ft bgs)	7 to 8	7 to 8
Sample Date	7/26/2018	7/26/2018
SVOCs (mg/kg)		
Total SVOCs	NE	NE

LEGEND:

- APPROXIMATE SITE BOUNDARY
- RSB10 — RI SOIL BORING LOCATION
- RSB13_NW2 — RI SVOC DELINEATION BORING LOCATION
- FORMER GASOLINE UST LOCATION (CNS, 2009)
- APPROXIMATE EXTENT OF SUB-CELLAR
- AOC 1: ON-SITE OPEN PETROLEUM SPILL

NOTES:

1. BASEMAP: BOUNDARY & TOPOGRAPHIC SURVEY, PREPARED BY CONTROL POINT ASSOCIATES INC., DATED OCTOBER 14, 2005.
2. ELEVATIONS ARE BASED UPON THE BOROUGH OF MANHATTAN DATUM, APPROXIMATELY 2.750 FEET ABOVE MEAN SEA LEVEL AT SANDY HOOK.
3. BORINGS WERE ADVANCED FROM CELLAR GRADE, WHICH IS BETWEEN APPROXIMATELY 7 AND 12 FEET BELOW SIDEWALK GRADE.
4. SOIL SAMPLE ANALYTICAL RESULTS ARE COMPARED TO TITLE 6 OF THE NEW YORK CODES, RULES, AND REGULATIONS (NYCRR) PART 375 UNRESTRICTED USE (UU), RESTRICTED USE-RESTRICTED RESIDENTIAL (RURR), AND PROTECTION OF GROUNDWATER (PGW) SOIL CLEANUP OBJECTIVES (SCOs).
5. RESULTS EXCEEDING UU SCOs ARE BOLDED.
6. RESULTS EXCEEDING RURR SCOs ARE SHADED AND BOLDED.
7. RESULTS EXCEEDING PGW SCOs ARE RED.
8. SOIL SAMPLES COLLECTED FROM BORINGS RSB07_N2, RSB07_SE2, AND RSB07_SW2 WERE NOT ANALYZED BECAUSE SOIL SAMPLES COLLECTED FROM BORINGS RSB07_N1, RSB07_SE1, AND RSB07_SW1 DID NOT EXCEED UU SCOs.
9. SOIL SAMPLES COLLECTED FROM BORINGS RSB13_NW2, RSB13_S2, AND RSB13_E2 WERE NOT ANALYZED BECAUSE SOIL SAMPLES FROM COLLECTED FROM BORINGS RSB013_NW1, RSB13_E1, AND RSB13_S1 DID NOT EXCEED UU SCOs.
10. mg/kg = MILLIGRAMS PER KILOGRAM
11. SVOCs = SEMIVOLATILE ORGANIC COMPOUNDS
12. NE = NO EXCEEDANCES
13. ND = NOT DETECTED
14. UST = UNDERGROUND STORAGE TANK
15. FT BGS = FEET BELOW CELLAR GRADE SURFACE
16. RI = REMEDIAL INVESTIGATION

Analytes	NYSDEC UU SCOs	NYSDEC RURR SCOs	NYSDEC PGW
SVOCs (mg/kg)			
Benzo(a)Anthracene	1	1	1
Benzo(a)Pyrene	1	1	~
Benzo(b)Fluoranthene	1	1	1.7
Benzo(k)Fluoranthene	0.8	3.9	~
Chrysene	1	3.9	1
Dibenz(a,h)Anthracene	0.33	0.33	~
Indeno(1,2,3-c,d)Pyrene	0.5	0.5	~

SCALE IN FEET

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

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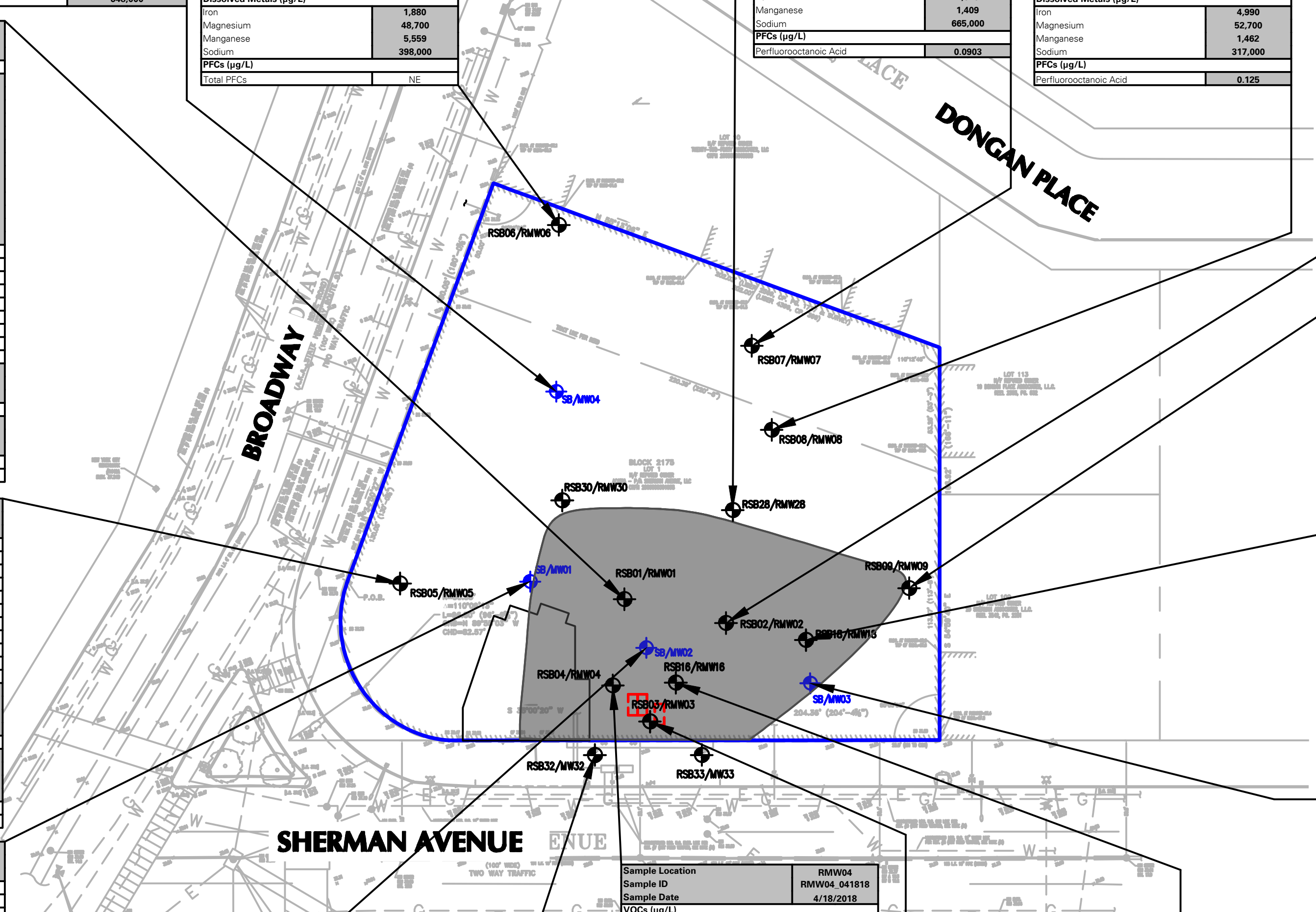
Figure Title
SOIL SAMPLE ANALYTICAL RESULTS MAP - RSB07 AND RSB13

Project No. 170505501
Date 02/09/2021
Drawn By JG
Checked By JL

Figure No. **4B**

Filename: \\langan.com\data\NYC\data5\170505501\Project Data\CAD\01\SheetFiles\Environmental\RAWP\Figure 4B - Soil Sample Analytical Results Map - RSB07 AND RSB13.dwg Date: 2/9/2021 Time: 21:59 User: lesmail Style Table: Langan.stb Layout: ANSIB-BL (1)



Sample Location	MW04
Sample ID	MW04_031218
Sample Date	3/12/2018
VOCs (µg/L)	
Total VOCs	NE
SVOCs (µg/L)	
Total SVOCs	NE
PCBs (µg/L)	
Total PCBs	ND
Pesticides (µg/L)	
Total Pesticides	NA
Herbicides (µg/L)	
Total Herbicides	NA
Total Metals (µg/L)	
Total Metals	NA
Dissolved Metals (µg/L)	
Iron	**744**
Manganese	**5,272 J**
Sodium	**648,000**

Sample Location	RMW06
Sample ID	RMW06_041918
Sample Date	4/19/2018
VOCs (µg/L)	
Total VOCs	NE
SVOCs (µg/L)	
Total SVOCs	NE
PCBs (µg/L)	
Total PCBs	ND
Pesticides (µg/L)	
Total Pesticides	ND
Herbicides (µg/L)	
Total Herbicides	ND
Total Metals (µg/L)	
Iron	**8,030**
Magnesium	**478,00**
Manganese	**5,484**
Sodium	**395,000**
Dissolved Metals (µg/L)	
Iron	**1,880**
Magnesium	**48,700**
Manganese	**5,559**
Sodium	**398,000**
PFCs (µg/L)	
Total PFCs	NE

Sample Location	RMW28
Sample ID	RMW28_080718
Sample Date	8/7/2018
VOCs (µg/L)	
1,2-Dichloroethane	**2.4 J**
SVOCs (µg/L)	
Total SVOCs	NE
PCBs (µg/L)	
Total PCBs	ND
Pesticides (µg/L)	
Total Pesticides	NA
Herbicides (µg/L)	
Total Herbicides	NA
Total Metals (µg/L)	
Total Metals	NA
Dissolved Metals (µg/L)	
Dissolved Metals	NA
PFCs (µg/L)	
Total PFCs	NA

Sample Location	RMW07
Sample ID	RMW07_041918
Sample Date	4/19/2018
VOCs (µg/L)	
Total VOCs	NE
SVOCs (µg/L)	
Total SVOCs	NE
PCBs (µg/L)	
Total PCBs	ND
Pesticides (µg/L)	
Total Pesticides	NE
Herbicides (µg/L)	
Total Herbicides	ND
Total Metals (µg/L)	
Iron	**1,960**
Manganese	**1,402**
Sodium	**674,000**
Dissolved Metals (µg/L)	
Iron	**1,020**
Manganese	**1,409**
Sodium	**665,000**
PFCs (µg/L)	
Perfluorooctanoic Acid	**0.0903**

Sample Location	RMW08
Sample ID	RMW08_041918
Sample Date	4/19/2018
VOCs (µg/L)	
Total VOCs	ND
SVOCs (µg/L)	
Total SVOCs	NE
PCBs (µg/L)	
Total PCBs	ND
Pesticides (µg/L)	
Total Pesticides	ND
Herbicides (µg/L)	
Total Herbicides	ND
Total Metals (µg/L)	
Iron	**4,660**
Magnesium	**50,500**
Manganese	**1,426**
Sodium	**282,000**
Dissolved Metals (µg/L)	
Iron	**4,990**
Magnesium	**52,700**
Manganese	**1,462**
Sodium	**317,000**
PFCs (µg/L)	
Perfluorooctanoic Acid	**0.125**

Sample Location	RMW02	
Sample ID	RMW02_041818	RGWDUP01_041818
Sample Date	4/18/2018	4/18/2018
VOCs (µg/L)		
1,2,4-Trimethylbenzene	**32 J**	**11 J**
1,3,5-Trimethylbenzene (Mesitylene)	**26 J**	**9.6 J**
Acrylonitrile	**36 J**	**16 J**
Ethylbenzene	**18 J**	**5.4 J**
Isopropylbenzene (Cumene)	**5.5**	NE
M,P-Xylene	**58**	**29**
n-Propylbenzene	**8.6**	NE
o-Xylene (1,2-Dimethylbenzene)	**6.5**	NE
SVOCs (µg/L)		
Total SVOCs	NE	NE
PCBs (µg/L)		
Total PCBs	ND	ND
Pesticides (µg/L)		
Total Pesticides	ND	ND
Herbicides (µg/L)		
Total Herbicides	ND	ND
Total Metals (µg/L)		
Antimony	ND	**3.11 J**
Arsenic	**55.53**	**51.84**
Beryllium	**4.18 J**	NE
Chromium, Total	**220.0 J**	**113.6 J**
Copper	**246.7 J**	NE
Iron	**174,000 J**	**70,700 J**
Lead	**171.9 J**	**50.49 J**
Magnesium	**49,900 J**	NE
Manganese	**2,276 J**	**874.0 J**
Nickel	**136.4 J**	NE
Selenium	**13.1 J**	NE
Sodium	**732,000**	**716,000**
Dissolved Metals (µg/L)		
Manganese	**511.5**	**438.0**
Sodium	**708,000**	**710,000**
PFCs (µg/L)		
Total PFCs	NE	NE

Sample Location	RMW01
Sample ID	RMW01_041918
Sample Date	4/19/2018
VOCs (µg/L)	
1,2,4,5-Tetramethylbenzene	**21**
1,2,4-Trimethylbenzene	**570**
1,2-Dichloropropane	**3.8 J**
1,3,5-Trimethylbenzene (Mesitylene)	**180**
Acrylonitrile	**260**
Benzene	**26**
Ethylbenzene	**380**
Isopropylbenzene (Cumene)	**30**
M,P-Xylene	**1,600**
Naphthalene	**120**
n-Propylbenzene	**72**
o-Xylene (1,2-Dimethylbenzene)	**620**
Toluene	**11 J**
SVOCs (µg/L)	
Total SVOCs	NE
PCBs (µg/L)	
Total PCBs	ND
Pesticides (µg/L)	
Total Pesticides	ND
Herbicides (µg/L)	
Total Herbicides	ND
Total Metals (µg/L)	
Iron	**20,600**
Manganese	**658.2**
Sodium	**626,000**
Dissolved Metals (µg/L)	
Iron	**605**
Manganese	**352.4**
Sodium	**592,000**
PFCs (µg/L)	
Total PFCs	NE

Sample Location	RMW05
Sample ID	RMW05_041918
Sample Date	4/19/2018
VOCs (µg/L)	
Total VOCs	ND
SVOCs (µg/L)	
Total SVOCs	NE
PCBs (µg/L)	
Total PCBs	ND
Pesticides (µg/L)	
Total Pesticides	ND
Herbicides (µg/L)	
Total Herbicides	ND
Total Metals (µg/L)	
Iron	**28,100**
Magnesium	**62,900**
Manganese	**4,309**
Sodium	**1,590,000**
Dissolved Metals (µg/L)	
Iron	**749**
Magnesium	**59,400**
Manganese	**3,976**
Sodium	**1,660,000**
PFCs (µg/L)	
Total PFCs	NE

Sample Location	MW01
Sample ID	MW01_031218
Sample Date	3/12/2018
VOCs (µg/L)	
Total VOCs	NE
SVOCs (µg/L)	
Total SVOCs	NE
PCBs (µg/L)	
Total PCBs	ND
Pesticides (µg/L)	
Total Pesticides	NA
Herbicides (µg/L)	
Total Herbicides	NA
Total Metals (µg/L)	
Total Metals	NA
Dissolved Metals (µg/L)	
Sodium	**1,470,000**

Sample Location	RMW09
Sample ID	RMW09_041918
Sample Date	4/19/2018
VOCs (µg/L)	
Total VOCs	ND
SVOCs (µg/L)	
Total SVOCs	NE
PCBs (µg/L)	
Total PCBs	ND
Pesticides (µg/L)	
Total Pesticides	ND
Herbicides (µg/L)	
Total Herbicides	ND
Total Metals (µg/L)	
Sodium	**508,000**
Dissolved Metals (µg/L)	
Sodium	**550,000**
PFCs (µg/L)	
Total PFCs	NE

Sample Location	RMW18	
Sample ID	RMW18_080718	RGWDUP02_080718
Sample Date	8/7/2018	8/7/2018
VOCs (µg/L)		
1,2,4,5-Tetramethylbenzene	**5.3**	**6.3**
1,2,4-Trimethylbenzene	**9.8**	**12**
1,3,5-Trimethylbenzene (Mesitylene)	**16**	**19**
Isopropylbenzene (Cumene)	**5.4**	**7.3**
n-Propylbenzene	**8**	**11**
SVOCs (µg/L)		
Total SVOCs	NE	NE
PCBs (µg/L)		
Total PCBs	NA	NA
Pesticides (µg/L)		
Total Pesticides	NA	NA
Herbicides (µg/L)		
Total Herbicides	NA	NA
Total Metals (µg/L)		
Total Metals	NA	NA
Dissolved Metals (µg/L)		
Dissolved Metals	NA	NA
PFCs (µg/L)		
Total PFCs	NA	NA

Sample Location	MW03
Sample ID	MW03_031218
Sample Date	3/12/2018
VOCs (µg/L)	
Total VOCs	ND
SVOCs (µg/L)	
Total SVOCs	NE
PCBs (µg/L)	
Total PCBs	ND
Pesticides (µg/L)	
Total Pesticides	NA
Herbicides (µg/L)	
Total Herbicides	NA
Total Metals (µg/L)	
Total Metals	NA
Dissolved Metals (µg/L)	
Sodium	**1,480,000**

Sample Location	MW02
Sample ID	MW02_031218
Sample Date	3/12/2018
VOCs (µg/L)	
1,2,4,5-Tetramethylbenzene	**41**
1,2,4-Trimethylbenzene	**1,300**
1,3,5-Trimethylbenzene (Mesitylene)	**390**
Acetone	**92 J**
Ethylbenzene	**330**
Isopropylbenzene (Cumene)	**49 J**
M,P-Xylene	**2,000**
Naphthalene	**72**
n-Propylbenzene	**160**
o-Xylene (1,2-Dimethylbenzene)	**530**
Toluene	**190**
SVOCs (µg/L)	
Total SVOCs	NE
PCBs (µg/L)	
Total PCBs	ND
Pesticides (µg/L)	
Total Pesticides	NA
Herbicides (µg/L)	
Total Herbicides	NA
Total Metals (µg/L)	
Total Metals	NA
Dissolved Metals (µg/L)	
Manganese	**300.6 J**
Sodium	**768,000**

Sample Location	MW32
Sample ID	MW32_091218
Sample Date	9/12/2018
VOCs (µg/L)	
Total VOCs	NE
SVOCs (µg/L)	
Benzo(a)Anthracene	**0.04 J**
Benzo(a)Pyrene	**0.06 J**
Benzo(b)Fluoranthene	**0.07 J**
Benzo(k)Fluoranthene	**0.04 J**
Chrysene	**0.06 J**
Indeno(1,2,3-c,d)Pyrene	**0.04 J**
PCBs (µg/L)	
Total PCBs	NA
Pesticides (µg/L)	
Total Pesticides	NA
Herbicides (µg/L)	
Total Herbicides	NA
Total Metals (µg/L)	
Total Metals	NA
Dissolved Metals (µg/L)	
Dissolved Metals	NA
PFCs (µg/L)	
Total PFCs	NA

Sample Location	RMW04
Sample ID	RMW04_041818
Sample Date	4/18/2018
VOCs (µg/L)	
1,2,4,5-Tetramethylbenzene	**88**
1,2,4-Trimethylbenzene	**96**
1,3,5-Trimethylbenzene (Mesitylene)	**45**
Chloroform	**13**
Cymene	**7.4**
Ethylbenzene	**7.4**
M,P-Xylene	**23**
n-Butylbenzene	**11**
n-Propylbenzene	**17**
o-Xylene (1,2-Dimethylbenzene)	**14**
Sec-Butylbenzene	**16**
SVOCs (µg/L)	
Benzo(a)Anthracene	**0.04 J**
Benzo(b)Fluoranthene	**0.04 J**
Chrysene	**0.05 J**
PCBs (µg/L)	
Total PCBs	ND
Pesticides (µg/L)	
Total Pesticides	ND
Herbicides (µg/L)	
Total Herbicides	ND
Total Metals (µg/L)	
Antimony	**3.2 J**
Iron	**10,100**
Lead	**27.50**
Sodium	**214,000**
Dissolved Metals (µg/L)	
Sodium	**238,000 J**
PFCs (µg/L)	
Total PFCs	NE

Sample Location	RMW03
Sample ID	RMW03_041818
Sample Date	4/18/2018
VOCs (µg/L)	
1,2,4,5-Tetramethylbenzene	**38**
1,2,4-Trimethylbenzene	**630**
1,3,5-Trimethylbenzene (Mesitylene)	**200**
Ethylbenzene	**43**
Isopropylbenzene (Cumene)	**21 J**
M,P-Xylene	**320**
Naphthalene	**73**
n-Butylbenzene	**17 J**
n-Propylbenzene	**58**
o-Xylene (1,2-Dimethylbenzene)	**100**
SVOCs (µg/L)	
Total SVOCs	NE
PCBs (µg/L)	
Total PCBs	ND
Pesticides (µg/L)	
Total Pesticides	ND
Herbicides (µg/L)	
Total Herbicides	ND
Total Metals (µg/L)	
Iron	**13000**
Sodium	**372000**
Dissolved Metals (µg/L)	
Iron	**7090**
Sodium	**456000 J**
PFCs (µg/L)	
Perfluorooctanoic Acid	**0.169**

Sample Location	RMW16
Sample ID	RMW16_080718
Sample Date	8/7/2018
VOCs (µg/L)	
1,2,4,5-Tetramethylbenzene	**27**
1,2,4-Trimethylbenzene	**800**
1,3,5-Trimethylbenzene (Mesitylene)	**220**
Acetone	**110**
Ethylbenzene	**16 J**
Isopropylbenzene (Cumene)	**31**
M,P-Xylene	**140**
Naphthalene	**25 J**
n-Propylbenzene	**80**
o-Xylene (1,2-Dimethylbenzene)	**36**
Sec-Butylbenzene	**7.8 J**
Total Xylenes	**180**
SVOCs (µg/L)	
Naphthalene	NE
PCBs (µg/L)	
Total PCBs	NA
Pesticides (µg/L)	
Total Pesticides	NA
Herbicides (µg/L)	
Total Herbicides	NA
Total Metals (µg/L)	
Total Metals	NA
Dissolved Metals (µg/L)	
Dissolved Metals	NA
PFCs (µg/L)	
Total PFCs	NA

LEGEND:

- APPROXIMATE SITE BOUNDARY
- RSB01/RMW01 — RI SOIL BORING AND MONITORING WELL LOCATION
- SB/MW01 — PHASE II ESI SOIL BORING AND MONITORING WELL LOCATION
- FORMER GASOLINE UST LOCATION (CNS, 2009)
- APPROXIMATE EXTENT OF SUB-CELLAR

NOTES:

1. BASEMAP: BOUNDARY & TOPOGRAPHIC SURVEY, PREPARED BY CONTROL POINT ASSOCIATES INC., DATED OCTOBER 14, 2005.
2. ELEVATIONS ARE BASED UPON THE BOROUGH OF MANHATTAN DATUM, APPROXIMATELY 2.750 FEET ABOVE MEAN SEA LEVEL AT SANDY HOOK.
3. SAMPLE LOCATIONS ARE APPROXIMATE.
4. GROUNDWATER SAMPLE ANALYTICAL RESULTS ARE COMPARED TO THE NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION (NYSDEC) TECHNICAL AND OPERATIONAL GUIDANCE SERIES (TOGS) 1.1.1 AMBIENT WATER QUALITY STANDARDS (AWQS) AND GUIDANCE VALUES FOR DRINKING WATER (CLASS GA)(COLLECTIVELY REFERRED TO AS THE STANDARDS AND GUIDANCE VALUES [SGVs]).
5. REGULATORY CRITERIA DO NOT EXIST FOR PERFLUORINATED AND POLYFLUORINATED ALKYL SUBSTANCES AND 1,4-DIOXANE IN NEW YORK STATE. PERFLUORINATED AND POLYFLUORINATED ALKYL SUBSTANCES AND 1,4-DIOXANE ARE COMPARED TO THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (USEPA) HEALTH ADVISORY LEVEL.
6. RESULTS EXCEEDING SGVs AND/OR THE USEPA HEALTH ADVISORY LEVEL ARE SHADED AND BOLDED.
7. ONLY RESULTS WITH DETECTED CONCENTRATIONS ABOVE SGVs ARE SHOWN. GROUNDWATER SAMPLE ANALYTICAL RESULTS FROM RMW30 AND MW33 DID NOT EXCEED SGVs, AND ARE NOT SHOWN.
8. GROUNDWATER SAMPLES WERE COLLECTED AT CELLAR GRADE, WHICH IS BETWEEN ABOUT 7 AND 12 FEET BELOW SIDEWALK GRADE.
9. µg/L = MICROGRAMS PER LITER
10. VOCs = VOLATILE ORGANIC COMPOUNDS
11. SVOCs = SEMIVOLATILE ORGANIC COMPOUNDS
12. PCBs = POLYCHLORINATED BIPHENYLS
13. NE = NO EXCEEDANCES
14. ND = NOT DETECTED
15. NA = NOT ANALYZED
16. UST = UNDERGROUND STORAGE TANK
17. J= THE ANALYTE WAS DETECTED ABOVE THE METHOD DETECTION LIMIT (MDL), BUT BELOW THE REPORTING LIMIT (RL); THEREFORE, THE RESULT IS AN ESTIMATED CONCENTRATION.
18. PFCs = PERFLUORINATED CHEMICALS
19. ESI = ENVIRONMENTAL SITE INVESTIGATION
20. RI = REMEDIAL INVESTIGATION

Analytes	SGVs
VOCs (µg/L)	
1,2,4,5-Tetramethylbenzene	5
1,2,4-Trimethylbenzene	5
1,2-Dichloroethane	0.6
1,2-Dichloropropane	1
1,3,5-Trimethylbenzene (Mesitylene)	5
Acetone	50
Acrylonitrile	5
Benzene	1
Chloroform	7
Cymene	5
Ethylbenzene	5
Isopropylbenzene (Cumene)	5
M,P-Xylene	5
Naphthalene	10
n-Butylbenzene	5
n-Propylbenzene	5
o-Xylene (1,2-Dimethylbenzene)	5
Sec-Butylbenzene	5
Toluene	5
Total Xylenes	5
SVOCs (µg/L)	
Benzo(a)Anthracene	0.002
Benzo(a)Pyrene	0
Benzo(b)Fluoranthene	0.002
Benzo(k)Fluoranthene	0.002
Chrysene	0.002
Indeno(1,2,3-c,d)Pyrene	0.002
Total and Dissolved Metals (µg/L)	
Antimony	3
Arsenic	25
Beryllium	3
Chromium, Total	50
Copper	200
Iron	300
Lead	25
Magnesium	35000
Manganese	300
Nickel	100
Selenium	10
Sodium	20000

PFCs	USEPA Health Advisory Level
Perfluorooctanoic Acid	0.07

80 0 40 80

SCALE IN FEET

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

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Project	Figure Title	Project No.	Figure No.
4650 BROADWAY BLOCK No. 2175, LOT No. 1 NEW YORK NEW YORK	GROUNDWATER SAMPLE ANALYTICAL RESULTS MAP	170505501	5
		Date: 02/09/2021	
		Drawn By: JG	
		Checked By: JL	

Filename: \\langan.com\data\NYC\data5\170505501\Project Data\CAD\01\SheetFiles\Environmental\RAWP\Figure 5 - GW Sample Analytical Results Map.dwg Date: 2/10/2021 Time: 15:27 User: jgolding Style Table: Langan.stb Layout: ANSIB-BL

Sample Location Sample ID Sample Date	RSV07 RSV07_041118 4/11/2018
VOCs (µg/m³)	
1,2,4-Trimethylbenzene	4.44
1,3,5-Trimethylbenzene (Mesitylene)	1.05
1,3-Butadiene	0.538
2,2,4-Trimethylpentane	3.43
4-Ethyltoluene	1.28
Acetone	81.7
Benzene	11.1
Carbon Disulfide	3.95
Chloroform	3.97
Cyclohexane	1.23
Dichlorodifluoromethane	1.79 J
Ethanol	55
Ethylbenzene	4
Isopropanol	6.46 J
M,P-Xylene	15.5
Methyl Ethyl Ketone (2-Butanone)	3.69
Methylene Chloride	6.53
n-Heptane	5.66
n-Hexane	3.74
o-Xylene (1,2-Dimethylbenzene)	5.34
Tert-Butyl Alcohol	2.94
Tert-Butyl Methyl Ether	1.1
Toluene	28.1
Trichlorofluoromethane	1.19
Total VOCs	245.47

Sample Location Sample ID Sample Date	RSV08 RSV08_041118 4/11/2018
VOCs (µg/m³)	
1,2,4-Trimethylbenzene	17.3
Acetone	126
M,P-Xylene	23.1
n-Heptane	8.57
o-Xylene (1,2-Dimethylbenzene)	12
Tetrachloroethylene (PCE)	1.42
Toluene	18
Total VOCs	206.39

Sample Location Sample ID Sample Date	SV01 SV01_031218 3/12/2018
VOCs (µg/m³)	
1,2,4-Trimethylbenzene	19.7
1,3,5-Trimethylbenzene (Mesitylene)	5.95
1,3-Butadiene	3.03
2,2,4-Trimethylpentane	9.53
4-Ethyltoluene	5.9
Acetone	1340
Benzene	11.4
Carbon Disulfide	22.4
Chloroform	3.46
Chloromethane	4.27
Cyclohexane	8.64
Dichlorodifluoromethane	2.94
Ethanol	81.6
Ethylbenzene	11
Isopropanol	25.6 J
M,P-Xylene	45.2
Methyl Ethyl Ketone (2-Butanone)	32.7
n-Heptane	41.8
n-Hexane	52.5
o-Xylene (1,2-Dimethylbenzene)	16
Tert-Butyl Methyl Ether	3.24
Toluene	27.2
Total VOCs	1,774.06

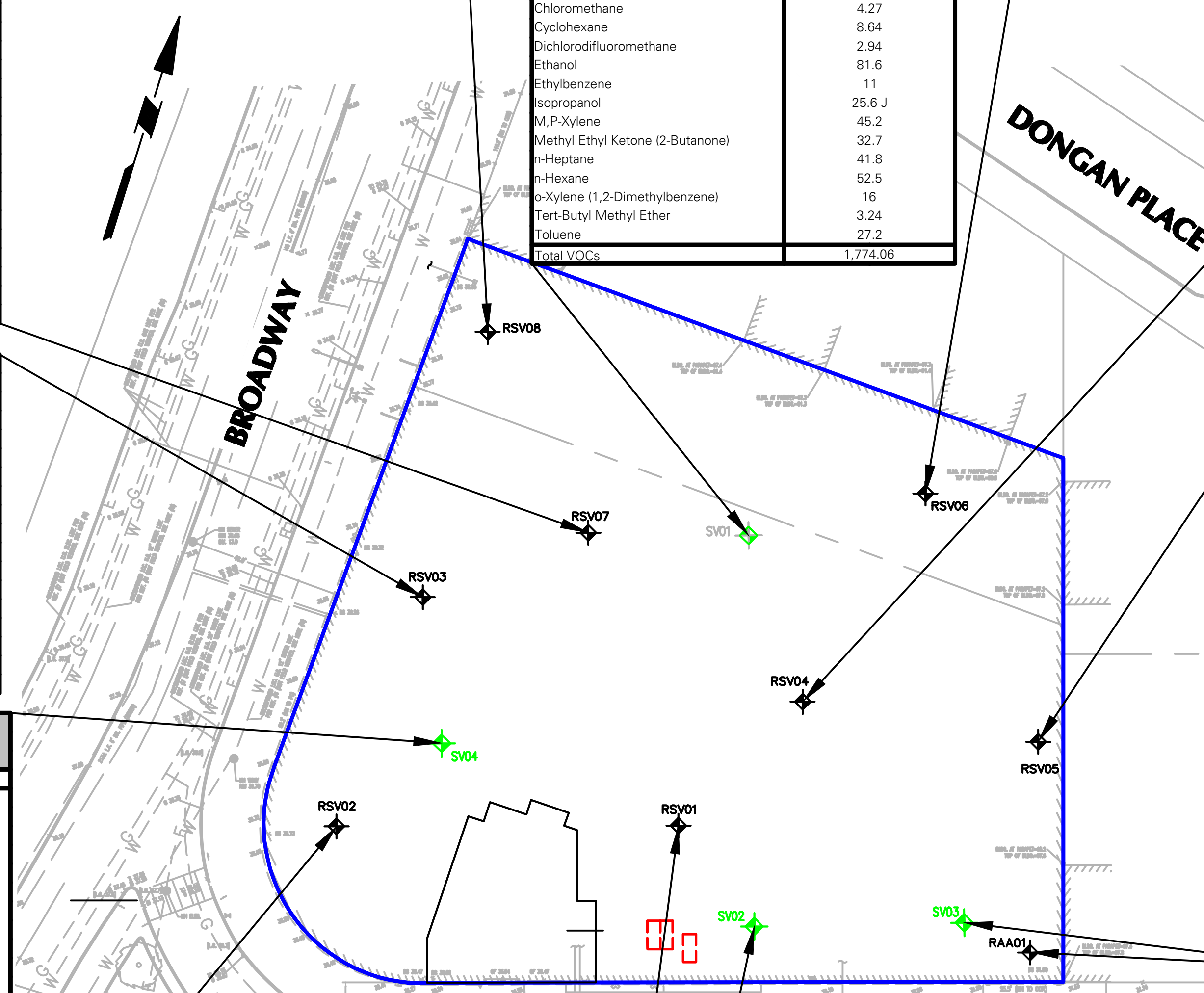
Sample Location Sample ID Sample Date	RSV06 RSV06_041118 4/11/2018
VOCs (µg/m³)	
1,1,1-Trichloroethane	0.546
1,2,4-Trimethylbenzene	10.5
M,P-Xylene	9.73
o-Xylene (1,2-Dimethylbenzene)	6.08
Tetrachloroethylene (PCE)	5.66
Total VOCs	32.52

LEGEND:

- APPROXIMATE SITE BOUNDARY
- RSV04 — RI SOIL VAPOR POINT LOCATION
- RAA01 — RI INDOOR AIR SAMPLE LOCATION
- SV01 — PHASE II ESI SOIL VAPOR POINT LOCATION
- FORMER GASOLINE UST LOCATION (CNS, 2009)
- APPROXIMATE EXTENT OF SUB-CELLAR

Sample Location Sample ID Sample Date	RSV04 RSV04_041118 4/11/2018
VOCs (µg/m³)	
1,2,4-Trimethylbenzene	14.7
1,3,5-Trimethylbenzene (Mesitylene)	5.51
Acetone	74.4
Carbon Disulfide	4.17
M,P-Xylene	16.9
o-Xylene (1,2-Dimethylbenzene)	9.73
Tetrachloroethylene (PCE)	0.678
Toluene	7.39
Total VOCs	133.48

Sample Location Sample ID Sample Date	RSV03 RSV03_041018 4/10/2018
VOCs (µg/m³)	
1,1,1-Trichloroethane	0.682
1,2,4-Trimethylbenzene	19.1
1,3,5-Trimethylbenzene (Mesitylene)	6.29
4-Ethyltoluene	4.92
Acetone	115
Chloroform	179
Ethanol	77.3
Ethylbenzene	4.39
M,P-Xylene	18.2
o-Xylene (1,2-Dimethylbenzene)	9.9
Tert-Butyl Alcohol	12.2
Tetrachloroethylene (PCE)	3.29
Toluene	8.1
Total VOCs	458.37



Sample Location Sample ID Sample Date	RSV05 RSV05_040918 4/9/2018
VOCs (µg/m³)	
1,2,4-Trimethylbenzene	10.2
Acetone	16.1
M,P-Xylene	14
o-Xylene (1,2-Dimethylbenzene)	9.56
Toluene	7.8
Total VOCs	57.66

NOTES:

1. BASEMAP: BOUNDARY & TOPOGRAPHIC SURVEY, PREPARED BY CONTROL POINT ASSOCIATES INC., DATED OCTOBER 14, 2005.
2. ELEVATIONS ARE BASED UPON THE BOROUGH OF MANHATTAN DATUM, APPROXIMATELY 2.750 FEET ABOVE MEAN SEA LEVEL AT SANDY HOOK.
3. SAMPLE LOCATIONS ARE APPROXIMATE.
4. SOIL VAPOR SAMPLES WERE COLLECTED AT CELLAR GRADE, WHICH IS BETWEEN ABOUT 7 AND 12 FEET BELOW SIDEWALK GRADE.
5. ONLY DETECTED COMPOUNDS ARE SHOWN.
6. µg/m3 = MICROGRAM PER CUBIC METER
7. VOCs = VOLATILE ORGANIC COMPOUNDS
8. UST = UNDERGROUND STORAGE TANK
9. ESI = ENVIRONMENTAL SITE INVESTIGATION
10. RI = REMEDIAL INVESTIGATION

Sample Location Sample ID Sample Date	SV03 SV03_031218 3/12/2018
VOCs (µg/m³)	
1,2,4-Trimethylbenzene	18.2
1,3,5-Trimethylbenzene (Mesitylene)	5.26
1,3-Butadiene	1.87
2,2,4-Trimethylpentane	14.6
4-Ethyltoluene	6.54
Acetone	361
Benzene	15.1
Carbon Disulfide	9.62
Cyclohexane	3.3
Dichlorodifluoromethane	2.68
Ethylbenzene	5.52
Isopropanol	4.38 J
M,P-Xylene	24
Methyl Ethyl Ketone (2-Butanone)	12.4
n-Heptane	13.3
n-Hexane	11.7
o-Xylene (1,2-Dimethylbenzene)	10.9
Tert-Butyl Methyl Ether	3.25
Tetrachloroethylene (PCE)	9.9
Toluene	23
Total VOCs	556.52

Sample Location Sample ID Sample Date	SV04 SV04_031218 3/12/2018
VOCs (µg/m³)	
1,1,1-Trichloroethane	3.52
1,2,4-Trimethylbenzene	22.1
1,3,5-Trimethylbenzene (Mesitylene)	6.1
2,2,4-Trimethylpentane	4.05
4-Ethyltoluene	6.34
Acetone	508
Benzene	7.44
Carbon Disulfide	84.7
Ethanol	27.9
Ethylbenzene	9.47
Isopropanol	9.54 J
M,P-Xylene	36
Methyl Ethyl Ketone (2-Butanone)	18.6
n-Heptane	11.2
n-Hexane	5.5
o-Xylene (1,2-Dimethylbenzene)	14.4
Styrene	2.34
Tert-Butyl Methyl Ether	16.2
Tetrachloroethylene (PCE)	9.7
Toluene	14.5
Total VOCs	817.6

Sample Location Sample ID Sample Date	RAA01 AA01_040918 4/9/2018
VOCs (µg/m³)	
1,2,4-Trimethylbenzene	12.1
1,3,5-Trimethylbenzene (Mesitylene)	3.61
1,3-Butadiene	2.74
2,2,4-Trimethylpentane	12.5
4-Ethyltoluene	3.42
Acetone	27.1
Benzene	13.7
Chloromethane	1.12
Cyclohexane	2.43
Dichlorodifluoromethane	1.76 J
Ethanol	36.4
Ethylbenzene	7.17
M,P-Xylene	29
n-Heptane	5.94
n-Hexane	7.47
o-Xylene (1,2-Dimethylbenzene)	10.3
Styrene	0.911
Toluene	36.6
Trichlorofluoromethane	1.17
Total VOCs	213.681

Sample Location Sample ID Sample Date	RSV01 RSV01_040918 4/9/2018
VOCs (µg/m³)	
1,2,4-Trimethylbenzene	11
1,3,5-Trimethylbenzene (Mesitylene)	3.21
1,3-Butadiene	0.456
2,2,4-Trimethylpentane	6.31
4-Ethyltoluene	2.8
Acetone	43.9
Benzene	7.44
Carbon Disulfide	6.85
Chloromethane	0.434
Cyclohexane	2.98
Dichlorodifluoromethane	1.97 J
Ethanol	98
Ethylbenzene	8.51
Isopropanol	20.5 J
M,P-Xylene	35.6
Methyl Ethyl Ketone (2-Butanone)	4.45
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	2.63
Methylene Chloride	5.77
n-Heptane	7.34
n-Hexane	4.86
o-Xylene (1,2-Dimethylbenzene)	12.8
Styrene	1.47
Tert-Butyl Alcohol	2.34
Toluene	38.4
Trichloroethylene (TCE)	19.3
Trichlorofluoromethane	1.16
Total VOCs	328.01

Sample Location Sample ID Sample Date	SV02 SV02_031218 3/12/2018
VOCs (µg/m³)	
1,2,4-Trimethylbenzene	16.6
Acetone	141
Benzene	15.7
Carbon Disulfide	11.8
Chloroform	64.9
Cyclohexane	24.2
M,P-Xylene	26.8
n-Heptane	8.97
n-Hexane	12.2
o-Xylene (1,2-Dimethylbenzene)	12.4
Tetrachloroethylene (PCE)	2.92
Toluene	13.2
Total VOCs	350.69

Sample Location Sample ID Sample Date	RSV02 RSV02_041018 4/10/2018
VOCs (µg/m³)	
1,2,4-Trimethylbenzene	10.7
Acetone	68.9
Carbon Disulfide	4.55
M,P-Xylene	9.9
o-Xylene (1,2-Dimethylbenzene)	5.82
Tetrachloroethylene (PCE)	1.12
Toluene	6.1
Trichloroethylene (TCE)	0.564
Total VOCs	107.65

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SCALE IN FEET

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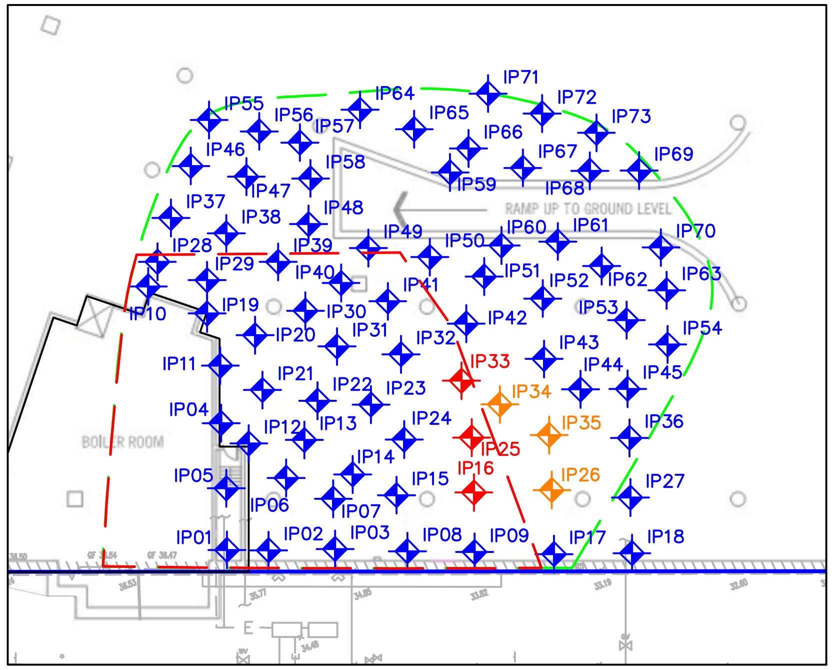
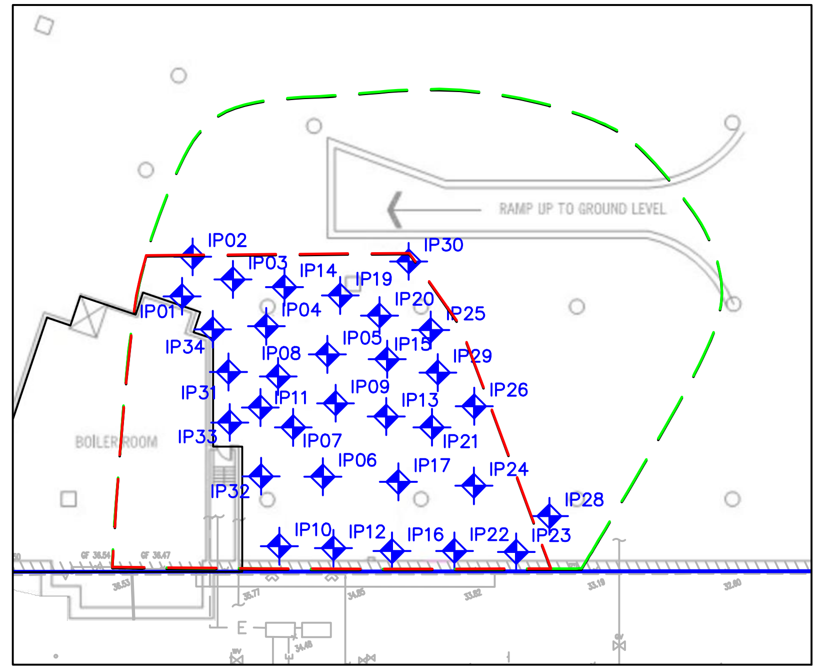
Project	Figure Title	Project No.	Figure No.
4650 BROADWAY BLOCK No. 2175, LOT No. 1 NEW YORK NEW YORK	SOIL VAPOR SAMPLE ANALYTICAL RESULTS MAP	170505501 Date 02/09/2021 Drawn By VZ Checked By JL	6

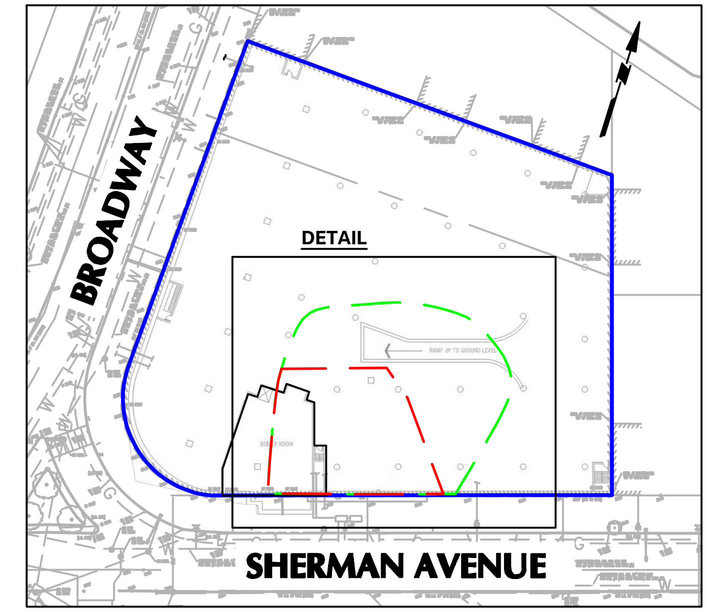
Filename: \\langan.com\data\NYC\data5\170505501\Project Data\CAD\01\SheetFiles\Environmental\RAWP\Figure 6 - SV Sample Analytical Results Map.dwg Date: 2/10/2021 Time: 00:21 User: lesmail Style Table: Langan.stb Layout: ANSIB-BL



DETAIL 1-A
APRIL 8 - APRIL 18, 2019, PERSULFOX® AND REGENOX® INJECTION LOCATIONS



DETAIL 1-B
MAY 13 - MAY 17, 2019, PERSULFOX® AND REGENOX® INJECTION LOCATIONS



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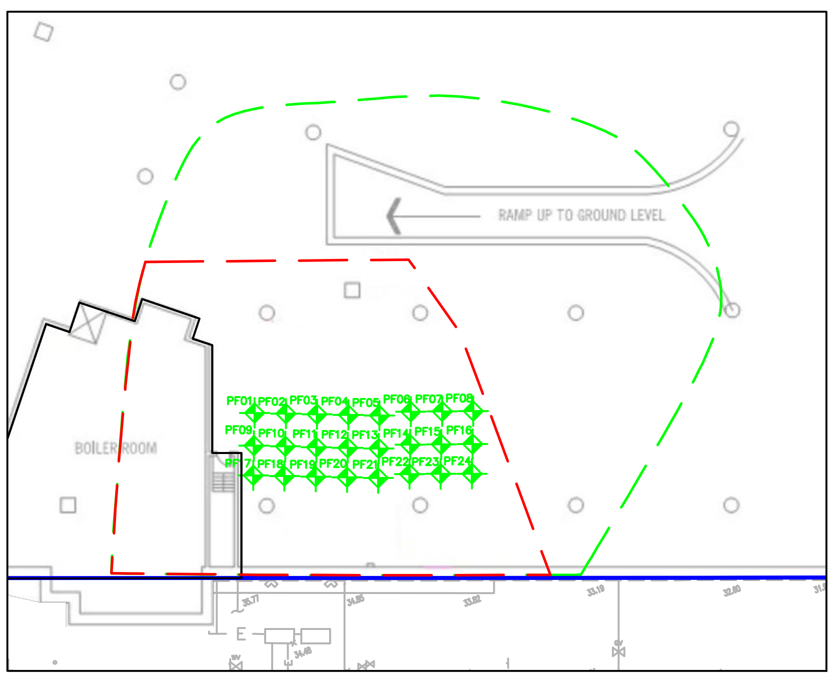
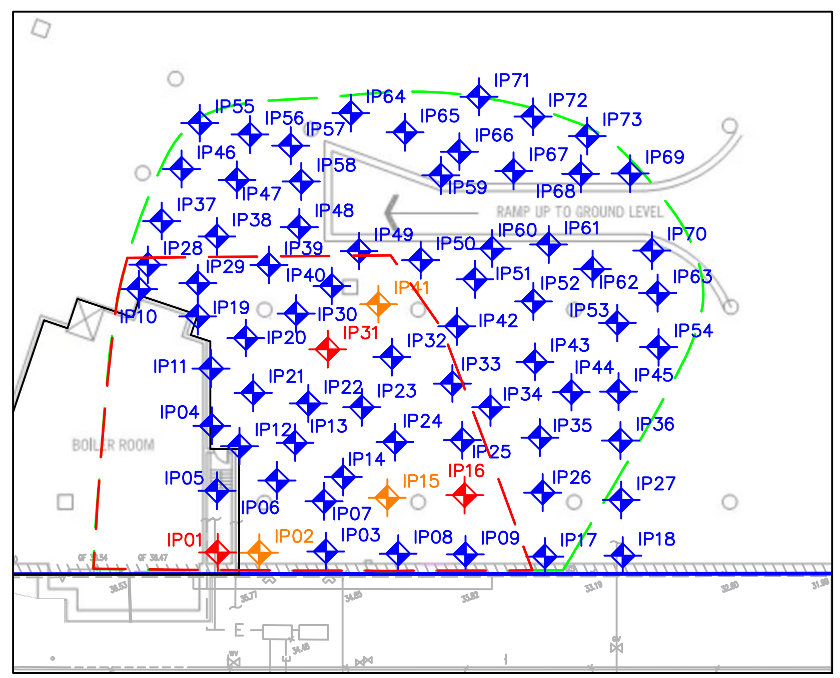
SCALE IN FEET

LEGEND:

- APPROXIMATE SITE BOUNDARY
- IP-01 COMPLETED INJECTION POINT LOCATION
- IP-01 ABANDONED INJECTION POINT LOCATION
- IP-01 DOUBLE VOLUME INJECTION POINT LOCATION
- PF01 PETROFIX INJECTION POINT LOCATION
- PETROLEUM PLUME EXTENT - TREATMENT AREA 1 (SOURCE AREA)
- PETROLEUM PLUME EXTENT - TREATMENT AREA 2 (RESIDUAL IMPACTED AREA)
- APPROXIMATE EXTENT OF SUB-CELLAR



DETAIL 1-C
AUGUST 22 - AUGUST 26, 2019, PETROFIX® INJECTION LOCATIONS



DETAIL 1-D
AUGUST 5 - AUGUST 22, 2019, PLUMESTOP®, AND AUGUST 22 - AUGUST 29, 2019 ORC-ADVANCE® INJECTION LOCATIONS

NOTES:

1. BASEMAP: BOUNDARY & TOPOGRAPHIC SURVEY, PREPARED BY CONTROL POINT ASSOCIATES INC., DATED OCTOBER 14, 2005.
2. ALL INJECTION LOCATIONS ARE APPROXIMATE.

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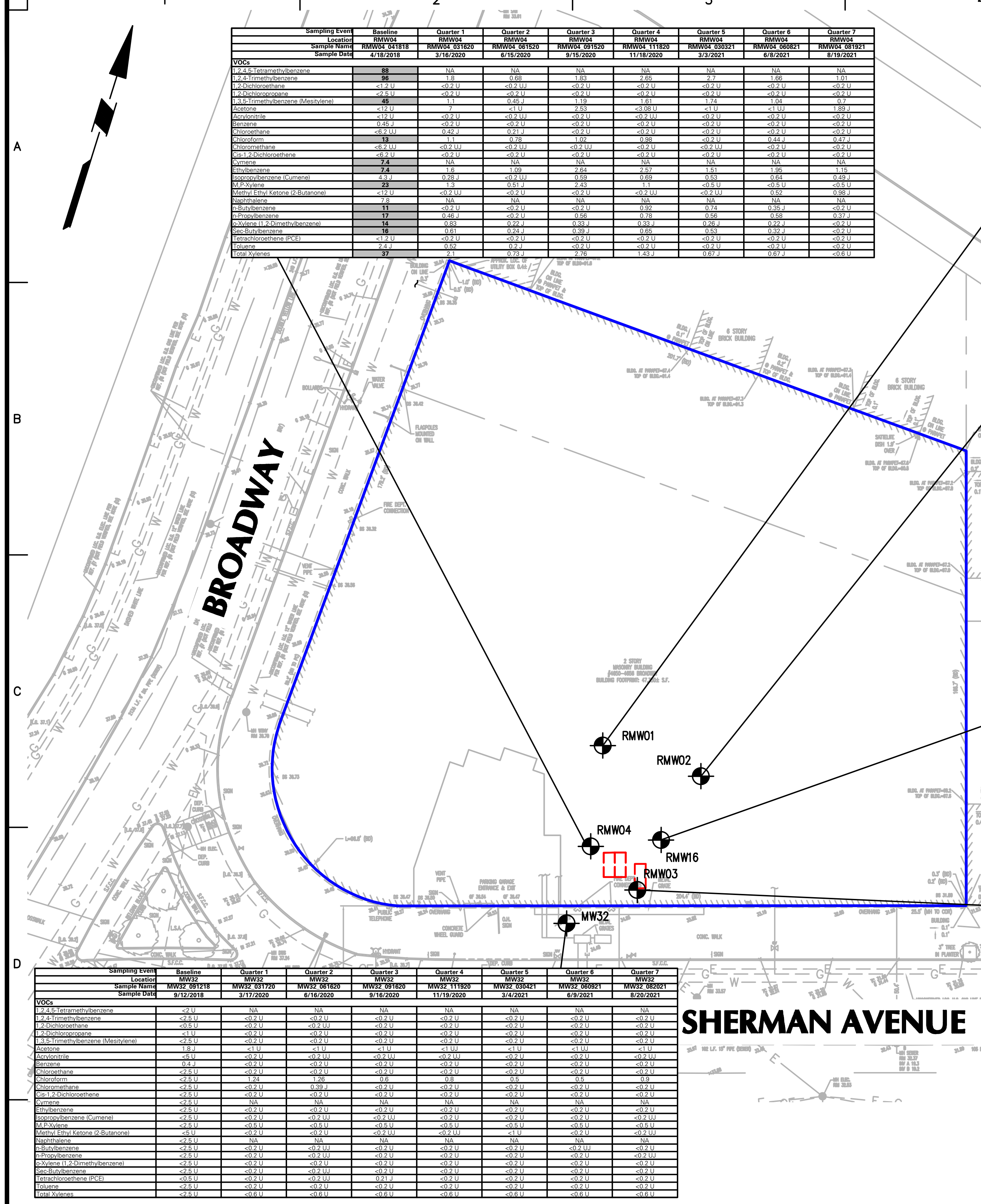
LANGAN	Project	Figure Title	Project No. 170505501	Figure No.
Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C. 21 Penn Plaza, 360 West 31st Street, 8th Floor New York, NY 10001 T: 212.479.5400 F: 212.479.5444 www.langan.com	4650 BROADWAY BLOCK No. 2175, LOT No. 1 NEW YORK NEW YORK	TREATMENT AREA LOCATION PLAN	Date 04/29/2020 Drawn By JG Checked By JL	7A

Filename: C:\Users\lesmail\Desktop\Figure 7A - Treatment Area Location Plan.dwg Date: 1/12/2022 Time: 17:08 User: lesmail Style Table: Langan.stb Layout: ANSIB-BL



Sampling Event	Baseline	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 5	Quarter 6	Quarter 7
Location	RMW04	RMW04	RMW04	RMW04	RMW04	RMW04	RMW04	RMW04
Sample Name	RMW04_041818	RMW04_031620	RMW04_061520	RMW04_091520	RMW04_111820	RMW04_030321	RMW04_060821	RMW04_081921
Sample Date	4/18/2018	3/16/2020	6/15/2020	9/15/2020	11/18/2020	3/3/2021	6/8/2021	8/19/2021
VOCs								
1,2,4,5-Tetramethylbenzene	**88**	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trimethylbenzene	**96**	1.8	0.68	1.83	2.65	2.7	1.66	1.01
1,2-Dichloroethane	<1.2 U	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,2-Dichloropropane	<2.5 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,3,5-Trimethylbenzene (Mesitylene)	**45**	1.1	0.45 J	1.19	1.61	1.74	1.04	0.7
Acetone	<12 U	7	<1 U	2.53	<3.08 U	<1 U	<1 UJ	1.89 J
Acrylonitrile	<12 U	<0.2 U	<0.2 UJ	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U
Benzene	0.45 J	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Chloroethane	<6.2 UJ	0.42 J	0.21 J	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Chloroform	**13**	1.1	0.78	1.02	0.98	<0.2 U	0.44 J	0.47 J
Chloromethane	<6.2 UJ	<0.2 UJ	<0.2 UJ	<0.2 UJ	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U
Cis-1,2-Dichloroethene	<6.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Cymene	**7.4**	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	**7.4**	1.6	1.09	2.64	2.57	1.51	1.95	1.15
Isopropylbenzene (Cumene)	4.3 J	0.28 J	<0.2 UJ	0.59	0.69	0.53	0.64	0.49 J
M,P-Xylene	**23**	1.3	0.51 J	2.43	1.1	<0.5 U	<0.5 U	<0.5 U
Methyl Ethyl Ketone (2-Butanone)	<12 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 UJ	<0.2 UJ	0.52	0.98 J
Naphthalene	7.8	NA	NA	NA	NA	NA	NA	NA
n-Butylbenzene	**11**	<0.2 U	<0.2 U	<0.2 U	0.92	0.74	0.35 J	<0.2 U
n-Propylbenzene	**17**	0.46 J	<0.2 U	0.56	0.78	0.56	0.58	0.37 J
o-Xylene (1,2-Dimethylbenzene)	**14**	0.83	0.22 J	0.33 J	0.33 J	0.26 J	0.22 J	<0.2 U
Sec-Butylbenzene	**16**	0.61	0.24 J	0.39 J	0.65	0.53	0.32 J	<0.2 U
Tetrachloroethene (PCE)	<1.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Toluene	2.4 J	0.52	0.2 J	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Total Xylenes	**37**	2.1	0.73 J	2.76	1.43 J	0.67 J	0.67 J	<0.6 U

Sampling Event	Baseline	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 5	Quarter 6	Quarter 7
Location	RMW01	RMW01	RMW01	RMW01	RMW01	RMW01	RMW01	RMW01
Sample Name	RMW01_041918	RMW01_031620	RMW01_061520	RMW01_091520	RMW01_111820	RMW01_030321	RMW01_060821	RMW01_081921
Sample Date	4/19/2018	3/16/2020	6/15/2020	9/15/2020	11/18/2020	3/3/2021	6/8/2021	8/19/2021
VOCs								
1,2,4,5-Tetramethylbenzene	**21**	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trimethylbenzene	**570**	**300 D**	**27.4**	**89.5**	**177 D**	**893 D**	**43.1 J**	**76.8 J**
1,2-Dichloroethane	<5 U	<2 U	<0.2 UJ	<0.2 U	<1 U	<2 U	<0.2 U	<0.2 U
1,2-Dichloropropane	**3.8 J**	<2 U	<0.2 U	<0.2 U	<1 U	<2 U	0.55	<0.2 U
1,3,5-Trimethylbenzene (Mesitylene)	**180**	**74 D**	4.34	**12**	**51.6 D**	**258 D**	**5.19**	**13.6 J**
Acetone	37 J	**210 D**	<2.82 U	9.04	<11.2 U	18.6 JD	2.05 J	10.2
Acrylonitrile	**260**	<2 U	<0.2 UJ	<0.2 U	<1 U	<2 U	<0.2 U	<0.2 U
Benzene	**26**	**2.7 JD**	<0.2 U	0.28 J	<1 U	<2 U	<0.2 U	<0.2 U
Chloroethane	<25 U	3.2 JD	<0.2 U	<0.2 U	2 JD	<2 UJ	<0.2 U	<0.2 U
Chloroform	<25 U	<2 U	<0.2 U	2.98	<1 U	<2 U	<0.2 U	<0.2 U
Chloromethane	<25 UJ	4 J	<0.2 UJ	<0.2 UJ	<1 UJ	<2 UJ	<0.2 U	<0.2 U
Cis-1,2-Dichloroethene	<25 U	<2 U	<0.2 U	<0.2 U	<1 U	<2 U	<0.2 U	<0.2 U
Cymene	<25 U	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	**380**	**110 D**	3.04	**23.6**	**55.6 D**	**200 D**	**10.5**	**44 J**
Isopropylbenzene (Cumene)	**30**	**18 D**	1.29 J	**5.18**	**11.9 D**	**42.5 D**	2.79 J	**5.23 J**
M,P-Xylene	**1,600**	**520 D**	**37**	**184**	**246 D**	**962 D**	**107**	**239 J**
Methyl Ethyl Ketone (2-Butanone)	<50 U	<2 UJ	<0.2 U	<0.2 U	<1 U	<2 UJ	<0.2 U	<0.2 UJ
Naphthalene	**120**	NA	NA	NA	NA	NA	NA	NA
n-Butylbenzene	<25 U	<2 U	0.42 J	0.89	3.45 D	4.7 JD	2.25 J	1.62 J
n-Propylbenzene	**72**	**39 D**	3.05	**10.8**	**21.2 D**	**93.9 D**	**5.52**	**7.83 J**
o-Xylene (1,2-Dimethylbenzene)	**620**	**120 D**	**11.2**	**24.4**	**7.4 D**	**14.5 D**	**40.2**	**97.7 J**
Sec-Butylbenzene	<25 U	2.2 JD	0.3 J	0.92	2.05 JD	**5.2 D**	0.9	0.86 J
Tetrachloroethene (PCE)	<5 UJ	<2 U	<0.2 U	<0.2 U	<1 U	<2 U	<0.2 U	<0.2 U
Toluene	**11 J**	**12 D**	<0.2 U	0.34 J	**5.55 D**	**15.4 D**	0.21 J	0.32 J
Total Xylenes	**2,200**	**640 D**	**48.3**	**208**	**254 D**	**976 D**	**148**	**336 J**

Sampling Event	Baseline	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 5	Quarter 6	Quarter 7
Location	RMW02	RMW02	RMW02	RMW02	RMW02	RMW02	RMW02	RMW02
Sample Name	RMW02_041818	RMW02_031620	RMW02_061520	RMW02_091520	RMW02_111820	RMW02_030321	RMW02_060821	RMW02_081921
Sample Date	4/18/2018	3/16/2020	6/15/2020	9/15/2020	11/18/2020	3/3/2021	6/8/2021	8/19/2021
VOCs								
1,2,4,5-Tetramethylbenzene	3	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trimethylbenzene	**32 J**	0.95	**15**	1.51	1.75 JD	3.74	4.67	3.43
1,2-Dichloroethane	<0.5 U	**7.9**	**1.09 J**	**1.16**	<1 U	0.6	0.31 J	0.46 J
1,2-Dichloropropane	<1 U	<0.2 U	<0.2 U	<0.2 U	<1 U	<0.2 U	<0.2 U	0.41 J
1,3,5-Trimethylbenzene (Mesitylene)	**26 J**	0.24 J	**9.71**	0.54	1.5 JD	2.15	3.69	2.37
Acetone	<15 U	**210 D**	<19.9 U	7.17	<5 UJ	4.56	<1 UJ	<1 U
Acrylonitrile	**36 J**	<0.2 U	<0.2 UJ	<0.2 U	<1 UJ	**76.3**	<0.2 U	<0.2 U
Benzene	<0.5 U	<0.2 U	<0.5 U	0.33 J	**1.65 JD**	0.65	0.37 J	0.8
Chloroethane	<2.5 U	**35**	**5.19**	**5.73**	**5.85 J**	4.77 J	2.3	**5.17**
Chloroform	<2.5 U	3	<0.2 U	2.78	5.55 D	<0.2 U	<0.2 U	<0.2 U
Chloromethane	<2.5 U	**67**	**7.24 J**	<0.2 UJ	<1 U	<0.2 UJ	<0.2 U	<0.2 U
Cis-1,2-Dichloroethene	<2.5 U	<0.2 U	<0.2 U	<0.2 U	<1 U	<0.2 U	<0.2 U	<0.2 U
Cymene	0.76 J	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	**18 J**	0.53	**56.6**	**37.4**	**127 D**	**101**	**42.8**	**28.8**
Isopropylbenzene (Cumene)	**5.5**	<0.2 U	**6.73 J**	4.41	**8.9 D**	**16.9**	**9.68**	**7.46**
M,P-Xylene	**58**	1.7	**181**	**10.7**	**16.8 D**	**27.1**	**24.4**	**6.64**
Methyl Ethyl Ketone (2-Butanone)	<5 U	**69**	<0.2 U	<0.2 U	<1 UJ	<0.2 UJ	0.43 J	<0.2 UJ
Naphthalene	8.9 J	NA	NA	NA	NA	NA	NA	NA
n-Butylbenzene	1.6 J	<0.2 U	0.54	0.33 J	2.15 JD	1.7	1.35 J	0.49 J
n-Propylbenzene	**8.6**	0.21 J	**13.7**	**6.49**	**13.9 D**	**25.5**	**13.5**	4.99
o-Xylene (1,2-Dimethylbenzene)	**6.5**	0.6	**29.9**	1.55	2.75 D	1.6	0.97	0.63
Sec-Butylbenzene	<2.5 U	<0.2 U	0.68	0.38 J	1.6 JD	1.86	1.29	0.93
Tetrachloroethene (PCE)	<0.5 U	<0.2 U	0.25 J	0.32 J	<1 U	0.23 J	<0.2 U	0.21 J
Toluene	<2.5 U	0.25 J	1.36	0.39 J	<1 U	1	0.42 J	0.39 J
Total Xylenes	**65**	2.3	**211**	**12.2**	**19.6 D**	**28.7**	**25.4**	**7.27**

Sampling Event	Baseline	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 5	Quarter 6	Quarter 7
Location	RMW16	RMW16	RMW16	RMW16	RMW16	RMW16	RMW16	RMW16
Sample Name	RMW16_080718	RMW16_031720	RMW16_030421	RMW16_061620	RMW16_091620	RMW16_111820	RMW16_060921	RMW16_082021
Sample Date	8/7/2018	3/17/2020	3/4/2021	6/16/2020	9/16/2020	11/18/2020	6/9/2021	8/20/2021
VOCs								
1,2,4,5-Tetramethylbenzene	**27**	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trimethylbenzene	**800**	<0.2 U	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,2-Dichloroethane	<5 U	<0.2 U	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,2-Dichloropropane	<10 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,3,5-Trimethylbenzene (Mesitylene)	**220**	<0.2 U	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Acetone	**110**	**75.5**	1.71 J	10.5 J	**52**	<10.1 U	<1 UJ	<1 U
Acrylonitrile	<50 U	<0.2 U	<0.2 U	<0.2 UJ	<0.2 UJ	<0.2 UJ	<0.2 U	<0.2 UJ
Benzene	<5 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Chloroethane	<25 U	0.39 J	1.72 J	<0.2 U	2.67	3.13 J	1.2	1.73
Chloroform	<25 U	0.25 J	0.26 J	0.29 J	0.39 J	0.4 J	0.3 J	0.26 J
Chloromethane	<25 U	**10.7**	0.45 J	0.34 J	1.74	<0.2 U	0.23 J	<0.2 U
Cis-1,2-Dichloroethene	<25 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Cymene	<25 U	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	**16 J**	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Isopropylbenzene (Cumene)	**31**	<0.2 U	<0.2 U	<0.2 UJ	<0.2 UJ	<0.2 U	<0.2 U	<0.2 UJ
M,P-Xylene	**140**	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
Methyl Ethyl Ketone (2-Butanone)	<50 U	<0.2 U	<0.52 U	<0.2 U	1.35 J	<0.2 UJ	<0.2 U	<0.2 UJ
Naphthalene	**25 J**	NA	NA	NA	NA	NA	NA	NA
n-Butylbenzene	<25 U	<0.2 U	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 UJ	<0.2 U
n-Propylbenzene	**80**	<0.2 U	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 UJ	<0.2 UJ
o-Xylene (1,2-Dimethylbenzene)	**36**	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Sec-Butylbenzene	**7.8 J**	<0.2 U	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Tetrachloroethene (PCE)	<5 U	<0.2 U	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Toluene	<25 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Total Xylenes	**180**	<0.6 U	<0.6 U	<0.6 U	<0.6 U	<0.6 U	<0.6 U	<0.6 U

Sampling Event	Baseline	Quarter 3	Quarter 4	Quarter 5	Quarter 6	Quarter 7
Location	RMW03	RMW03	RMW03	RMW03	RMW03	RMW03
Sample Name	RMW03_041818	RMW03_091620	RMW03_111920	RMW03_030321	RMW03_060821	RMW03_081921
Sample Date	4/19/2018	9/16/2020	11/19/2020	3/3/2021	6/8/2021	8/19/2021
VOCs						
1,2,4,5-Tetramethylbenzene	**38**	NA	NA	NA	NA	NA
1,2,4-Trimethylbenzene	**630**	**49.6 D**	**19.3**	**12.2**	0.79	**7.29**
1,2-Dichloroethane	<5 U	<0.4 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,2-Dichloropropane	<10 U	<0.4 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,3,5-Trimethylbenzene (Mesitylene)	**200**	**25.8 D**	**16.5**	**12.7**	1.52	**16.8**
Acetone	28 J	21.6 D	7.4 J	<1 U	1.6 J	2.92
Acrylonitrile	<50 U	<0.4 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Benzene	<5 U	<0.4 UJ	0.26 J	<0.2 U	<0.2 U	0.54
Chloroethane	<25 U	<0.4 U	0.24 J	<0.2 U	<0.2 U	<0.2 U
Chloroform	<25 U	1.16 D	1.04	0.76	0.57	0.53
Chloromethane	<25 U	<0.4 UJ	<0.2 UJ	<0.2 UJ	<0.2 U	<0.2 U
Cis-1,2-Dichloroethene	<25 U	**6.48 BD**	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Cymene	<25 U	NA	NA	NA	NA	NA
Ethylbenzene	**43**	3.72 D	1.95	0.78	<0.2 U	2.42
Isopropylbenzene (Cumene)	**21 J**	4.16 D	2.87	2.42	0.36 J	3.6
M,P-Xylene	**320**	**11 D**	3.52	0.66 J	<0.5 U	<0.5 U
Methyl Ethyl Ketone (2-Butanone)	<50 U	<0.4 U	<2.9 U	1.49 J	0.4 J	<0.2 UJ
Naphthalene	**73**	NA	NA	NA	NA	NA
n-Butylbenzene	**17 J**	3.86 D	3.11	2.66	0.36 J	0.41 J
n-Propylbenzene	**58**	**11 D**	**8.05**	**7.3**	1.03	**10.6**
o-Xylene (1,2-Dimethylbenzene)	**100**	0.58 JD	0.23 J	<0.2 U	<0.2 U	<0.2 U
Sec-Butylbenzene	<25 U	1.56 D	1.5	1.47	0.22 J	2.24
Tetrachloroethene (PCE)	<5 U	**20.8 D**	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Toluene	<25 U	<0.4 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Total Xylenes	**420**	**11.6 D**	3.75	0.66 J	<0.6 U	<0.6 U

Sampling Event	Baseline	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 5	Quarter 6	Quarter 7
Location	MW32	MW32	MW32	MW32	MW32	MW32	MW32	MW32
Sample Name	MW32_091218	MW32_031720	MW32_061620	MW32_091620	MW32_111920	MW32_030421	MW32_060921	MW32_082021
Sample Date	9/12/2018	3/17/2020	6/16/2020	9/16/2020	11/19/2020	3/4/2021	6/9/2021	8/20/2021
VOCs								
1,2,4,5-Tetramethylbenzene	<2 U	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trimethylbenzene	<2.5 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,2-Dichloroethane	<0.5 U	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,2-Dichloropropane	<1 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,3,5-Trimethylbenzene (Mesitylene)	<2.5 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Acetone	1.8 J	<1 U	<1 U	<1 U	<1 UJ	<1 U	<1 UJ	<1 U
Acrylonitrile	<5 U	<0.2 U	<0.2 UJ	<0.2 UJ	<0.2 UJ	<0.2 U	<0.2 U	<0.2 UJ
Benzene	0.4 J	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Chloroethane	<2.5 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Chloroform	<2.5 U	1.24	1.26	0.6	0.8	0.5	0.5	0.9
Chloromethane	<2.5 U	<0.2 U	0.39 J	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Cis-1,2-Dichloroethene	<2.5 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Cymene	<2.5 U	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	<2.5 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Isopropylbenzene (Cumene)	<2.5 U	<0.2 U	<0.2 UJ	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U	<0.2 UJ
M,P-Xylene	<2.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
Methyl Ethyl Ketone (2-Butanone)	<5 U	<0.2 U	<0.2 U	<0.2 UJ	<0.2 UJ	<1 U	<0.2 U	<0.2 UJ
Naphthalene	<2.5 U	NA	NA	NA	NA	NA	NA	NA
n-Butylbenzene	<2.5 U	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U	<0.2 UJ	<0.2 U
n-Propylbenzene	<2.5 U	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 UJ
o-Xylene (1,2-Dimethylbenzene)	<2.5 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Sec-Butylbenzene	<2.5 U	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Tetrachloroethene (PCE)	<0.5 U	<0.2 U	<0.2 UJ	0.21 J	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Toluene	<2.5 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Total Xylenes	<2.5 U	<0.6 U	<0.6 U	<0.6 U	<0.6 U	<0.6 U	<0.6 U	<0.6 U

LEGEND:

APPROXIMATE SITE BOUNDARY

RMW01 MONITORING WELL LOCATION

FORMER UNDERGROUND STORAGE TANK LOCATIONS

Analyte	NYSDEC SGVs
VOCs (µg/L)	
1,2,4,5-Tetramethylbenzene	5
1,2,4-Trimethylbenzene	5
1,2-Dichloroethane	0.6
1,2-Dichloropropane	1
1,3,5-Trimethylbenzene (Mesitylene)	5
Acetone	50
Acrylonitrile	5
Benzene	1
Bromomethane	5
Chloroethane	5
Chloroform	7
Chloromethane	5
Cis-1,2-Dichloroethene	5
Cymene	5
Ethylbenzene	5
Isopropylbenzene (Cumene)	5
M,P-Xylene	5
Methyl Ethyl Ketone (2-Butanone)	50
Naphthalene	10
n-Butylbenzene	5
n-Propylbenzene	5
o-Xylene (1,2-Dimethylbenzene)	5
Sec-Butylbenzene	5
Tetrachloroethene (PCE)	5
Toluene	5
Total Xylenes	5

NOTES:

1. BASEMAP: BOUNDARY & TOPOGRAPHIC SURVEY, PREPARED BY CONTROL POINT ASSOCIATES INC., DATED OCTOBER 14, 2005.
2. 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 SGV").
3. CRITERION COMPARISONS FOR TOTAL XYLENES AND M,P-XYLENE ARE PROVIDED FOR REFERENCE. PROMULGATED NYSDEC SGVs ARE FOR O-XYLENE, M-XYLENE, AND P-XYLENE.
4. ONLY DETECTED ANALYTES ARE SHOWN IN THE TABLE.
5. DETECTED ANALYTICAL RESULTS ABOVE NYSDEC SGVs ARE BOLDED AND SHADED.
6. MONITORING WELL RMW03 WAS NOT ACCESSIBLE DURING THE MARCH 2020 OR JUNE 2020 SAMPLING EVENTS.
7. µg/L = MICROGRAMS PER LITER
8. NA = NOT ANALYZED
9. ND = THE ANALYTE WAS ANALYZED FOR, BUT WAS NOT DETECTED AT A LEVEL GREATER THAN OR EQUAL TO THE RL.
10. NE = THE ANALYTE WAS ANALYZED BUT NOT DETECTED GREATER THAN OR EQUAL TO THE GUIDANCE VALUE.

QUALIFIERS:

D = THE CONCENTRATION REPORTED IS A RESULT OF A DILUTED SAMPLE.
BD = THE CONCENTRATION REPORTED IS A RESULT OF A DILUTED SAMPLE AND THE ANALYTE WAS ALSO DETECTED IN THE BATCH BLANK.
J = THE ANALYTE WAS DETECTED ABOVE THE METHOD DETECTION LIMIT (MDL), BUT BELOW THE RL; THEREFORE, THE RESULT IS AN ESTIMATED CONCENTRATION.
JD = THE CONCENTRATION REPORTED IS A RESULT OF A DILUTED SAMPLE AND THE ANALYTE WAS DETECTED ABOVE THE METHOD DETECTION LIMIT (MDL), BUT BELOW THE RL; THEREFORE, THE RESULT IS AN ESTIMATED CONCENTRATION.

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.

50 0 25 50

SCALE: 1 INCH = 50 FEET

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NEW YORK NEW YORK

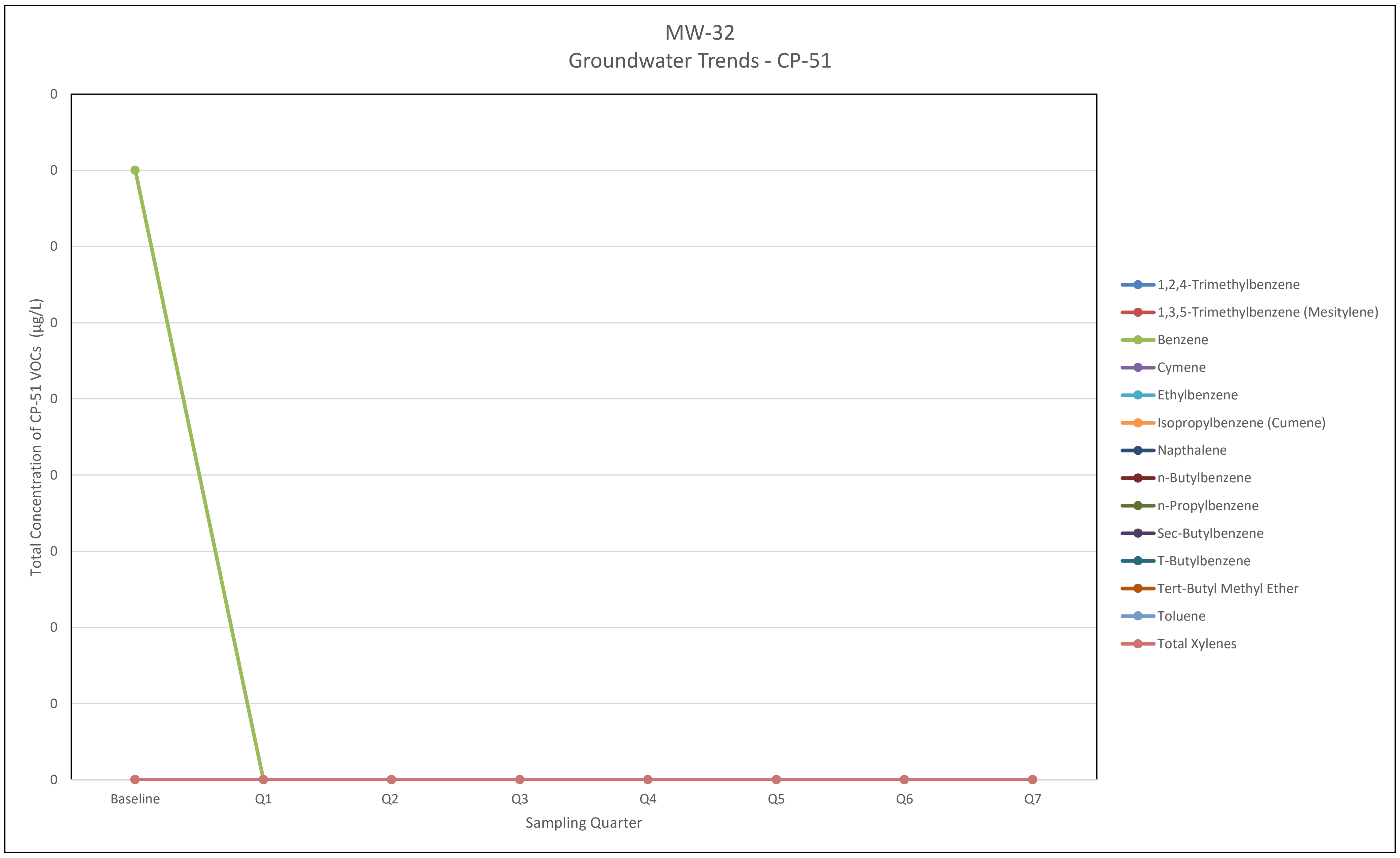
Figure Title
POST-INJECTION QUARTERLY GROUNDWATER SAMPLE ANALYTICAL RESULTS MAP

Project No. 170505501
Date 09/24/2021
Drawn By LE
Checked By BG

Figure No. 7B

Figure 7C
Remedial Action Work Plan
Groundwater Sample Analytical Results Trends

4650 Broadway
New York, New York
NYSDEC BCP Site No.: C231123
Langan Project No.: 170505501



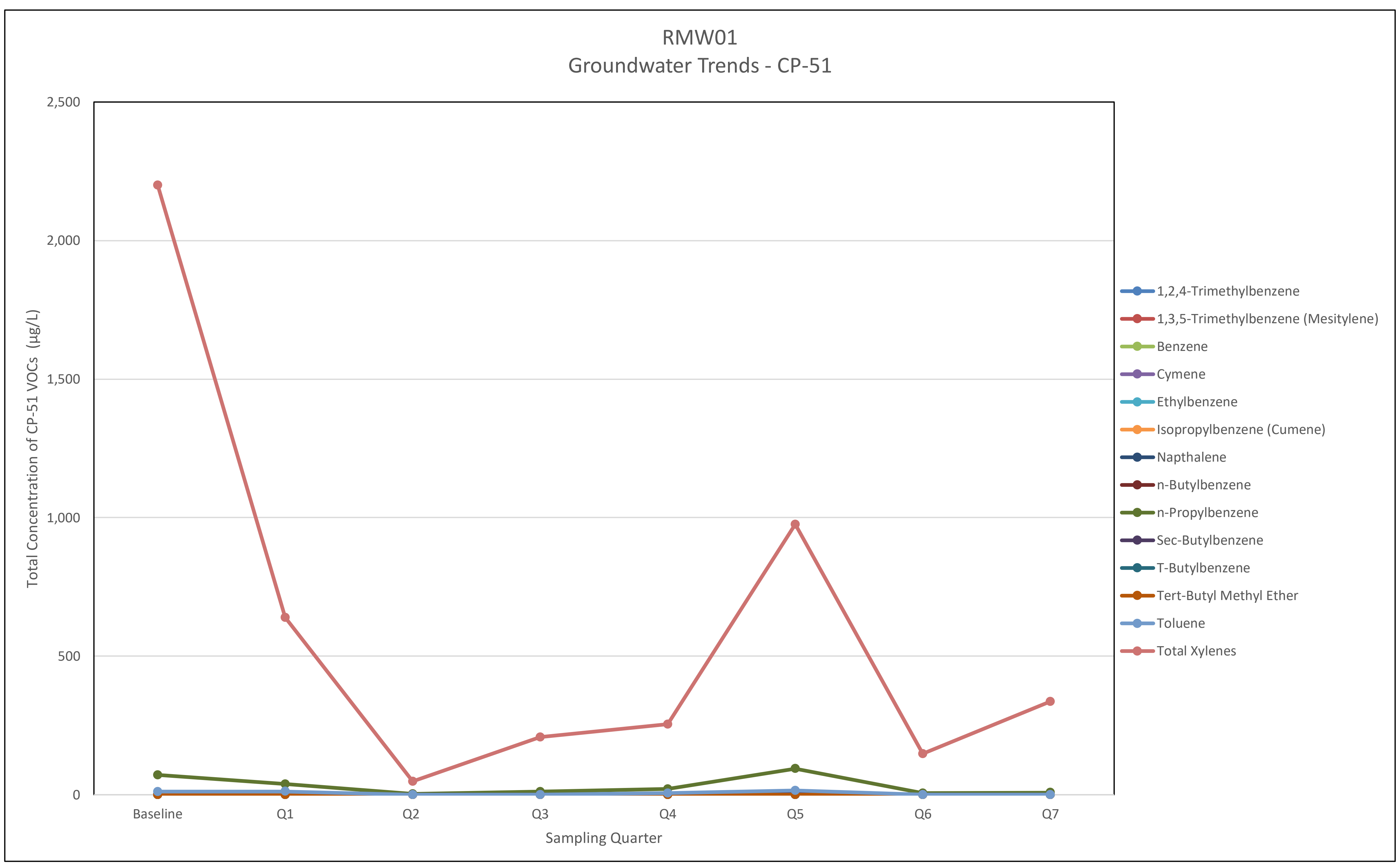
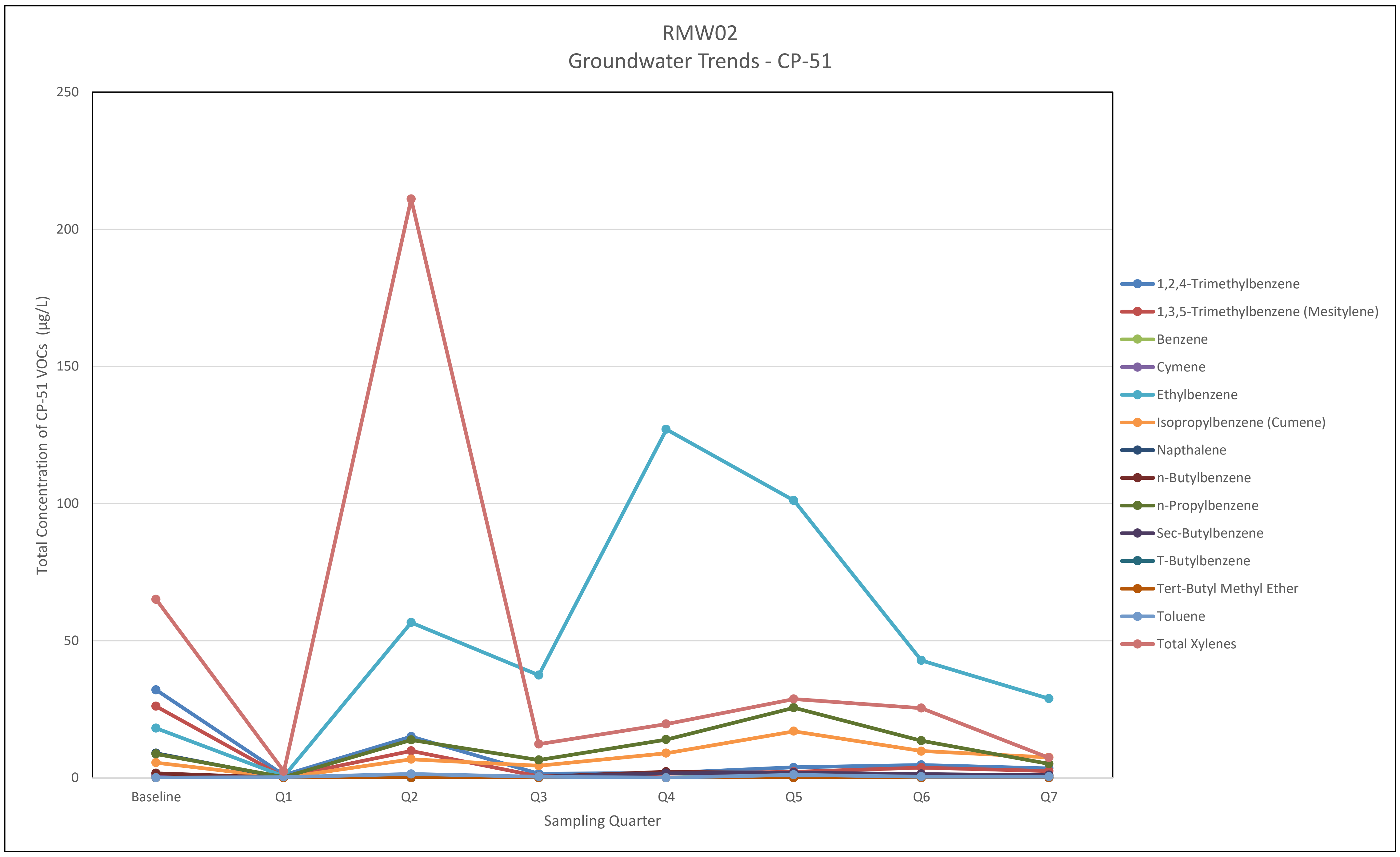


Figure 7C
Remedial Action Work Plan
Groundwater Sample Analytical Results Trends

4650 Broadway
New York, New York
NYSDEC BCP Site No.: C231123
Langan Project No.: 170505501



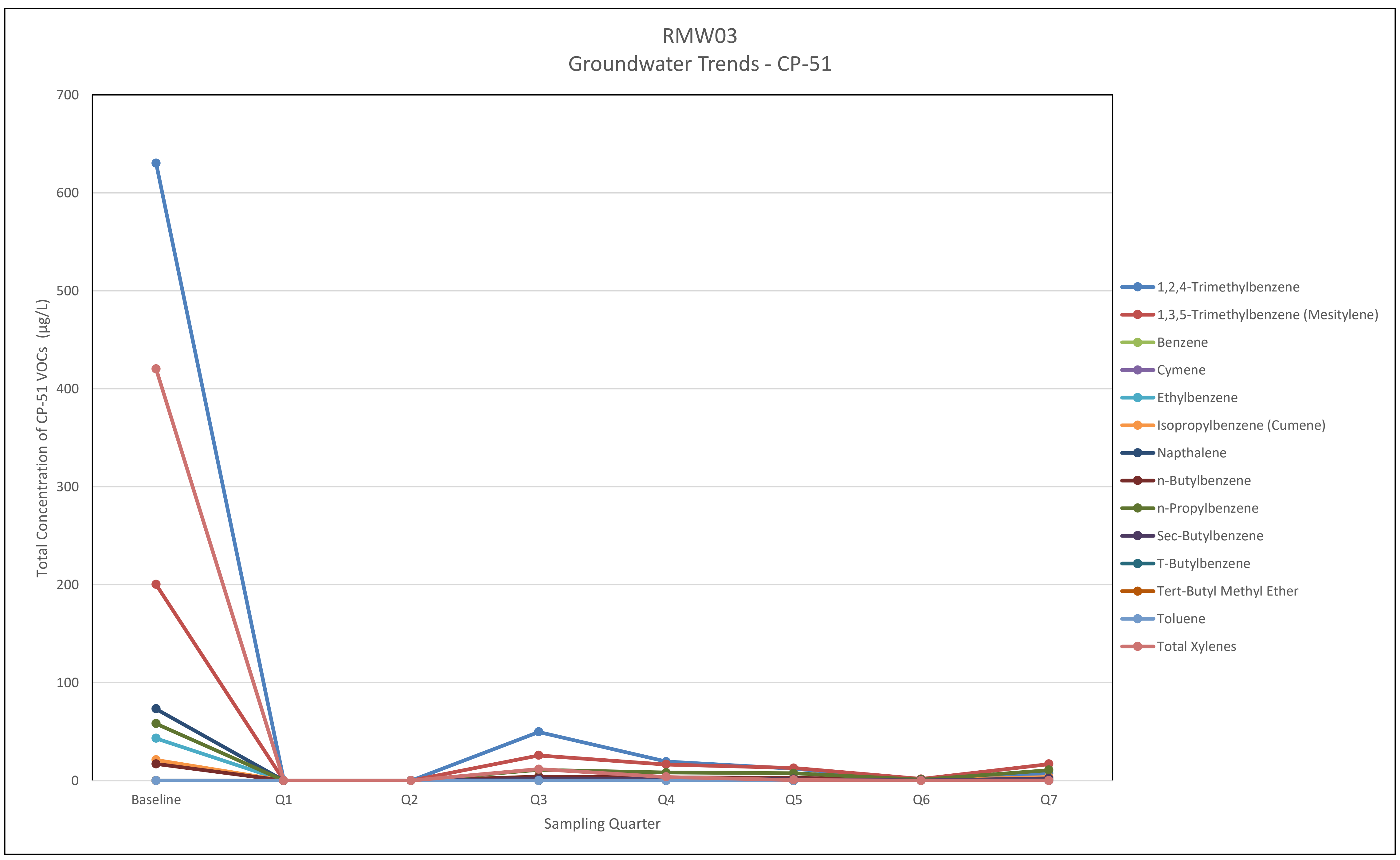
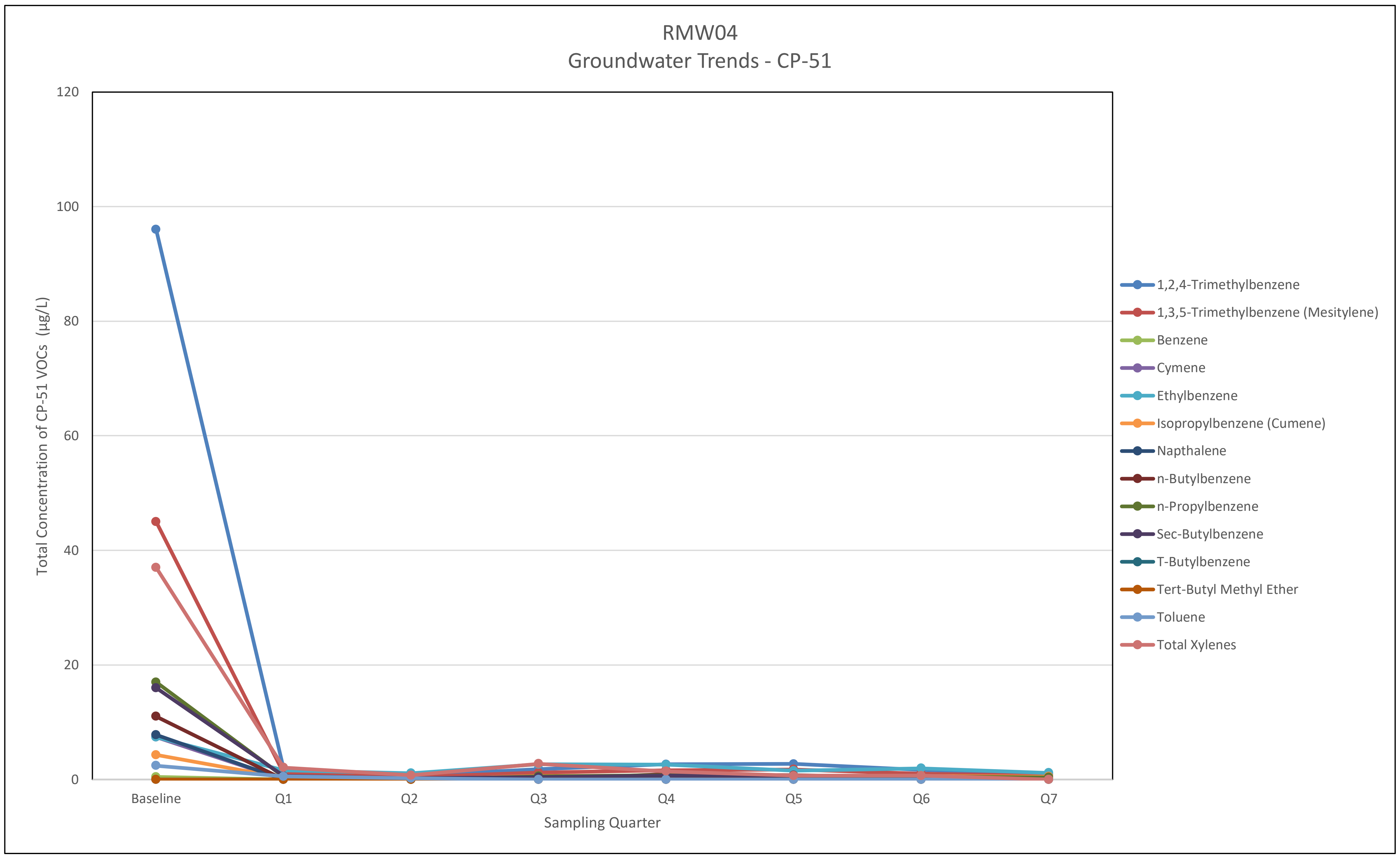
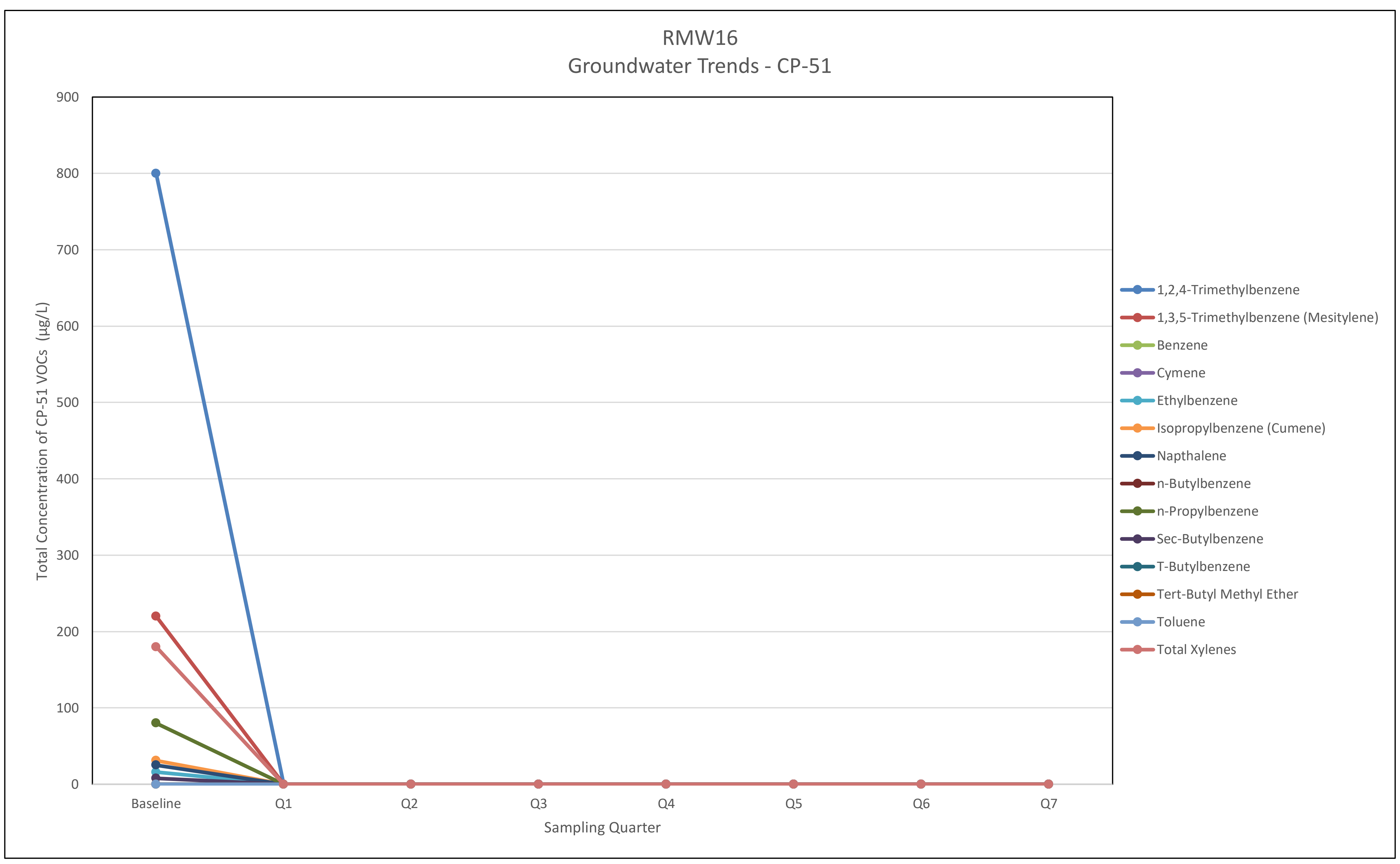


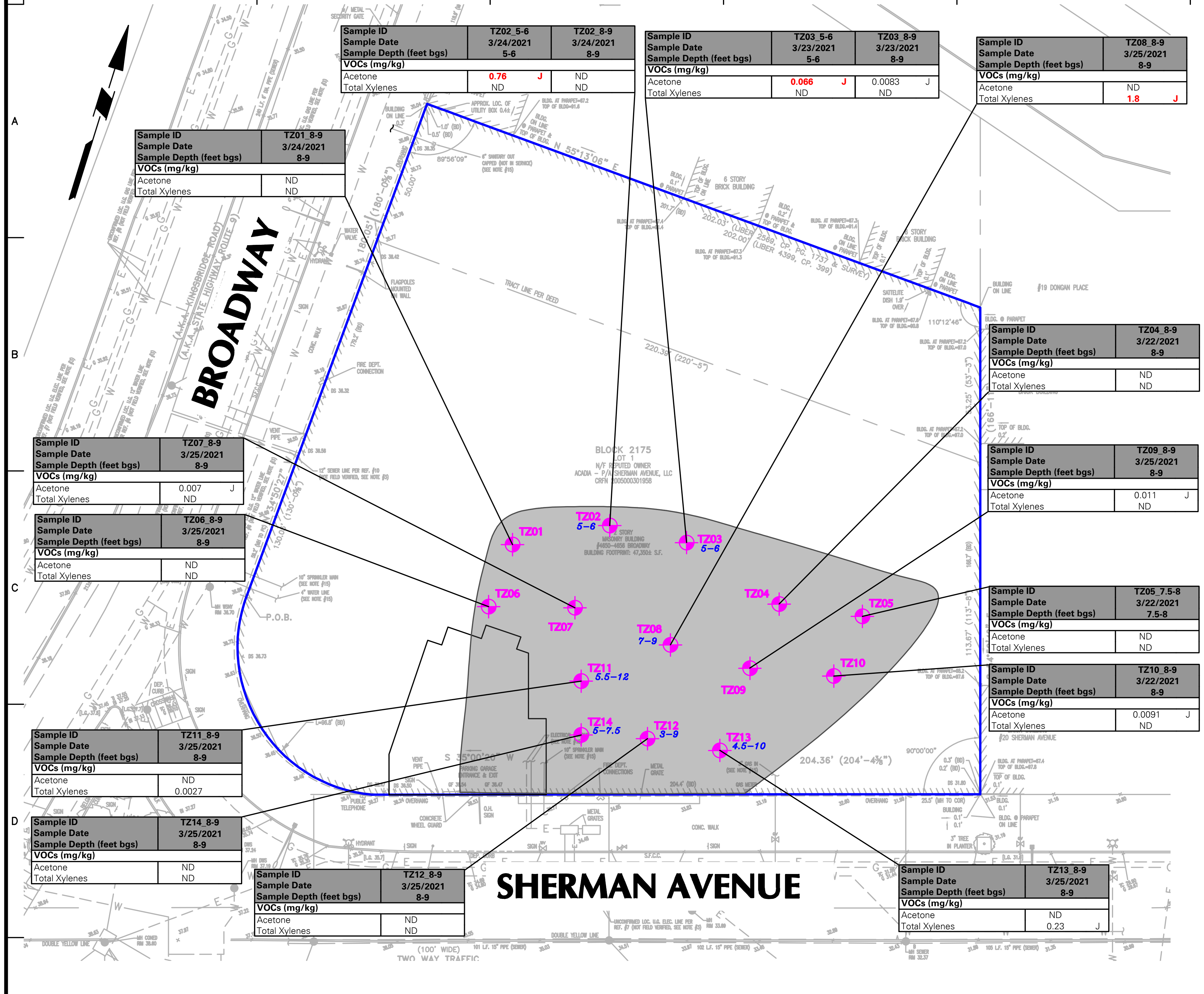
Figure 7C
Remedial Action Work Plan
Groundwater Sample Analytical Results Trends

4650 Broadway
New York, New York
NYSDEC BCP Site No.: C231123
Langan Project No.: 170505501





NOTES:
µg/L = micrograms per liter
VOC = Volatile Organic Compound
Q1 = Quarter 1
CP-51 = Commissioner's Policy 51
Monitoring well RMW03 was inaccessible during the Q1 and Q2 sampling events.



Sample ID	TZ01_8-9
Sample Date	3/24/2021
Sample Depth (feet bgs)	8-9
VOCs (mg/kg)	
Acetone	ND
Total Xylenes	ND

Sample ID	TZ02_5-6	TZ02_8-9
Sample Date	3/24/2021	3/24/2021
Sample Depth (feet bgs)	5-6	8-9
VOCs (mg/kg)		
Acetone	0.76 J	ND
Total Xylenes	ND	ND

Sample ID	TZ03_5-6	TZ03_8-9
Sample Date	3/23/2021	3/23/2021
Sample Depth (feet bgs)	5-6	8-9
VOCs (mg/kg)		
Acetone	0.066 J	0.0083 J
Total Xylenes	ND	ND

Sample ID	TZ08_8-9
Sample Date	3/25/2021
Sample Depth (feet bgs)	8-9
VOCs (mg/kg)	
Acetone	ND
Total Xylenes	1.8 J

Sample ID	TZ04_8-9
Sample Date	3/22/2021
Sample Depth (feet bgs)	8-9
VOCs (mg/kg)	
Acetone	ND
Total Xylenes	ND

Sample ID	TZ07_8-9
Sample Date	3/25/2021
Sample Depth (feet bgs)	8-9
VOCs (mg/kg)	
Acetone	0.007 J
Total Xylenes	ND

Sample ID	TZ09_8-9
Sample Date	3/25/2021
Sample Depth (feet bgs)	8-9
VOCs (mg/kg)	
Acetone	0.011 J
Total Xylenes	ND

Sample ID	TZ06_8-9
Sample Date	3/25/2021
Sample Depth (feet bgs)	8-9
VOCs (mg/kg)	
Acetone	ND
Total Xylenes	ND

Sample ID	TZ05_7.5-8
Sample Date	3/22/2021
Sample Depth (feet bgs)	7.5-8
VOCs (mg/kg)	
Acetone	ND
Total Xylenes	ND

Sample ID	TZ10_8-9
Sample Date	3/22/2021
Sample Depth (feet bgs)	8-9
VOCs (mg/kg)	
Acetone	0.0091 J
Total Xylenes	ND

Sample ID	TZ11_8-9
Sample Date	3/25/2021
Sample Depth (feet bgs)	8-9
VOCs (mg/kg)	
Acetone	ND
Total Xylenes	0.0027

Sample ID	TZ14_8-9
Sample Date	3/25/2021
Sample Depth (feet bgs)	8-9
VOCs (mg/kg)	
Acetone	ND
Total Xylenes	ND

Sample ID	TZ12_8-9
Sample Date	3/25/2021
Sample Depth (feet bgs)	8-9
VOCs (mg/kg)	
Acetone	ND
Total Xylenes	ND

Sample ID	TZ13_8-9
Sample Date	3/25/2021
Sample Depth (feet bgs)	8-9
VOCs (mg/kg)	
Acetone	ND
Total Xylenes	0.23 J

LEGEND:

- APPROXIMATE SITE BOUNDARY
- APPROXIMATE SUB-CELLAR BOUNDARY
- PETROLEUM-IMPACTED AREA
- TZ01 SOIL BORING LOCATION
- 5–6 DEPTH INTERVAL (IN FEET) WHERE NUISANCE CONDITIONS (STAINING, ODORS, AND/OR ELEVATED PID READINGS) WERE OBSERVED

NOTES:

1. BASEMAP: BOUNDARY & TOPOGRAPHIC SURVEY, PREPARED BY CONTROL POINT ASSOCIATES INC., DATED OCTOBER 14, 2005.
2. ELEVATIONS ARE BASED UPON THE BOROUGH OF MANHATTAN DATUM, APPROXIMATELY 2.750 FEET ABOVE MEAN SEA LEVEL AT SANDY HOOK.
3. SOIL SAMPLE ANALYTICAL RESULTS ARE COMPARED TO TITLE 6 OF THE NEW YORK CODES, RULES, AND REGULATIONS (NYCRR) PART 375 UNRESTRICTED USE (UU) AND RESTRICTED USE-RESTRICTED RESIDENTIAL (RURR) SOIL CLEANUP OBJECTIVES (SCOs).
4. ANALYTES DETECTED IN SOIL THAT WERE ALSO DETECTED IN EXCEEDANCE OF THE NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION (NYSDEC) TECHNICAL AND OPERATIONAL GUIDANCE SERIES (TOGS) 1.1.1 AMBIENT WATER QUALITY STANDARDS (AWQS) AND GUIDANCE FOR DRINKING WATER (CLASS GA) COLLECTIVELY REFERRED TO AS THE STANDARDS AND GUIDANCE VALUES (SGVS) IN GROUNDWATER WERE COMPARED TO THE NYCRR PART 375 PROTECTION OF GROUNDWATER (PGW) SCOs.
5. NO RESULTS WERE DETECTED ABOVE THE UU OR RURR SCOs.
6. RESULTS EXCEEDING PGW SCOs ARE RED.
7. SOIL SAMPLES WERE ANALYZED FOR VOCs ONLY.
8. SOIL BORINGS WERE ADVANCED FROM CELLAR GRADE, WHICH IS BETWEEN APPROXIMATELY 7 AND 12 FEET BELOW SIDE WALK GRADE. THE SUB-CELLAR IS APPROXIMATELY 4 FEET BELOW CELLAR GRADE.
9. FT BGS = FEET BELOW CELLAR GRADE SURFACE
10. mg/kg = MILLIGRAMS PER KILOGRAM
11. PID = PHOTOIONIZATION DETECTOR
12. NE = NO EXCEEDANCES
13. ND = NOT DETECTED
14. VOC = VOLATILE ORGANIC COMPOUND
15. J= THE ANALYTE WAS POSITIVELY IDENTIFIED AND THE ASSOCIATED NUMERICAL VALUE IS THE APPROXIMATE CONCENTRATION OF THE ANALYTE IN THE SAMPLE.

Analyte	CAS Number	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	NYSDEC Part 375 Protection of Groundwater SCOs
VOCs (mg/kg)				
Acetone	67-64-1	0.05	100	0.05
Total Xylenes	1330-20-7	0.26	100	1.6

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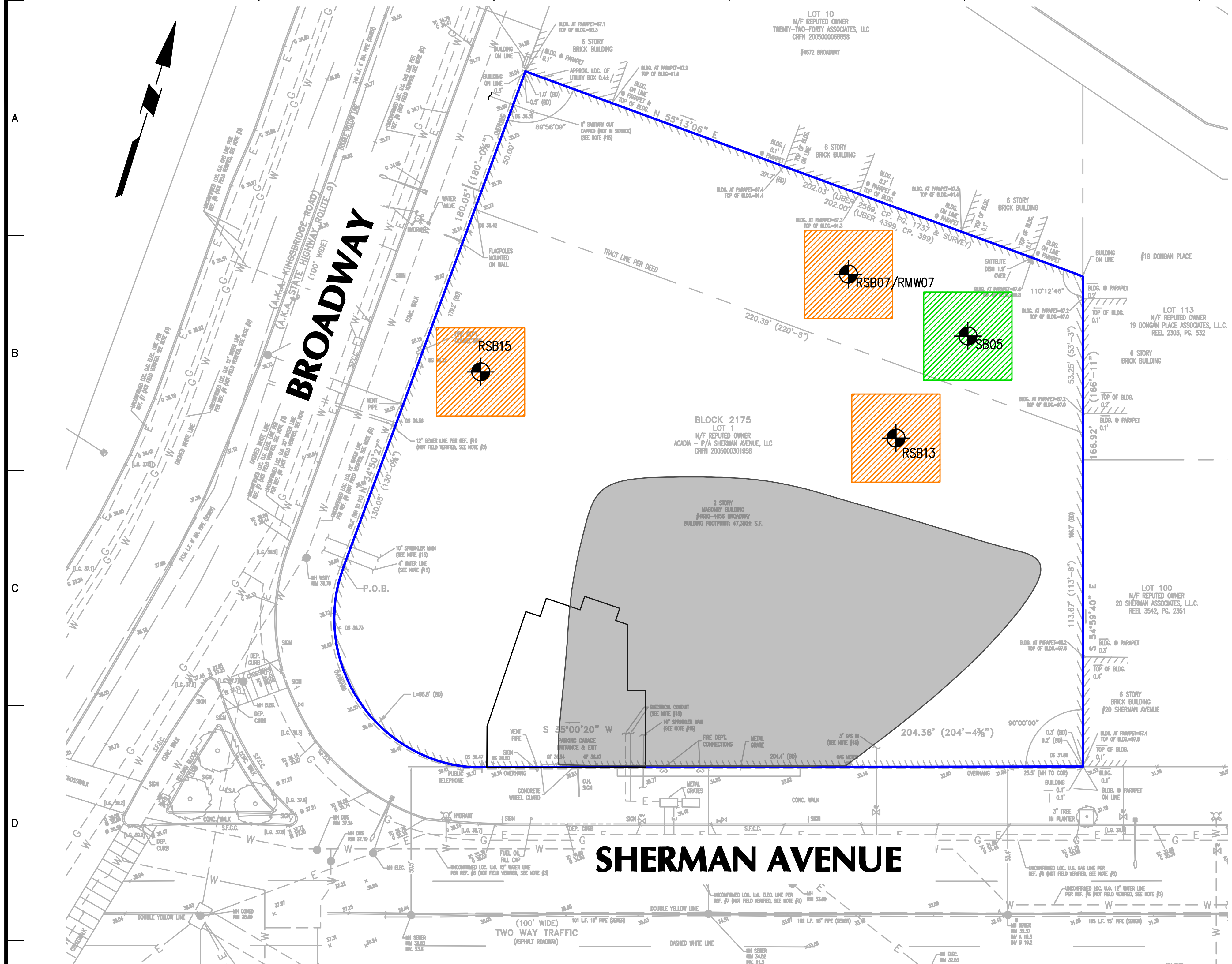
Project
4650 BROADWAY
BLOCK No. 2175, LOT No. 1
NEW YORK NEW YORK

Figure Title
SUPPLEMENTAL SOIL INVESTIGATION ANALYTICAL RESULTS MAP

Project No. 170505501
Date 06/03/2021
Drawn By LE
Checked By BG

Figure No.
8

Filename: \\langan.com\data\NYC\data5\170505501\Project Data\CAD\01\SheetFiles\Environmental\RAWP\Figure 8 - Supplemental Soil Investigation Analytical Results Map.dwg Date: 10/5/2021 Time: 15:23 User: lesmail Style Table: Langan.stb Layout: Figure 8 - Supplemental Soil Investigation Map



LEGEND:

APPROXIMATE SITE BOUNDARY

APPROXIMATE SUB-CELLAR BOUNDARY

RSB15 SOIL BORING LOCATION

APPROXIMATE PROPOSED EXTENT OF HOTSPOT EXCAVATION BELOW EXISTING CELLAR (ABOUT 2 FEET BELOW CELLAR GRADE)

APPROXIMATE PROPOSED EXTENT OF HOTSPOT EXCAVATION BELOW EXISTING CELLAR (ABOUT 8 FEET BELOW CELLAR GRADE)

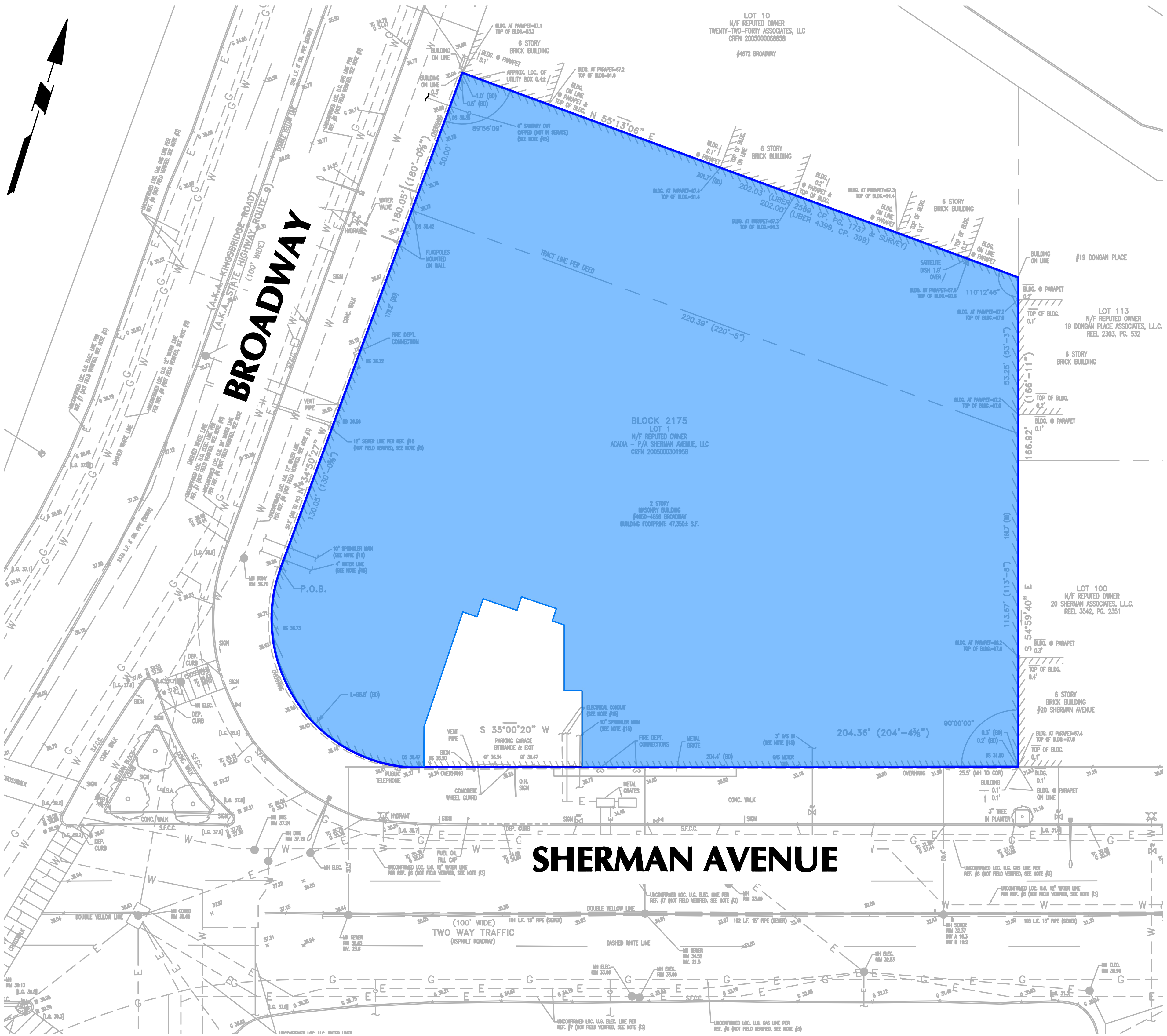
APPROXIMATE PROPOSED EXTENT OF PETROLEUM-IMPACTED AREA EXCAVATION BELOW EXISTING CELLAR (ABOUT 12 FEET BELOW CELLAR GRADE)

NOTES:

1. BASEMAP: BOUNDARY & TOPOGRAPHIC SURVEY, PREPARED BY CONTROL POINT ASSOCIATES INC., DATED OCTOBER 14, 2005.
2. ELEVATIONS ARE BASED UPON THE BOROUGH OF MANHATTAN DATUM, APPROXIMATELY 2.750 FEET ABOVE MEAN SEA LEVEL AT SANDY HOOK.
3. CELLAR GRADE IS APPROXIMATELY BETWEEN 7 AND 12 FEET BELOW SIDE WALK GRADE AND THE SUB-CELLAR IS APPROXIMATELY 4 FEET BELOW CELLAR GRADE. EXCAVATION IS NOT PROPOSED WITHIN THE SUB-CELLAR FOOTPRINT.

LANGAN 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	Project **4650 BROADWAY** BLOCK No. 2175, LOT No. 1 NEW YORK NEW YORK	Figure Title **TRACK 1 CLEANUP PLAN**	Project No. 170505501 Date 09/23/2021 Drawn By JG Checked By JL	Figure No. **9**

Filename: \\langan.com\data\NYC\data5\170505501\Project Data\CAD\01\SheetFiles\Environmental\RAWP\Figures 8 and 9 - Track 1 and 4 Cleanup Plans.dwg Date: 10/4/2021 Time: 23:14 User: lesmail Style Table: Langan.stb Layout: Track 1



LEGEND:

APPROXIMATE SITE BOUNDARY

APPROXIMATE SUB-CELLAR BOUNDARY

EXTENT OF EXCAVATION OF THE UPPER TWO FEET BELOW CELLAR GRADE. AN ENGINEERED COMPOSITE COVER (BUILDING SLAB) UNDERLAIN BY A 20-MIL VAPOR BARRIER WILL BE INSTALLED FOLLOWING SOIL REMOVAL.

NOTES:

1. BASEMAP: BOUNDARY & TOPOGRAPHIC SURVEY, PREPARED BY CONTROL POINT ASSOCIATES INC., DATED OCTOBER 14, 2005.
2. ELEVATIONS ARE BASED UPON THE BOROUGH OF MANHATTAN DATUM, APPROXIMATELY 2.750 FEET ABOVE MEAN SEA LEVEL AT SANDY HOOK.
3. CELLAR GRADE IS APPROXIMATELY BETWEEN 7 AND 12 FEET BELOW SIDE WALK GRADE AND THE SUB-CELLAR IS APPROXIMATELY 4 FEET BELOW CELLAR GRADE. EXCAVATION IS NOT PROPOSED WITHIN THE SUB-CELLAR FOOTPRINT.

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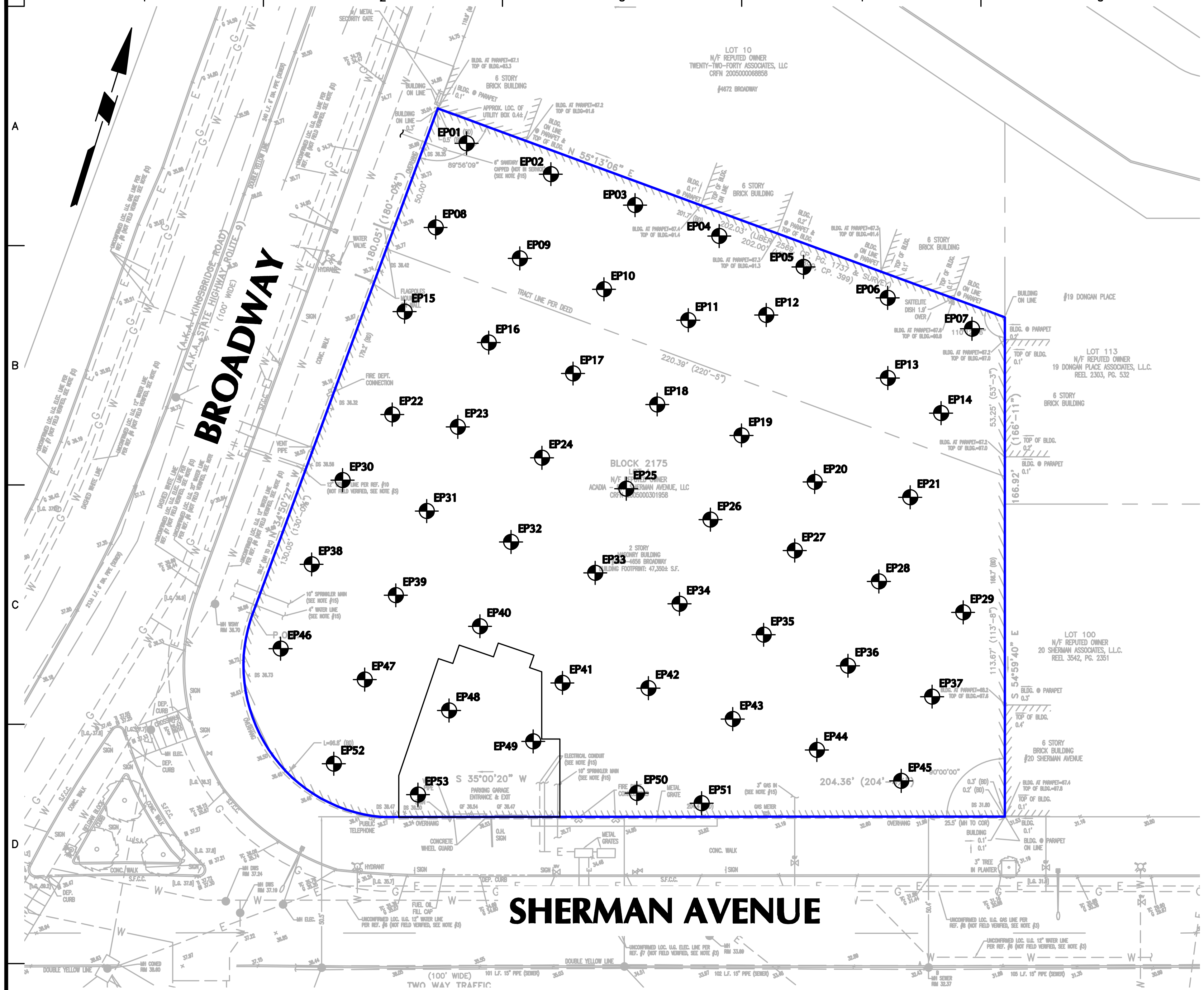
Filename: \\langan.com\data\NYC\data5\170505501\Project Data\CAD\01\SheetFiles\Environmental\RAWP\Figures 8 and 9 - Track 1 and 4 Cleanup Plans.dwg Date: 10/4/2021 Time: 23:30 User: lesmail Style Table: Langan.stb Layout: Track 4



LEGEND:

APPROXIMATE SITE BOUNDARY

APPROXIMATE SUB-CELLAR BOUNDARY

EP01 PROPOSED ENDPOINT DOCUMENTATION SAMPLE LOCATION

NOTES:

1. BASEMAP: BOUNDARY & TOPOGRAPHIC SURVEY, PREPARED BY CONTROL POINT ASSOCIATES INC., DATED OCTOBER 14, 2005.
2. ELEVATIONS ARE BASED UPON THE BOROUGH OF MANHATTAN DATUM, APPROXIMATELY 2.750 FEET ABOVE MEAN SEA LEVEL AT SANDY HOOK.
3. CELLAR GRADE IS BETWEEN APPROXIMATELY 7 AND 12 FEET BELOW SIDE WALK GRADE AND THE SUB-CELLAR IS APPROXIMATELY 4 FEET BELOW CELLAR GRADE.
4. PROPOSED ENDPOINT SAMPLE LOCATIONS ARE APPROXIMATE AND SUBJECT TO CHANGE BASED ON FIELD CONDITIONS.

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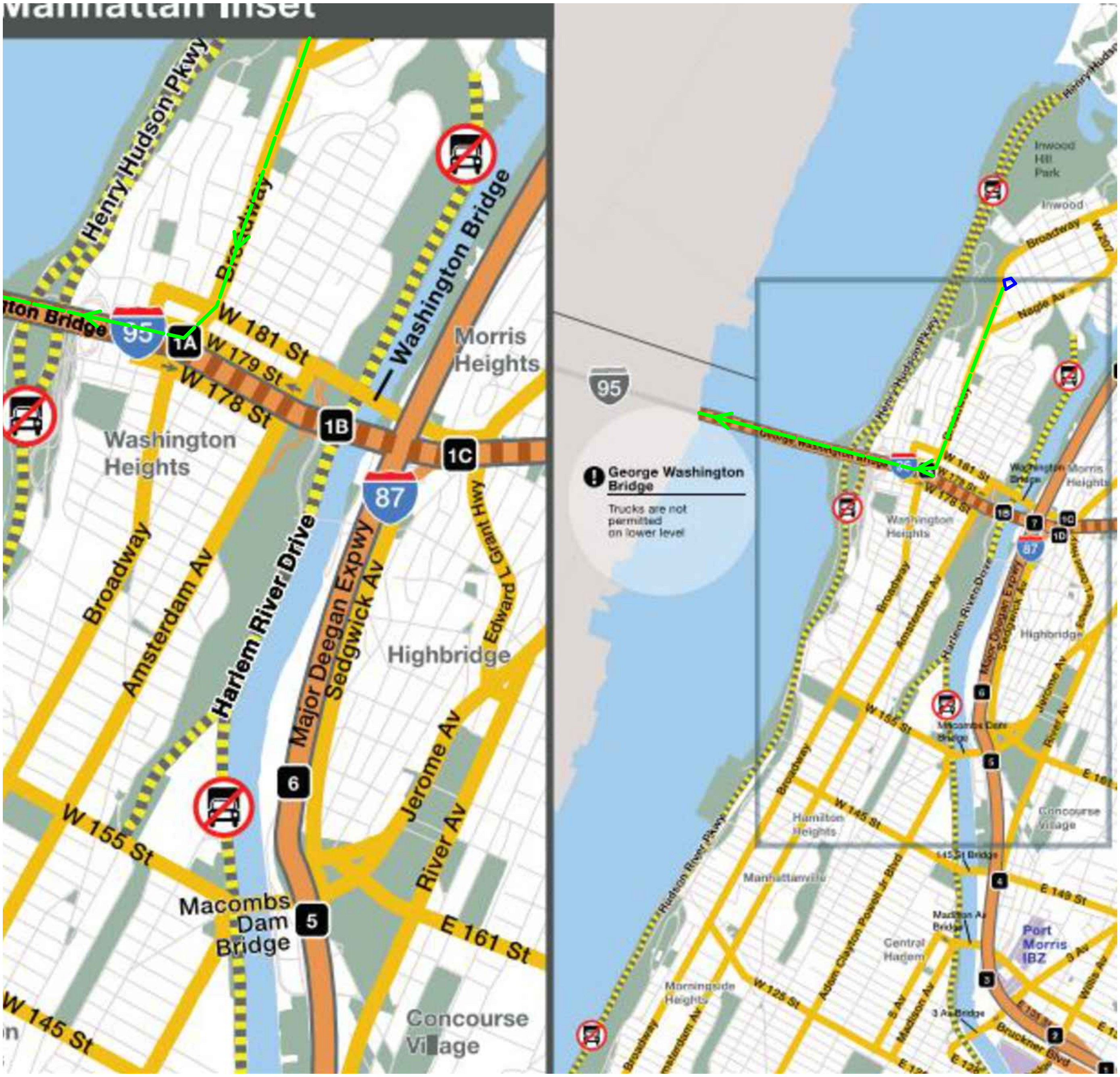

LEGEND:

APPROXIMATE SITE BOUNDARY
TRUCK ROUTE
LOCAL TRUCK ROUTE
THROUGH TRUCK ROUTE
THROUGH TRUCK ROUTE ON EXPRESSWAY

NOTES:

1. BASEMAP IS REFERENCED FROM THE NEW YORK CITY DEPARTMENT OF TRANSPORTATION 2015 TRUCK ROUTE MAP, ACCESSED ON MAY 27, 2018.
2. LOCATION OF SITE ACCESS IS SUBJECT TO CHANGE, PENDING CONSTRUCTION LOGISTICS.
3. FIGURE IS NOT TO SCALE.

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Project	Figure Title	Project No.	Figure No.
4650 BROADWAY BLOCK No. 2175 LOT No. 1 NEW YORK NEW YORK	TRUCK ROUTE MAP	170505501 Date: 01/29/2021 Drawn By: JG Checked By: JL	12

TABLES

LANGAN

Table 1
Remedial Action Work Plan
Quarterly Groundwater Sample Analytical Results

4650 Broadway
New York, New York
NYSDEC BCP Site No.: C231123
Langan Project No.: 170505501

Analyte	CAS Number	NYSDEC SGVs	Sampling Event	Baseline	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 5	Quarter 6	Quarter 7
			Location	MW32	MW32	MW32	MW32	MW32	MW32	MW32	MW32
			Sample Name	MW32_091218	MW32_031720	MW32_061620	MW32_091620	MW32_111920	MW32_030421	MW32_060921	MW32_082021
			Sample Date	9/12/2018	3/17/2020	6/16/2020	9/16/2020	11/19/2020	3/4/2021	6/9/2021	8/20/2021
			Unit	Result	Result	Result	Result	Result	Result	Result	Result
Volatile Organic Compounds											
1,1,1,2-Tetrachloroethane	630-20-6	5	ug/l	<2.5 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,1,1-Trichloroethane	71-55-6	5	ug/l	<2.5 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,1,2,2-Tetrachloroethane	79-34-5	5	ug/l	<0.5 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	5	ug/l	NA	<0.2 U	<0.2 U	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U
1,1,2-Trichloroethane	79-00-5	1	ug/l	<1.5 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,1-Dichloroethane	75-34-3	5	ug/l	<2.5 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,1-Dichloroethene	75-35-4	5	ug/l	<0.5 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,1-Dichloropropene	563-58-6	5	ug/l	<2.5 U	NA	NA	NA	NA	NA	NA	NA
1,2,3-Trichlorobenzene	87-61-6	5	ug/l	<2.5 UJ	<0.2 U	<0.2 UJ	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,2,3-Trichloropropane	96-18-4	0.04	ug/l	<2.5 U	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,2,4,5-Tetramethylbenzene	95-93-2	**5**	ug/l	<2 U	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	120-82-1	5	ug/l	<2.5 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,2,4-Trimethylbenzene	95-63-6	**5**	ug/l	<2.5 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,2-Dibromo-3-Chloropropane	96-12-8	0.04	ug/l	<2.5 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,2-Dibromoethane (Ethylene Dibromide)	106-93-4	0.0006	ug/l	<2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 UJ
1,2-Dichlorobenzene	95-50-1	3	ug/l	<2.5 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,2-Dichloroethane	107-06-2	**0.6**	ug/l	<0.5 U	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,2-Dichloropropane	78-87-5	**1**	ug/l	<1 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,3,5-Trimethylbenzene (Mesitylene)	108-67-8	**5**	ug/l	<2.5 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,3-Dichlorobenzene	541-73-1	3	ug/l	<2.5 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,3-Dichloropropane	142-28-9	5	ug/l	<2.5 U	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	106-46-7	3	ug/l	<2.5 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,4-Diethyl Benzene	105-05-5	NS	ug/l	<2 U	NA	NA	NA	NA	NA	NA	NA
1,4-Dioxane (P-Dioxane)	123-91-1	NS	ug/l	<250 U	<40 UJ	<40 UJ	<40 UJ	<40 UJ	<40 U	<40 U	<40 UJ
2,2-Dichloropropane	594-20-7	5	ug/l	<2.5 U	NA	NA	NA	NA	NA	NA	NA
2-Chlorotoluene	95-49-8	5	ug/l	<2.5 U	NA	NA	NA	NA	NA	NA	NA
2-Hexanone (MBK)	591-78-6	50	ug/l	<5 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 UJ
4-Chlorotoluene	106-43-4	5	ug/l	<2.5 U	NA	NA	NA	NA	NA	NA	NA
4-Ethyltoluene	622-96-8	NS	ug/l	<2 U	NA	NA	NA	NA	NA	NA	NA
Acetone	67-64-1	**50**	ug/l	1.8 J	<1 U	<1 U	<1 U	<1 UJ	<1 U	<1 UJ	<1 U
Acrolein	107-02-8	5	ug/l	NA	<0.2 UJ	<0.2 UJ	<0.2 U	<0.2 U	<0.2 UJ	<0.2 UJ	<0.2 UJ
Acrylonitrile	107-13-1	**5**	ug/l	<5 U	<0.2 U	<0.2 UJ	<0.2 UJ	<0.2 UJ	<0.2 U	<0.2 U	<0.2 UJ
Benzene	71-43-2	**1**	ug/l	0.4 J	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Bromobenzene	108-86-1	5	ug/l	<2.5 U	NA	NA	NA	NA	NA	NA	NA
Bromochloromethane	74-97-5	5	ug/l	<2.5 U	<0.2 U	<0.2 UJ	<0.2 UJ	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U
Bromodichloromethane	75-27-4	50	ug/l	<0.5 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Bromoform	75-25-2	50	ug/l	<2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U
Bromomethane	74-83-9	**5**	ug/l	0.88 J	<0.2 U	<0.2 UJ	<0.2 UJ	<0.2 UJ	<0.2 UJ	<0.2 UJ	<0.2 U
Carbon Disulfide	75-15-0	60	ug/l	<5 U	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Carbon Tetrachloride	56-23-5	5	ug/l	<0.5 U	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Chlorobenzene	108-90-7	5	ug/l	<2.5 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Chloroethane	75-00-3	**5**	ug/l	<2.5 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Chloroform	67-66-3	**7**	ug/l	<2.5 U	1.24	1.26	0.6	0.8	0.5	0.5	0.9
Chloromethane	74-87-3	**5**	ug/l	<2.5 U	<0.2 U	0.39 J	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Cis-1,2-Dichloroethene	156-59-2	**5**	ug/l	<2.5 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Cis-1,3-Dichloropropene	10061-01-5	0.4	ug/l	<0.5 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Cyclohexane	110-82-7	NS	ug/l	NA	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U
Cymene	99-87-6	**5**	ug/l	<2.5 U	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	124-48-1	50	ug/l	<0.5 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Dibromomethane	74-95-3	5	ug/l	<5 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Dichlorodifluoromethane	75-71-8	5	ug/l	<5 U	<0.2 UJ	<0.2 UJ	<0.2 U	<0.2 UJ	<0.2 UJ	<0.2 U	<0.2 UJ
Diethyl Ether (Ethyl Ether)	60-29-7	NS	ug/l	<2.5 U	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	100-41-4	**5**	ug/l	<2.5 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Hexachlorobutadiene	87-68-3	0.5	ug/l	<2.5 U	<0.2 U	<0.2 U	<0.2 U	<0.2 UJ	<0.2 U	<0.2 UJ	<0.2 U
Isopropylbenzene (Cumene)	98-82-8	**5**	ug/l	<2.5 U	<0.2 U	<0.2 UJ	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U	<0.2 UJ
M,P-Xylene	179601-23-1	**5**	ug/l	<2.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
Methyl Acetate	79-20-9	NS	ug/l	NA	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 UJ
Methyl Ethyl Ketone (2-Butanone)	78-93-3	**50**	ug/l	<5 U	<0.2 U	<0.2 U	<0.2 UJ	<0.2 UJ	<1 U	<0.2 U	<0.2 UJ
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	108-10-1	NS	ug/l	<5 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 UJ
Methylcyclohexane	108-87-2	NS	ug/l	NA	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Methylene Chloride	75-09-2	5	ug/l	<2.5 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
Naphthalene	91-20-3	**10**	ug/l	<2.5 U	NA	NA	NA	NA	NA	NA	NA
n-Butylbenzene	104-51-8	**5**	ug/l	<2.5 U	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U	<0.2 UJ	<0.2 U
n-Propylbenzene	103-65-1	**5**	ug/l	<2.5 U	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 UJ
o-Xylene (1,2-Dimethylbenzene)	95-47-6	**5**	ug/l	<2.5 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
p-Cymene (p-Isopropyltoluene)	CYMP	NS	ug/l	NA	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Sec-Butylbenzene	135-98-8	**5**	ug/l	<2.5 U	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Styrene	100-42-5	5	ug/l	<2.5 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
T-Butylbenzene	98-06-6	5	ug/l	<2.5 U	<0.2 U	<0.2 UJ	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U
Tert-Butyl Alcohol	75-65-0	NS	ug/l	NA	<0.5 U	<0.5 UJ	<0.5 U	<0.5 UJ	<0.5 U	<0.5 U	<0.5 UJ
Tert-Butyl Methyl Ether	1634-04-4	10	ug/l	<2.5 U	<0.2 U	<0.2 U	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 UJ
Tetrachloroethene (PCE)	127-18-4	**5**	ug/l	<0.5 U	<0.2 U	<0.2 UJ	0.21 J	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Toluene	108-88-3	**5**	ug/l	<2.5 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Total 1,2-Dichloroethene (Cis and Trans)	540-59-0	NS	ug/l	<2.5 U	NA	NA	NA	NA	NA	NA	NA
Total Xylenes	1330-20-7	**5**	ug/l	<2.5 U	<0.6 U	<0.6 U	<0.6 U	<0.6 U	<0.6 U	<0.6 U	<0.6 U
Total, 1,3-Dichloropropene (Cis And Trans)	542-75-6	0.4	ug/l	<0.5 U	NA	NA	NA	NA	NA	NA	NA
Trans-1,2-Dichloroethene	156-60-5	5	ug/l	<2.5 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Trans-1,3-Dichloropropene	10061-02-6	0.4	ug/l	<0.5 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Trans-1,4-Dichloro-2-Butene	110-57-6	5	ug/l	<2.5 U	NA	NA	NA	NA	NA	NA	NA
Trichloroethene (TCE)	79-01-6	5	ug/l	<0.5 U	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U	<0.2 UJ	<0.2 U
Trichlorofluoromethane	75-69-4	5	ug/l	<2.5 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U
Vinyl Acetate	108-05-4	NS	ug/l	<5 U	NA	NA	NA	NA	NA	NA	NA
Vinyl Chloride	75-01-4	2	ug/l	<1 U	<0.2 U	<0.2 U	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U

Table 1
Remedial Action Work Plan
Quarterly Groundwater Sample Analytical Results

4650 Broadway
New York, New York
NYSDEC BCP Site No.: C231123
Langan Project No.: 170505501

Analyte	CAS Number	NYSDEC SGVs	Sampling Event	Baseline	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 5	Quarter 6	Quarter 7
			Location	RMW01	RMW01	RMW01	RMW01	RMW01	RMW01	RMW01	RMW01
			Sample Name	RMW01_041918	RMW01_031620	RMW01_061520	RMW01_091520	RMW01_111820	RMW01_030321	RMW01_060821	RMW01_081921
			Sample Date	4/19/2018	3/16/2020	6/15/2020	9/15/2020	11/18/2020	3/3/2021	6/8/2021	8/19/2021
			Unit	Result	Result	Result	Result	Result	Result	Result	Result
Volatile Organic Compounds											
1,1,1,2-Tetrachloroethane	630-20-6	5	ug/l	<25 U	<2 U	<0.2 U	<0.2 U	<1 U	<2 U	<0.2 U	<0.2 U
1,1,1-Trichloroethane	71-55-6	5	ug/l	<25 U	<2 U	<0.2 U	<0.2 U	<1 U	<2 U	<0.2 U	<0.2 U
1,1,2,2-Tetrachloroethane	79-34-5	5	ug/l	<5 U	<2 U	<0.2 U	<0.2 U	<1 U	<2 U	<0.2 U	<0.2 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	5	ug/l	NA	<2 U	<0.2 U	<0.2 U	<1 U	<2 UJ	<0.2 U	<0.2 U
1,1,2-Trichloroethane	79-00-5	1	ug/l	<15 U	<2 U	<0.2 U	<0.2 U	<1 U	<2 U	<0.2 U	<0.2 U
1,1-Dichloroethane	75-34-3	5	ug/l	<25 U	<2 U	<0.2 U	<0.2 U	<1 U	<2 U	<0.2 U	<0.2 U
1,1-Dichloroethene	75-35-4	5	ug/l	<5 U	<2 U	<0.2 U	<0.2 U	<1 U	<2 U	<0.2 U	<0.2 U
1,1-Dichloropropene	563-58-6	5	ug/l	<25 U	NA	NA	NA	NA	NA	NA	NA
1,2,3-Trichlorobenzene	87-61-6	5	ug/l	<25 U	<2 UJ	<0.2 UJ	<0.2 U	<1 U	<2 U	<0.2 U	<0.2 U
1,2,3-Trichloropropane	96-18-4	0.04	ug/l	<25 U	<2 U	<0.2 U	<0.2 U	<1 U	<2 U	<0.2 U	<0.2 U
1,2,4,5-Tetramethylbenzene	95-93-2	**5**	ug/l	**21**	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	120-82-1	5	ug/l	<25 U	<2 U	<0.2 U	<0.2 U	<1 U	<2 U	<0.2 U	<0.2 U
1,2,4-Trimethylbenzene	95-63-6	**5**	ug/l	**570**	**300 D**	**27.4**	**89.5**	**177 D**	**893 D**	**43.1 J**	**76.8 J**
1,2-Dibromo-3-Chloropropane	96-12-8	0.04	ug/l	<25 U	<2 U	<0.2 U	<0.2 U	<1 U	<2 U	<0.2 U	<0.2 U
1,2-Dibromoethane (Ethylene Dibromide)	106-93-4	0.0006	ug/l	<20 U	<2 U	<0.2 U	<0.2 U	<1 U	<2 U	<0.2 U	<0.2 UJ
1,2-Dichlorobenzene	95-50-1	3	ug/l	<25 U	<2 U	<0.2 U	<0.2 U	<1 U	<2 U	<0.2 U	<0.2 U
1,2-Dichloroethane	107-06-2	**0.6**	ug/l	<5 U	<2 U	<0.2 UJ	<0.2 U	<1 U	<2 U	<0.2 U	<0.2 U
1,2-Dichloropropane	78-87-5	**1**	ug/l	**3.8 J**	<2 U	<0.2 U	<0.2 U	<1 U	<2 U	0.55	<0.2 U
1,3,5-Trimethylbenzene (Mesitylene)	108-67-8	**5**	ug/l	**180**	**74 D**	4.34	**12**	**51.6 D**	**258 D**	**5.19**	**13.6 J**
1,3-Dichlorobenzene	541-73-1	3	ug/l	<25 U	<2 U	<0.2 U	<0.2 U	<1 U	<2 U	<0.2 U	<0.2 U
1,3-Dichloropropane	142-28-9	5	ug/l	<25 U	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	106-46-7	3	ug/l	<25 U	<2 U	<0.2 U	<0.2 U	<1 U	<2 U	<0.2 U	<0.2 U
1,4-Diethyl Benzene	105-05-5	NS	ug/l	52	NA	NA	NA	NA	NA	NA	NA
1,4-Dioxane (P-Dioxane)	123-91-1	NS	ug/l	<2,500 UJ	<400 UJ	<40 UJ	<40 U	<200 UJ	<400 UJ	<40 U	<40 U
2,2-Dichloropropane	594-20-7	5	ug/l	<25 U	NA	NA	NA	NA	NA	NA	NA
2-Chlorotoluene	95-49-8	5	ug/l	<25 U	NA	NA	NA	NA	NA	NA	NA
2-Hexanone (MBK)	591-78-6	50	ug/l	<50 U	<2 U	<1 U	2.89	<1 U	<2 UJ	<0.2 U	10.3 J
4-Chlorotoluene	106-43-4	5	ug/l	<25 U	NA	NA	NA	NA	NA	NA	NA
4-Ethyltoluene	622-96-8	NS	ug/l	440	NA	NA	NA	NA	NA	NA	NA
Acetone	67-64-1	**50**	ug/l	37 J	**210 D**	<2.82 U	9.04	<11.2 U	18.6 JD	2.05 J	10.2
Acrolein	107-02-8	5	ug/l	NA	<2 UJ	<0.2 UJ	<0.2 U	<1 U	<2 U	<0.2 UJ	<0.2 U
Acrylonitrile	107-13-1	**5**	ug/l	**260**	<2 U	<0.2 UJ	<0.2 U	<1 U	<2 U	<0.2 U	<0.2 U
Benzene	71-43-2	**1**	ug/l	**26**	**2.7 JD**	<0.2 U	0.28 J	<1 U	<2 U	<0.2 U	<0.2 U
Bromobenzene	108-86-1	5	ug/l	<25 U	NA	NA	NA	NA	NA	NA	NA
Bromochloromethane	74-97-5	5	ug/l	<25 U	<2 U	<0.2 UJ	<0.2 U	<1 U	<2 U	<0.2 U	<0.2 U
Bromodichloromethane	75-27-4	50	ug/l	<5 U	<2 U	<0.2 U	<0.2 U	<1 U	<2 U	<0.2 U	<0.2 U
Bromoform	75-25-2	50	ug/l	<20 U	<2 U	<0.2 U	<0.2 U	<1 U	<2 U	<0.2 U	<0.2 U
Bromomethane	74-83-9	**5**	ug/l	<25 U	<2 UJ	<0.2 UJ	<0.2 UJ	<1 U	<2 UJ	<0.2 UJ	<0.2 UJ
Carbon Disulfide	75-15-0	60	ug/l	<50 U	2.3 J	<0.2 U	0.85	1.95 JD	<2 U	<0.2 U	0.37 J
Carbon Tetrachloride	56-23-5	5	ug/l	<5 U	<2 U	<0.2 UJ	<0.2 U	<1 U	<2 U	<0.2 U	<0.2 U
Chlorobenzene	108-90-7	5	ug/l	<25 U	<2 U	<0.2 U	<0.2 U	<1 U	<2 U	<0.2 U	<0.2 U
Chloroethane	75-00-3	**5**	ug/l	<25 U	3.2 JD	<0.2 U	<0.2 U	2 JD	<2 UJ	<0.2 U	<0.2 U
Chloroform	67-66-3	**7**	ug/l	<25 U	<2 U	<0.2 U	2.98	<1 U	<2 U	<0.2 U	<0.2 U
Chloromethane	74-87-3	**5**	ug/l	<25 UJ	4 J	<0.2 UJ	<0.2 UJ	<1 UJ	<2 UJ	<0.2 U	<0.2 U
Cis-1,2-Dichloroethene	156-59-2	**5**	ug/l	<25 U	<2 U	<0.2 U	<0.2 U	<1 U	<2 U	<0.2 U	<0.2 U
Cis-1,3-Dichloropropene	10061-01-5	0.4	ug/l	<5 U	<2 U	<0.2 U	<0.2 U	<1 U	<2 U	<0.2 U	<0.2 U
Cyclohexane	110-82-7	NS	ug/l	NA	200 D	18.1 J	46.1	124 D	315 D	21.4	40.7 J
Cymene	99-87-6	**5**	ug/l	<25 U	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	124-48-1	50	ug/l	<5 U	<2 U	<0.2 U	<0.2 U	<1 U	<2 U	<0.2 U	<0.2 U
Dibromomethane	74-95-3	5	ug/l	<50 U	<2 U	<0.2 U	<0.2 U	<1 U	<2 U	<0.2 U	<0.2 U
Dichlorodifluoromethane	75-71-8	5	ug/l	<50 U	<2 UJ	<0.2 UJ	<0.2 U	<1 UJ	<2 UJ	<0.2 U	<0.2 U
Diethyl Ether (Ethyl Ether)	60-29-7	NS	ug/l	<25 U	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	100-41-4	**5**	ug/l	**380**	**110 D**	3.04	**23.6**	**55.6 D**	**200 D**	**10.5**	**44 J**
Hexachlorobutadiene	87-68-3	0.5	ug/l	<25 U	<2 U	<0.2 U	<0.2 U	<1 UJ	<2 U	<0.2 UJ	<0.2 U
Isopropylbenzene (Cumene)	98-82-8	**5**	ug/l	**30**	**18 D**	1.29 J	**5.18**	**11.9 D**	**42.5 D**	2.79 J	**5.23 J**
M,P-Xylene	179601-23-1	**5**	ug/l	**1,600**	**520 D**	**37**	**184**	**246 D**	**962 D**	**107**	**239 J**
Methyl Acetate	79-20-9	NS	ug/l	NA	<2 U	<0.2 UJ	<0.2 U	<1 U	<2 U	<0.2 U	<0.2 U
Methyl Ethyl Ketone (2-Butanone)	78-93-3	**50**	ug/l	<50 U	<2 UJ	<0.2 U	<0.2 U	<1 U	<2 UJ	<0.2 U	<0.2 UJ
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	108-10-1	NS	ug/l	<50 U	<2 U	<0.2 U	<0.2 U	<1 U	<2 UJ	<0.2 U	<0.2 U
Methylcyclohexane	108-87-2	NS	ug/l	NA	90 J	19.3 J	53.7	78.6 D	269 J	43.6	50.6 J
Methylene Chloride	75-09-2	5	ug/l	<25 U	<10 U	<1 UJ	<1 U	<5 U	<10 U	<1 U	<1 U
Naphthalene	91-20-3	**10**	ug/l	**120**	NA	NA	NA	NA	NA	NA	NA
n-Butylbenzene	104-51-8	**5**	ug/l	<25 U	<2 U	0.42 J	0.89	3.45 D	4.7 JD	2.25 J	1.62 J
n-Propylbenzene	103-65-1	**5**	ug/l	**72**	**39 D**	3.05	**10.8**	**21.2 D**	**93.9 D**	**5.52**	**7.83 J**
o-Xylene (1,2-Dimethylbenzene)	95-47-6	**5**	ug/l	**620**	**120 D**	**11.2**	**24.4**	**7.4 D**	**14.5 D**	**40.2**	**97.7 J**
p-Cymene (p-Isopropyltoluene)	CYMP	NS	ug/l	NA	<2 U	0.26 J	0.68	<1 U	3 JD	0.51	0.52
Sec-Butylbenzene	135-98-8	**5**	ug/l	<25 U	2.2 JD	0.3 J	0.92	2.05 JD	**5.2 D**	0.9	0.86 J
Styrene	100-42-5	5	ug/l	<25 U	<2 U	0.37 J	<0.2 U	<1 U	<2 U	1.29	<0.2 U
T-Butylbenzene	98-06-6	5	ug/l	<25 U	<2 U	<0.2 UJ	<0.2 U	<1 U	<2 U	<0.2 U	<0.2 U
Tert-Butyl Alcohol	75-65-0	NS	ug/l	NA	<5 U	<0.5 UJ	<0.5 UJ	<2.5 UJ	<5 U	<0.5 U	<0.5 U
Tert-Butyl Methyl Ether	1634-04-4	10	ug/l	<25 U	<2 U	<0.2 UJ	<0.2 U	<1 U	<2 U	<0.2 U	<0.2 UJ
Tetrachloroethene (PCE)	127-18-4	**5**	ug/l	<5 UJ	<2 U	<0.2 U	<0.2 U	<1 U	<2 U	<0.2 U	<0.2 U
Toluene	108-88-3	**5**	ug/l	**11 J**	**12 D**	<0.2 U	0.34 J	**5.55 D**	**15.4 D**	0.21 J	0.32 J
Total 1,2-Dichloroethene (Cis and Trans)	540-59-0	NS	ug/l	<25 U	NA	NA	NA	NA	NA	NA	NA
Total Xylenes	1330-20-7	**5**	ug/l	**2,200**	**640 D**	**48.3**	**208**	**254 D**	**976 D**	**148**	**336 J**
Total, 1,3-Dichloropropene (Cis And Trans)	542-75-6	0.4	ug/l	<5 U	NA	NA	NA	NA	NA	NA	NA
Trans-1,2-Dichloroethene	156-60-5	5	ug/l	<25 U	<2 U	<0.2 U	<0.2 U	<1 U	<2 U	<0.2 U	<0.2 U
Trans-1,3-Dichloropropene	10061-02-6	0.4	ug/l	<5 U	<2 U	<0.2 U	<0.2 U	<1 U	<2 U	<0.2 U	<0.2 U
Trans-1,4-Dichloro-2-Butene	110-57-6	5	ug/l	<25 U	<2 U	NA	NA	NA	NA	NA	NA
Trichloroethene (TCE)	79-01-6	5	ug/l	<5 U	<2 U	<0.2 U	<0.2 U	<1 U	<2 U	<0.2 UJ	<0.2 U
Trichlorofluoromethane	75-69-4	5	ug/l	<25 U	<2 U	<0.2 U	<0.2 U	<1 U	<2 UJ	<0.2 U	<0.2 U
Vinyl Acetate	108-05-4	NS	ug/l	<50 U	NA	NA	NA	NA	NA	NA	NA
Vinyl Chloride	75-01-4	2	ug/l	<10 UJ	<2 UJ	<0.2 UJ	<0.2 U	<1 U	<2 UJ	<0.2 U	<0.2 U

Table 1
Remedial Action Work Plan
Quarterly Groundwater Sample Analytical Results

4650 Broadway
New York, New York
NYSDEC BCP Site No.: C231123
Langan Project No.: 170505501

Analyte	CAS Number	NYSDEC SGVs	Sampling Event	Baseline	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 5	Quarter 6	Quarter 7
			Location	RMW02	RMW02	RMW02	RMW02	RMW02	RMW02	RMW02	RMW02
			Sample Name	RMW02_041818	RMW02_031620	RMW02_061520	RMW02_091520	RMW02_111820	RMW02_030321	RMW02_060821	RMW02_081921
			Sample Date	4/18/2018	3/16/2020	6/15/2020	9/15/2020	11/18/2020	3/3/2021	6/8/2021	8/19/2021
			Unit	Result	Result	Result	Result	Result	Result	Result	Result
Volatile Organic Compounds											
1,1,1,2-Tetrachloroethane	630-20-6	5	ug/l	<2.5 U	<0.2 U	<0.2 U	<0.2 U	<1 U	<0.2 U	<0.2 U	<0.2 U
1,1,1-Trichloroethane	71-55-6	5	ug/l	<2.5 U	<0.2 U	<0.2 U	<0.2 U	<1 U	<0.2 U	<0.2 U	<0.2 U
1,1,2,2-Tetrachloroethane	79-34-5	5	ug/l	<0.5 U	<0.2 U	<0.2 U	<0.2 U	<1 U	<0.2 U	<0.2 U	<0.2 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	5	ug/l	NA	<0.2 U	<0.2 U	<0.2 U	<1 U	<0.2 UJ	<0.2 U	<0.2 U
1,1,2-Trichloroethane	79-00-5	1	ug/l	<1.5 U	<0.2 U	<0.2 U	<0.2 U	<1 U	<0.2 U	<0.2 U	<0.2 U
1,1-Dichloroethane	75-34-3	5	ug/l	<2.5 U	0.44 J	<0.2 U	<0.2 U	<1 U	<0.2 U	<0.2 U	<0.2 U
1,1-Dichloroethene	75-35-4	5	ug/l	<0.5 U	<0.2 U	<0.2 U	<0.2 U	<1 U	<0.2 U	<0.2 U	<0.2 U
1,1-Dichloropropene	563-58-6	5	ug/l	<2.5 U	NA	NA	NA	NA	NA	NA	NA
1,2,3-Trichlorobenzene	87-61-6	5	ug/l	<2.5 U	<0.2 U	<0.2 UJ	<0.2 U	<1 U	<0.2 U	<0.2 U	<0.2 U
1,2,3-Trichloropropane	96-18-4	0.04	ug/l	<2.5 U	<0.2 U	<0.2 U	<0.2 U	<1 U	<0.2 U	<0.2 U	<0.2 U
1,2,4,5-Tetramethylbenzene	95-93-2	**5**	ug/l	3	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	120-82-1	5	ug/l	<2.5 U	<0.2 U	<0.2 U	<0.2 U	<1 U	<0.2 U	<0.2 U	<0.2 U
1,2,4-Trimethylbenzene	95-63-6	**5**	ug/l	**32 J**	0.95	**15**	1.51	1.75 JD	3.74	4.67	3.43
1,2-Dibromo-3-Chloropropane	96-12-8	0.04	ug/l	<2.5 U	<0.2 U	<0.2 U	<0.2 U	<1 U	<0.2 U	<0.2 U	<0.2 U
1,2-Dibromoethane (Ethylene Dibromide)	106-93-4	0.0006	ug/l	<2 U	<0.2 U	<0.2 U	<0.2 U	<1 U	<0.2 U	<0.2 U	<0.2 UJ
1,2-Dichlorobenzene	95-50-1	3	ug/l	<2.5 U	<0.2 U	<0.2 U	<0.2 U	<1 U	<0.2 U	<0.2 U	<0.2 U
1,2-Dichloroethane	107-06-2	**0.6**	ug/l	<0.5 U	**7.9**	**1.09 J**	**1.16**	<1 U	0.6	0.31 J	0.46 J
1,2-Dichloropropane	78-87-5	**1**	ug/l	<1 U	<0.2 U	<0.2 U	<0.2 U	<1 U	<0.2 U	<0.2 U	0.41 J
1,3,5-Trimethylbenzene (Mesitylene)	108-67-8	**5**	ug/l	**26 J**	0.24 J	**9.71**	0.54	1.5 JD	2.15	3.69	2.37
1,3-Dichlorobenzene	541-73-1	3	ug/l	<2.5 U	<0.2 U	<0.2 U	<0.2 U	<1 U	<0.2 U	<0.2 U	<0.2 U
1,3-Dichloropropane	142-28-9	5	ug/l	<2.5 U	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	106-46-7	3	ug/l	<2.5 U	<0.2 U	<0.2 U	<0.2 U	<1 U	<0.2 U	<0.2 U	<0.2 U
1,4-Diethyl Benzene	105-05-5	NS	ug/l	<2 U	NA	NA	NA	NA	NA	NA	NA
1,4-Dioxane (P-Dioxane)	123-91-1	NS	ug/l	<250 UJ	<40 UJ	<40 UJ	<40 U	<200 UJ	<40 UJ	<40 U	<40 U
2,2-Dichloropropane	594-20-7	5	ug/l	<2.5 U	NA	NA	NA	NA	NA	NA	NA
2-Chlorotoluene	95-49-8	5	ug/l	<2.5 U	NA	NA	NA	NA	NA	NA	NA
2-Hexanone (MBK)	591-78-6	50	ug/l	<5 U	<0.2 U	<0.2 U	<0.2 U	<1 U	<0.2 UJ	<0.2 U	<0.2 U
4-Chlorotoluene	106-43-4	5	ug/l	<2.5 U	NA	NA	NA	NA	NA	NA	NA
4-Ethyltoluene	622-96-8	NS	ug/l	46	NA	NA	NA	NA	NA	NA	NA
Acetone	67-64-1	**50**	ug/l	<15 U	**210 D**	<19.9 U	7.17	<5 UJ	4.56	<1 UJ	<1 U
Acrolein	107-02-8	5	ug/l	NA	<0.2 UJ	<0.2 UJ	<0.2 U	<1 UJ	<0.2 U	<0.2 UJ	<0.2 U
Acrylonitrile	107-13-1	**5**	ug/l	**36 J**	<0.2 U	<0.2 UJ	<0.2 U	<1 UJ	**76.3**	<0.2 U	<0.2 U
Benzene	71-43-2	**1**	ug/l	<0.5 U	<0.2 U	<0.5 U	0.33 J	**1.65 JD**	0.65	0.37 J	0.8
Bromobenzene	108-86-1	5	ug/l	<2.5 U	NA	NA	NA	NA	NA	NA	NA
Bromochloromethane	74-97-5	5	ug/l	<2.5 U	0.31 J	<0.2 UJ	<0.2 U	<1 UJ	<0.2 U	<0.2 U	<0.2 U
Bromodichloromethane	75-27-4	50	ug/l	<0.5 U	<0.2 U	<0.2 U	<0.2 U	<1 U	<0.2 U	<0.2 U	<0.2 U
Bromoform	75-25-2	50	ug/l	<2 U	<0.2 U	<0.2 U	<0.2 U	<1 U	<0.2 U	<0.2 U	<0.2 U
Bromomethane	74-83-9	**5**	ug/l	<2.5 UJ	1 J	<0.2 UJ	<0.2 UJ	<1 U	<0.2 UJ	<0.2 UJ	<0.2 UJ
Carbon Disulfide	75-15-0	60	ug/l	<5 U	4.7	3.28	2.79	<1 U	1.33	0.9	0.79
Carbon Tetrachloride	56-23-5	5	ug/l	<0.5 U	<0.2 U	<0.2 UJ	<0.2 U	<1 U	<0.2 U	<0.2 U	<0.2 U
Chlorobenzene	108-90-7	5	ug/l	<2.5 U	<0.2 U	<0.2 U	<0.2 U	<1 U	<0.2 U	<0.2 U	<0.2 U
Chloroethane	75-00-3	**5**	ug/l	<2.5 U	**35**	**5.19**	**5.73**	**5.85 J**	4.77 J	2.3	**5.17**
Chloroform	67-66-3	**7**	ug/l	<2.5 U	3	<0.2 U	2.78	5.55 D	<0.2 U	<0.2 U	<0.2 U
Chloromethane	74-87-3	**5**	ug/l	<2.5 U	**67**	**7.24 J**	<0.2 UJ	<1 U	<0.2 UJ	<0.2 U	<0.2 U
Cis-1,2-Dichloroethene	156-59-2	**5**	ug/l	<2.5 U	<0.2 U	<0.2 U	<0.2 U	<1 U	<0.2 U	<0.2 U	<0.2 U
Cis-1,3-Dichloropropene	10061-01-5	0.4	ug/l	<0.5 U	<0.2 U	<0.2 U	<0.2 U	<1 U	<0.2 U	<0.2 U	<0.2 U
Cyclohexane	110-82-7	NS	ug/l	NA	24 J	110 J	44.7	98 D	111	60	23.8
Cymene	99-87-6	**5**	ug/l	0.76 J	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	124-48-1	50	ug/l	<0.5 U	<0.2 U	<0.2 U	<0.2 U	<1 U	<0.2 U	<0.2 U	<0.2 U
Dibromomethane	74-95-3	5	ug/l	<5 U	<0.2 U	<0.2 U	<0.2 U	<1 U	<0.2 U	<0.2 U	<0.2 U
Dichlorodifluoromethane	75-71-8	5	ug/l	<5 U	<0.2 U	<0.2 UJ	<0.2 U	<1 UJ	<0.2 UJ	<0.2 U	<0.2 U
Diethyl Ether (Ethyl Ether)	60-29-7	NS	ug/l	<2.5 U	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	100-41-4	**5**	ug/l	**18 J**	0.53	**56.6**	**37.4**	**127 D**	**101**	**42.8**	**28.8**
Hexachlorobutadiene	87-68-3	0.5	ug/l	<2.5 U	<0.2 U	<0.2 U	<0.2 U	<1 UJ	<0.2 U	<0.2 UJ	<0.2 U
Isopropylbenzene (Cumene)	98-82-8	**5**	ug/l	**5.5**	<0.2 U	**6.73 J**	4.41	**8.9 D**	**16.9**	**9.68**	**7.46**
M,P-Xylene	179601-23-1	**5**	ug/l	**58**	1.7	**181**	**10.7**	**16.8 D**	**27.1**	**24.4**	**6.64**
Methyl Acetate	79-20-9	NS	ug/l	NA	<0.2 U	<0.2 UJ	<0.2 U	<1 UJ	<0.2 U	<0.2 U	<0.2 U
Methyl Ethyl Ketone (2-Butanone)	78-93-3	**50**	ug/l	<5 U	**69**	<0.2 U	<0.2 U	<1 UJ	<0.2 UJ	0.43 J	<0.2 UJ
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	108-10-1	NS	ug/l	<5 U	4.4	<0.2 U	<0.2 U	<1 U	<0.2 UJ	<0.2 U	<0.2 U
Methylcyclohexane	108-87-2	NS	ug/l	NA	3.9	54 J	19.5	48.9 D	96.8 J	41.7	17
Methylene Chloride	75-09-2	5	ug/l	<2.5 U	4.1	1.27 J	1.54 J	<5 U	1.73 J	<1 U	<1 U
Naphthalene	91-20-3	**10**	ug/l	8.9 J	NA	NA	NA	NA	NA	NA	NA
n-Butylbenzene	104-51-8	**5**	ug/l	1.6 J	<0.2 U	0.54	0.33 J	2.15 JD	1.7	1.35 J	0.49 J
n-Propylbenzene	103-65-1	**5**	ug/l	**8.6**	0.21 J	**13.7**	**6.49**	**13.9 D**	**25.5**	**13.5**	4.99
o-Xylene (1,2-Dimethylbenzene)	95-47-6	**5**	ug/l	**6.5**	0.6	**29.9**	1.55	2.75 D	1.6	0.97	0.63
p-Cymene (p-Isopropyltoluene)	CYMP	NS	ug/l	NA	<0.2 U	0.7	0.31 J	<1 U	1.38	1.21	0.8
Sec-Butylbenzene	135-98-8	**5**	ug/l	<2.5 U	<0.2 U	0.68	0.38 J	1.6 JD	1.86	1.29	0.93
Styrene	100-42-5	5	ug/l	<2.5 U	<0.2 U	<0.2 U	<0.2 U	<1 U	<0.2 U	<0.2 U	<0.2 U
T-Butylbenzene	98-06-6	5	ug/l	<2.5 U	<0.2 U	<0.2 UJ	<0.2 U	<1 UJ	0.23 J	<0.2 U	0.24 J
Tert-Butyl Alcohol	75-65-0	NS	ug/l	NA	<0.5 U	<0.5 UJ	<0.5 UJ	<2.5 UJ	<0.5 U	<0.5 U	<0.5 U
Tert-Butyl Methyl Ether	1634-04-4	10	ug/l	<2.5 U	<0.2 U	<0.2 UJ	<0.2 U	<1 UJ	<0.2 U	<0.2 U	<0.2 UJ
Tetrachloroethene (PCE)	127-18-4	**5**	ug/l	<0.5 U	<0.2 U	0.25 J	0.32 J	<1 U	0.23 J	<0.2 U	0.21 J
Toluene	108-88-3	**5**	ug/l	<2.5 U	0.25 J	1.36	0.39 J	<1 U	1	0.42 J	0.39 J
Total 1,2-Dichloroethene (Cis and Trans)	540-59-0	NS	ug/l	<2.5 U	NA	NA	NA	NA	NA	NA	NA
Total Xylenes	1330-20-7	**5**	ug/l	**65**	2.3	**211**	**12.2**	**19.6 D**	**28.7**	**25.4**	**7.27**
Total, 1,3-Dichloropropene (Cis And Trans)	542-75-6	0.4	ug/l	<0.5 U	NA	NA	NA	NA	NA	NA	NA
Trans-1,2-Dichloroethene	156-60-5	5	ug/l	<2.5 U	<0.2 U	<0.2 U	<0.2 U	<1 U	<0.2 U	<0.2 U	<0.2 U
Trans-1,3-Dichloropropene	10061-02-6	0.4	ug/l	<0.5 U	<0.2 U	<0.2 U	<0.2 U	<1 U	<0.2 U	<0.2 U	<0.2 U
Trans-1,4-Dichloro-2-Butene	110-57-6	5	ug/l	<2.5 U	<0.2 U	NA	NA	NA	NA	NA	NA
Trichloroethene (TCE)	79-01-6	5	ug/l	<0.5 U	<0.2 U	<0.2 U	<0.2 U	<1 U	<0.2 U	<0.2 UJ	<0.2 U
Trichlorofluoromethane	75-69-4	5	ug/l	<2.5 U	<0.2 U	<0.2 U	<0.2 U	<1 U	<0.2 UJ	<0.2 U	<0.2 U
Vinyl Acetate	108-05-4	NS	ug/l	<5 U	NA	NA	NA	NA	NA	NA	NA
Vinyl Chloride	75-01-4	2	ug/l	<1 U	<0.2 U	<0.2 UJ	<0.2 U	<1 U	<0.2 UJ	<0.2 U	<0.2 U

Table 1
Remedial Action Work Plan
Quarterly Groundwater Sample Analytical Results

4650 Broadway
New York, New York
NYSDEC BCP Site No.: C231123
Langan Project No.: 170505501

Analyte	CAS Number	NYSDEC SGVs	Sampling Event	Baseline	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 5	Quarter 6	Quarter 7
			Location	RMW03	RMW03	RMW03	RMW03	RMW03	RMW03	RMW03	RMW03
			Sample Name	RMW03_041818	---	---	RMW03_091620	RMW03_111920	RMW03_030321	RMW03_060821	RMW03_081921
			Sample Date	4/19/2018	---	---	9/16/2020	11/19/2020	3/3/2021	6/8/2021	8/19/2021
			Unit	Result			Result	Result	Result	Result	Result
Volatile Organic Compounds											
1,1,1,2-Tetrachloroethane	630-20-6	5	ug/l	<25 U	Not Sampled	Not Sampled	<0.4 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,1,1-Trichloroethane	71-55-6	5	ug/l	<25 U	Not Sampled	Not Sampled	<0.4 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,1,2,2-Tetrachloroethane	79-34-5	5	ug/l	<5 U	Not Sampled	Not Sampled	<0.4 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	5	ug/l	NA	Not Sampled	Not Sampled	<0.4 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U
1,1,2-Trichloroethane	79-00-5	1	ug/l	<15 U	Not Sampled	Not Sampled	<0.4 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,1-Dichloroethane	75-34-3	5	ug/l	<25 U	Not Sampled	Not Sampled	<0.4 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,1-Dichloroethene	75-35-4	5	ug/l	<5 U	Not Sampled	Not Sampled	<0.4 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,1-Dichloropropene	563-58-6	5	ug/l	<25 U	Not Sampled	Not Sampled	NA	NA	NA	NA	NA
1,2,3-Trichlorobenzene	87-61-6	5	ug/l	<25 U	Not Sampled	Not Sampled	<0.4 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,2,3-Trichloropropane	96-18-4	0.04	ug/l	<25 U	Not Sampled	Not Sampled	<0.4 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,2,4,5-Tetramethylbenzene	95-93-2	**5**	ug/l	**38**	Not Sampled	Not Sampled	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	120-82-1	5	ug/l	<25 U	Not Sampled	Not Sampled	<0.4 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,2,4-Trimethylbenzene	95-63-6	**5**	ug/l	**630**	Not Sampled	Not Sampled	**49.6 D**	**19.3**	**12.2**	0.79	**7.29**
1,2-Dibromo-3-Chloropropane	96-12-8	0.04	ug/l	<25 U	Not Sampled	Not Sampled	<0.4 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,2-Dibromoethane (Ethylene Dibromide)	106-93-4	0.0006	ug/l	<20 U	Not Sampled	Not Sampled	<0.4 U	<0.2 U	<0.2 U	<0.2 U	<0.2 UJ
1,2-Dichlorobenzene	95-50-1	3	ug/l	<25 U	Not Sampled	Not Sampled	<0.4 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,2-Dichloroethane	107-06-2	**0.6**	ug/l	<5 U	Not Sampled	Not Sampled	<0.4 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,2-Dichloropropane	78-87-5	**1**	ug/l	<10 U	Not Sampled	Not Sampled	<0.4 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,3,5-Trimethylbenzene (Mesitylene)	108-67-8	**5**	ug/l	**200**	Not Sampled	Not Sampled	**25.8 D**	**16.5**	**12.7**	1.52	**16.8**
1,3-Dichlorobenzene	541-73-1	3	ug/l	<25 U	Not Sampled	Not Sampled	<0.4 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,3-Dichloropropane	142-28-9	5	ug/l	<25 U	Not Sampled	Not Sampled	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	106-46-7	3	ug/l	<25 U	Not Sampled	Not Sampled	<0.4 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,4-Diethyl Benzene	105-05-5	NS	ug/l	<20 U	Not Sampled	Not Sampled	NA	NA	NA	NA	NA
1,4-Dioxane (P-Dioxane)	123-91-1	NS	ug/l	<2,500 UJ	Not Sampled	Not Sampled	<80 U	<40 UJ	<40 U	<40 U	<40 U
2,2-Dichloropropane	594-20-7	5	ug/l	<25 U	Not Sampled	Not Sampled	NA	NA	NA	NA	NA
2-Chlorotoluene	95-49-8	5	ug/l	<25 U	Not Sampled	Not Sampled	NA	NA	NA	NA	NA
2-Hexanone (MBK)	591-78-6	50	ug/l	<50 U	Not Sampled	Not Sampled	<0.4 U	<0.2 U	<0.2 U	3.65	<0.2 U
4-Chlorotoluene	106-43-4	5	ug/l	<25 U	Not Sampled	Not Sampled	NA	NA	NA	NA	NA
4-Ethyltoluene	622-96-8	NS	ug/l	430	Not Sampled	Not Sampled	NA	NA	NA	NA	NA
Acetone	67-64-1	**50**	ug/l	28 J	Not Sampled	Not Sampled	21.6 D	7.4 J	<1 U	1.6 J	2.92
Acrolein	107-02-8	5	ug/l	NA	Not Sampled	Not Sampled	<0.4 UJ	<0.2 UJ	<0.2 UJ	<0.2 UJ	<0.2 U
Acrylonitrile	107-13-1	**5**	ug/l	<50 U	Not Sampled	Not Sampled	<0.4 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Benzene	71-43-2	**1**	ug/l	<5 U	Not Sampled	Not Sampled	<0.4 UJ	0.26 J	<0.2 U	<0.2 U	0.54
Bromobenzene	108-86-1	5	ug/l	<25 U	Not Sampled	Not Sampled	NA	NA	NA	NA	NA
Bromochloromethane	74-97-5	5	ug/l	<25 U	Not Sampled	Not Sampled	<0.4 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Bromodichloromethane	75-27-4	50	ug/l	<5 U	Not Sampled	Not Sampled	<0.4 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Bromoform	75-25-2	50	ug/l	<20 U	Not Sampled	Not Sampled	<0.4 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Bromomethane	74-83-9	**5**	ug/l	<25 UJ	Not Sampled	Not Sampled	<0.4 UJ	<0.2 UJ	<0.2 UJ	<0.2 UJ	<0.2 UJ
Carbon Disulfide	75-15-0	60	ug/l	<50 U	Not Sampled	Not Sampled	3.06 D	0.85	<0.2 U	<0.2 U	<0.2 U
Carbon Tetrachloride	56-23-5	5	ug/l	<5 U	Not Sampled	Not Sampled	<0.4 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Chlorobenzene	108-90-7	5	ug/l	<25 U	Not Sampled	Not Sampled	<0.4 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Chloroethane	75-00-3	**5**	ug/l	<25 U	Not Sampled	Not Sampled	<0.4 U	0.24 J	<0.2 U	<0.2 U	<0.2 U
Chloroform	67-66-3	**7**	ug/l	<25 U	Not Sampled	Not Sampled	1.16 D	1.04	0.76	0.57	0.53
Chloromethane	74-87-3	**5**	ug/l	<25 U	Not Sampled	Not Sampled	<0.4 UJ	<0.2 UJ	<0.2 UJ	<0.2 U	<0.2 U
Cis-1,2-Dichloroethene	156-59-2	**5**	ug/l	<25 U	Not Sampled	Not Sampled	**6.48 BD**	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Cis-1,3-Dichloropropene	10061-01-5	0.4	ug/l	<5 U	Not Sampled	Not Sampled	<0.4 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Cyclohexane	110-82-7	NS	ug/l	NA	Not Sampled	Not Sampled	5.58 J	<0.2 U	<0.2 UJ	1.2	<0.2 U
Cymene	99-87-6	**5**	ug/l	<25 U	Not Sampled	Not Sampled	NA	NA	NA	NA	NA
Dibromochloromethane	124-48-1	50	ug/l	<5 U	Not Sampled	Not Sampled	<0.4 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Dibromomethane	74-95-3	5	ug/l	<50 U	Not Sampled	Not Sampled	<0.4 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Dichlorodifluoromethane	75-71-8	5	ug/l	<50 U	Not Sampled	Not Sampled	<0.4 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U
Diethyl Ether (Ethyl Ether)	60-29-7	NS	ug/l	<25 U	Not Sampled	Not Sampled	NA	NA	NA	NA	NA
Ethylbenzene	100-41-4	**5**	ug/l	**43**	Not Sampled	Not Sampled	3.72 D	1.95	0.78	<0.2 U	2.42
Hexachlorobutadiene	87-68-3	0.5	ug/l	<25 U	Not Sampled	Not Sampled	<0.4 U	<0.2 U	<0.2 U	<0.2 UJ	<0.2 U
Isopropylbenzene (Cumene)	98-82-8	**5**	ug/l	**21 J**	Not Sampled	Not Sampled	4.16 D	2.87	2.42	0.36 J	3.6
M,P-Xylene	179601-23-1	**5**	ug/l	**320**	Not Sampled	Not Sampled	**11 D**	3.52	0.66 J	<0.5 U	<0.5 U
Methyl Acetate	79-20-9	NS	ug/l	NA	Not Sampled	Not Sampled	<0.4 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Methyl Ethyl Ketone (2-Butanone)	78-93-3	**50**	ug/l	<50 U	Not Sampled	Not Sampled	<0.4 U	<2.9 U	1.49 J	0.4 J	<0.2 UJ
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	108-10-1	NS	ug/l	<50 U	Not Sampled	Not Sampled	<0.4 U	<0.2 U	<0.2 U	0.33 J	<0.2 U
Methylcyclohexane	108-87-2	NS	ug/l	NA	Not Sampled	Not Sampled	38.6 J	6.89	<0.2 U	<0.2 U	<0.2 U
Methylene Chloride	75-09-2	5	ug/l	<25 U	Not Sampled	Not Sampled	<2 U	<1 U	<1 U	<1 U	1.22 J
Naphthalene	91-20-3	**10**	ug/l	**73**	Not Sampled	Not Sampled	NA	NA	NA	NA	NA
n-Butylbenzene	104-51-8	**5**	ug/l	**17 J**	Not Sampled	Not Sampled	3.86 D	3.11	2.66	0.36 J	0.41 J
n-Propylbenzene	103-65-1	**5**	ug/l	**58**	Not Sampled	Not Sampled	**11 D**	**8.05**	**7.3**	1.03	**10.6**
o-Xylene (1,2-Dimethylbenzene)	95-47-6	**5**	ug/l	**100**	Not Sampled	Not Sampled	0.58 JD	0.23 J	<0.2 U	<0.2 U	<0.2 U
p-Cymene (p-Isopropyltoluene)	CYMP	NS	ug/l	NA	Not Sampled	Not Sampled	1.04 D	0.93	0.88	<0.2 U	1.31
Sec-Butylbenzene	135-98-8	**5**	ug/l	<25 U	Not Sampled	Not Sampled	1.56 D	1.5	1.47	0.22 J	2.24
Styrene	100-42-5	5	ug/l	<25 U	Not Sampled	Not Sampled	<0.4 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
T-Butylbenzene	98-06-6	5	ug/l	<25 U	Not Sampled	Not Sampled	<0.4 UJ	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U
Tert-Butyl Alcohol	75-65-0	NS	ug/l	NA	Not Sampled	Not Sampled	<1 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
Tert-Butyl Methyl Ether	1634-04-4	10	ug/l	<25 U	Not Sampled	Not Sampled	<0.4 U	<0.2 U	<0.2 U	<0.2 U	<0.2 UJ
Tetrachloroethene (PCE)	127-18-4	**5**	ug/l	<5 U	Not Sampled	Not Sampled	**20.8 D**	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Toluene	108-88-3	**5**	ug/l	<25 U	Not Sampled	Not Sampled	<0.4 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Total 1,2-Dichloroethene (Cis and Trans)	540-59-0	NS	ug/l	<25 U	Not Sampled	Not Sampled	NA	NA	NA	NA	NA
Total Xylenes	1330-20-7	**5**	ug/l	**420**	Not Sampled	Not Sampled	**11.6 D**	3.75	0.66 J	<0.6 U	<0.6 U
Total, 1,3-Dichloropropene (Cis And Trans)	542-75-6	0.4	ug/l	<5 U	Not Sampled	Not Sampled	NA	NA	NA	NA	NA
Trans-1,2-Dichloroethene	156-60-5	5	ug/l	<25 U	Not Sampled	Not Sampled	<0.4 UJ	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Trans-1,3-Dichloropropene	10061-02-6	0.4	ug/l	<5 U	Not Sampled	Not Sampled	<0.4 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Trans-1,4-Dichloro-2-Butene	110-57-6	5	ug/l	<25 U	Not Sampled	Not Sampled	NA	NA	NA	NA	NA
Trichloroethene (TCE)	79-01-6	5	ug/l	<5 U	Not Sampled	Not Sampled	1.56 D	<0.2 U	<0.2 U	<0.2 UJ	<0.2 U
Trichlorofluoromethane	75-69-4	5	ug/l	<25 U	Not Sampled	Not Sampled	<0.4 U	<0.2 UJ	<0.2 UJ	<0.2 U	<0.2 U
Vinyl Acetate	108-05-4	NS	ug/l	<50 U	Not Sampled	Not Sampled	NA	NA	NA	NA	NA
Vinyl Chloride	75-01-4	2	ug/l	<10 U	Not Sampled	Not Sampled	<0.4 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U

Table 1
Remedial Action Work Plan
Quarterly Groundwater Sample Analytical Results

4650 Broadway
New York, New York
NYSDEC BCP Site No.: C231123
Langan Project No.: 170505501

Analyte	CAS Number	NYSDEC SGVs	Sampling Event	Baseline	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 5	Quarter 6	Quarter 7
			Location	RMW04	RMW04	RMW04	RMW04	RMW04	RMW04	RMW04	RMW04
			Sample Name	RMW04_041818	RMW04_031620	RMW04_061520	RMW04_091520	RMW04_111820	RMW04_030321	RMW04_060821	RMW04_081921
			Sample Date	4/18/2018	3/16/2020	6/15/2020	9/15/2020	11/18/2020	3/3/2021	6/8/2021	8/19/2021
			Unit	Result	Result	Result	Result	Result	Result	Result	Result
Volatile Organic Compounds											
1,1,1,2-Tetrachloroethane	630-20-6	5	ug/l	<6.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,1,1-Trichloroethane	71-55-6	5	ug/l	<6.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,1,2,2-Tetrachloroethane	79-34-5	5	ug/l	<1.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	5	ug/l	NA	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,1,2-Trichloroethane	79-00-5	1	ug/l	<3.8 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,1-Dichloroethane	75-34-3	5	ug/l	<6.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,1-Dichloroethene	75-35-4	5	ug/l	<1.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,1-Dichloropropene	563-58-6	5	ug/l	<6.2 U	NA	NA	NA	NA	NA	NA	NA
1,2,3-Trichlorobenzene	87-61-6	5	ug/l	<6.2 U	<0.2 UJ	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,2,3-Trichloropropane	96-18-4	0.04	ug/l	<6.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,2,4,5-Tetramethylbenzene	95-93-2	**5**	ug/l	**88**	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	120-82-1	5	ug/l	<6.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,2,4-Trimethylbenzene	95-63-6	**5**	ug/l	**96**	1.8	0.68	1.83	2.65	2.7	1.66	1.01
1,2-Dibromo-3-Chloropropane	96-12-8	0.04	ug/l	<6.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,2-Dibromoethane (Ethylene Dibromide)	106-93-4	0.0006	ug/l	<5 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 UJ
1,2-Dichlorobenzene	95-50-1	3	ug/l	<6.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,2-Dichloroethane	107-06-2	**0.6**	ug/l	<1.2 U	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,2-Dichloropropane	78-87-5	**1**	ug/l	<2.5 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,3,5-Trimethylbenzene (Mesitylene)	108-67-8	**5**	ug/l	**45**	1.1	0.45 J	1.19	1.61	1.74	1.04	0.7
1,3-Dichlorobenzene	541-73-1	3	ug/l	<6.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,3-Dichloropropane	142-28-9	5	ug/l	<6.2 U	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	106-46-7	3	ug/l	<6.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,4-Diethyl Benzene	105-05-5	NS	ug/l	250	NA	NA	NA	NA	NA	NA	NA
1,4-Dioxane (P-Dioxane)	123-91-1	NS	ug/l	<620 UJ	<40 UJ	<40 UJ	<40 U	<40 UJ	<40 U	<40 U	<40 U
2,2-Dichloropropane	594-20-7	5	ug/l	<6.2 U	NA	NA	NA	NA	NA	NA	NA
2-Chlorotoluene	95-49-8	5	ug/l	<6.2 U	NA	NA	NA	NA	NA	NA	NA
2-Hexanone (MBK)	591-78-6	50	ug/l	<12 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
4-Chlorotoluene	106-43-4	5	ug/l	<6.2 U	NA	NA	NA	NA	NA	NA	NA
4-Ethyltoluene	622-96-8	NS	ug/l	29	NA	NA	NA	NA	NA	NA	NA
Acetone	67-64-1	**50**	ug/l	<12 U	7	<1 U	2.53	<3.08 U	<1 U	<1 UJ	1.89 J
Acrolein	107-02-8	5	ug/l	NA	<0.2 UJ	<0.2 UJ	<0.2 U	<0.2 UJ	<0.2 UJ	<0.2 UJ	<0.2 U
Acrylonitrile	107-13-1	**5**	ug/l	<12 U	<0.2 U	<0.2 UJ	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U
Benzene	71-43-2	**1**	ug/l	0.45 J	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Bromobenzene	108-86-1	5	ug/l	<6.2 U	NA	NA	NA	NA	NA	NA	NA
Bromochloromethane	74-97-5	5	ug/l	<6.2 U	<0.2 U	<0.2 UJ	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U
Bromodichloromethane	75-27-4	50	ug/l	<1.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Bromoform	75-25-2	50	ug/l	<5 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Bromomethane	74-83-9	**5**	ug/l	<6.2 UJ	<0.2 UJ	<0.2 UJ	<0.2 UJ	<0.2 U	<0.2 UJ	<0.2 UJ	<0.2 UJ
Carbon Disulfide	75-15-0	60	ug/l	<12 U	1.2 J	0.46 J	0.62	0.29 J	<0.2 U	<0.2 U	<0.2 U
Carbon Tetrachloride	56-23-5	5	ug/l	<1.2 U	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Chlorobenzene	108-90-7	5	ug/l	<6.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Chloroethane	75-00-3	**5**	ug/l	<6.2 UJ	0.42 J	0.21 J	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Chloroform	67-66-3	**7**	ug/l	**13**	1.1	0.78	1.02	0.98	<0.2 U	0.44 J	0.47 J
Chloromethane	74-87-3	**5**	ug/l	<6.2 UJ	<0.2 UJ	<0.2 UJ	<0.2 UJ	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U
Cis-1,2-Dichloroethene	156-59-2	**5**	ug/l	<6.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Cis-1,3-Dichloropropene	10061-01-5	0.4	ug/l	<1.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Cyclohexane	110-82-7	NS	ug/l	NA	2.1	1.3 J	1.72	1.73	0.78 J	6.08	1.31
Cymene	99-87-6	**5**	ug/l	**7.4**	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	124-48-1	50	ug/l	<1.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Dibromomethane	74-95-3	5	ug/l	<12 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Dichlorodifluoromethane	75-71-8	5	ug/l	<12 UJ	<0.2 UJ	<0.2 UJ	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U
Diethyl Ether (Ethyl Ether)	60-29-7	NS	ug/l	<6.2 U	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	100-41-4	**5**	ug/l	**7.4**	1.6	1.09	2.64	2.57	1.51	1.95	1.15
Hexachlorobutadiene	87-68-3	0.5	ug/l	<6.2 UJ	<0.2 U	<0.2 U	<0.2 U	<0.2 UJ	<0.2 U	<0.2 UJ	<0.2 U
Isopropylbenzene (Cumene)	98-82-8	**5**	ug/l	4.3 J	0.28 J	<0.2 UJ	0.59	0.69	0.53	0.64	0.49 J
M,P-Xylene	179601-23-1	**5**	ug/l	**23**	1.3	0.51 J	2.43	1.1	<0.5 U	<0.5 U	<0.5 U
Methyl Acetate	79-20-9	NS	ug/l	NA	<0.2 U	<0.2 UJ	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U
Methyl Ethyl Ketone (2-Butanone)	78-93-3	**50**	ug/l	<12 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 UJ	<0.2 UJ	0.52	0.98 J
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	108-10-1	NS	ug/l	4.8 J	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Methylcyclohexane	108-87-2	NS	ug/l	NA	6.9 J	1.96 J	3.46	1.75	1.43	1.65	0.42 J
Methylene Chloride	75-09-2	5	ug/l	<6.2 U	<1 U	<1 UJ	<1 U	<1 U	2.53	<1 U	<1 U
Naphthalene	91-20-3	**10**	ug/l	7.8	NA	NA	NA	NA	NA	NA	NA
n-Butylbenzene	104-51-8	**5**	ug/l	**11**	<0.2 U	<0.2 U	<0.2 U	0.92	0.74	0.35 J	<0.2 U
n-Propylbenzene	103-65-1	**5**	ug/l	**17**	0.46 J	<0.2 U	0.56	0.78	0.56	0.58	0.37 J
o-Xylene (1,2-Dimethylbenzene)	95-47-6	**5**	ug/l	**14**	0.83	0.22 J	0.33 J	0.33 J	0.26 J	0.22 J	<0.2 U
p-Cymene (p-Isopropyltoluene)	CYMP	NS	ug/l	NA	0.36 J	<0.2 U	0.2 J	0.32 J	0.25 J	<0.2 U	<0.2 U
Sec-Butylbenzene	135-98-8	**5**	ug/l	**16**	0.61	0.24 J	0.39 J	0.65	0.53	0.32 J	<0.2 U
Styrene	100-42-5	5	ug/l	<6.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
T-Butylbenzene	98-06-6	5	ug/l	<6.2 U	<0.2 U	<0.2 UJ	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U
Tert-Butyl Alcohol	75-65-0	NS	ug/l	NA	<0.5 U	<0.5 UJ	<0.5 UJ	<0.5 UJ	<0.5 U	<0.5 U	<0.5 U
Tert-Butyl Methyl Ether	1634-04-4	10	ug/l	<6.2 U	<0.2 U	<0.2 UJ	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 UJ
Tetrachloroethene (PCE)	127-18-4	**5**	ug/l	<1.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Toluene	108-88-3	**5**	ug/l	2.4 J	0.52	0.2 J	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Total 1,2-Dichloroethene (Cis and Trans)	540-59-0	NS	ug/l	<6.2 U	NA	NA	NA	NA	NA	NA	NA
Total Xylenes	1330-20-7	**5**	ug/l	**37**	2.1	0.73 J	2.76	1.43 J	0.67 J	0.67 J	<0.6 U
Total, 1,3-Dichloropropene (Cis And Trans)	542-75-6	0.4	ug/l	<1.2 U	NA	NA	NA	NA	NA	NA	NA
Trans-1,2-Dichloroethene	156-60-5	5	ug/l	<6.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Trans-1,3-Dichloropropene	10061-02-6	0.4	ug/l	<1.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Trans-1,4-Dichloro-2-Butene	110-57-6	5	ug/l	<6.2 U	<0.2 U	NA	NA	NA	NA	NA	NA
Trichloroethene (TCE)	79-01-6	5	ug/l	<1.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 UJ	<0.2 U
Trichlorofluoromethane	75-69-4	5	ug/l	<6.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U
Vinyl Acetate	108-05-4	NS	ug/l	<12 U	NA	NA	NA	NA	NA	NA	NA
Vinyl Chloride	75-01-4	2	ug/l	<2.5 UJ	<0.2 UJ	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U

Table 1
Remedial Action Work Plan
Quarterly Groundwater Sample Analytical Results

4650 Broadway
New York, New York
NYSDEC BCP Site No.: C231123
Langan Project No.: 170505501

Analyte	CAS Number	NYSDEC SGVs	Sampling Event	Baseline	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 5	Quarter 6	Quarter 7
			Location	RMW16	RMW16	RMW16	RMW16	RMW16	RMW16	RMW16	RMW16
			Sample Name	RMW16_080718	RMW16_031720	RMW16_061620	RMW16_091620	RMW16_111820	RMW16_030421	RMW16_060921	RMW16_082021
			Sample Date	8/7/2018	3/17/2020	6/16/2020	9/16/2020	11/18/2020	3/4/2021	6/9/2021	8/20/2021
			Unit	Result	Result	Result	Result	Result	Result	Result	Result
Volatile Organic Compounds											
1,1,1,2-Tetrachloroethane	630-20-6	5	ug/l	<25 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,1,1-Trichloroethane	71-55-6	5	ug/l	<25 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,1,2,2-Tetrachloroethane	79-34-5	5	ug/l	<5 U	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	5	ug/l	NA	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U
1,1,2-Trichloroethane	79-00-5	1	ug/l	<15 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,1-Dichloroethane	75-34-3	5	ug/l	<25 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,1-Dichloroethene	75-35-4	5	ug/l	<5 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,1-Dichloropropene	563-58-6	5	ug/l	<25 U	NA	NA	NA	NA	NA	NA	NA
1,2,3-Trichlorobenzene	87-61-6	5	ug/l	<25 U	<0.2 U	<0.2 UJ	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,2,3-Trichloropropane	96-18-4	0.04	ug/l	<25 U	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,2,4,5-Tetramethylbenzene	95-93-2	**5**	ug/l	**27**	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	120-82-1	5	ug/l	<25 U	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,2,4-Trimethylbenzene	95-63-6	**5**	ug/l	**800**	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,2-Dibromo-3-Chloropropane	96-12-8	0.04	ug/l	<25 U	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,2-Dibromoethane (Ethylene Dibromide)	106-93-4	0.0006	ug/l	<20 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 UJ
1,2-Dichlorobenzene	95-50-1	3	ug/l	<25 U	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,2-Dichloroethane	107-06-2	**0.6**	ug/l	<5 U	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,2-Dichloropropane	78-87-5	**1**	ug/l	<10 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,3,5-Trimethylbenzene (Mesitylene)	108-67-8	**5**	ug/l	**220**	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,3-Dichlorobenzene	541-73-1	3	ug/l	<25 U	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,3-Dichloropropane	142-28-9	5	ug/l	<25 U	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	106-46-7	3	ug/l	<25 U	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,4-Diethyl Benzene	105-05-5	NS	ug/l	73	NA	NA	NA	NA	NA	NA	NA
1,4-Dioxane (P-Dioxane)	123-91-1	NS	ug/l	<2,500 U	<40 UJ	<40 UJ	<40 UJ	<40 UJ	<40 UJ	<40 U	<40 UJ
2,2-Dichloropropane	594-20-7	5	ug/l	<25 U	NA	NA	NA	NA	NA	NA	NA
2-Chlorotoluene	95-49-8	5	ug/l	<25 U	NA	NA	NA	NA	NA	NA	NA
2-Hexanone (MBK)	591-78-6	50	ug/l	<50 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 UJ	<0.2 U	<0.2 UJ
4-Chlorotoluene	106-43-4	5	ug/l	<25 U	NA	NA	NA	NA	NA	NA	NA
4-Ethyltoluene	622-96-8	NS	ug/l	390	NA	NA	NA	NA	NA	NA	NA
Acetone	67-64-1	**50**	ug/l	**110**	**75.5**	10.5 J	**52**	<10.1 U	1.71 J	<1 UJ	<1 U
Acrolein	107-02-8	5	ug/l	NA	<0.2 UJ	<0.2 UJ	<0.2 U	<0.2 UJ	<0.2 UJ	<0.2 UJ	<0.2 UJ
Acrylonitrile	107-13-1	**5**	ug/l	<50 U	<0.2 U	<0.2 UJ	<0.2 UJ	<0.2 UJ	<0.2 U	<0.2 U	<0.2 UJ
Benzene	71-43-2	**1**	ug/l	<5 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Bromobenzene	108-86-1	5	ug/l	<25 U	NA	NA	NA	NA	NA	NA	NA
Bromochloromethane	74-97-5	5	ug/l	<25 U	<0.2 U	<0.2 UJ	<0.2 UJ	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U
Bromodichloromethane	75-27-4	50	ug/l	<5 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Bromoform	75-25-2	50	ug/l	<20 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Bromomethane	74-83-9	**5**	ug/l	<25 U	<0.2 U	<0.2 UJ	<0.2 UJ	<0.2 U	<0.2 U	<0.2 UJ	<0.2 U
Carbon Disulfide	75-15-0	60	ug/l	<50 U	0.22 J	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Carbon Tetrachloride	56-23-5	5	ug/l	<5 U	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Chlorobenzene	108-90-7	5	ug/l	<25 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Chloroethane	75-00-3	**5**	ug/l	<25 U	0.39 J	<0.2 U	2.67	3.13 J	1.72 J	1.2	1.73
Chloroform	67-66-3	**7**	ug/l	<25 U	0.25 J	0.29 J	0.39 J	0.4 J	0.26 J	0.3 J	0.26 J
Chloromethane	74-87-3	**5**	ug/l	<25 U	**10.7**	0.34 J	1.74	<0.2 U	0.45 J	0.23 J	<0.2 U
Cis-1,2-Dichloroethene	156-59-2	**5**	ug/l	<25 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Cis-1,3-Dichloropropene	10061-01-5	0.4	ug/l	<5 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Cyclohexane	110-82-7	NS	ug/l	NA	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Cymene	99-87-6	**5**	ug/l	<25 U	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	124-48-1	50	ug/l	<5 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Dibromomethane	74-95-3	5	ug/l	<50 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Dichlorodifluoromethane	75-71-8	5	ug/l	<50 U	<0.2 UJ	<0.2 UJ	<0.2 U	<0.2 UJ	<0.2 UJ	<0.2 U	<0.2 UJ
Diethyl Ether (Ethyl Ether)	60-29-7	NS	ug/l	<25 U	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	100-41-4	**5**	ug/l	**16 J**	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Hexachlorobutadiene	87-68-3	0.5	ug/l	<25 U	<0.2 U	<0.2 UJ	<0.2 U	<0.2 UJ	<0.2 U	<0.2 UJ	<0.2 U
Isopropylbenzene (Cumene)	98-82-8	**5**	ug/l	**31**	<0.2 U	<0.2 UJ	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U	<0.2 UJ
M,P-Xylene	179601-23-1	**5**	ug/l	**140**	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
Methyl Acetate	79-20-9	NS	ug/l	NA	<0.2 U	<0.2 UJ	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 UJ
Methyl Ethyl Ketone (2-Butanone)	78-93-3	**50**	ug/l	<50 U	<0.2 U	<0.2 U	1.35 J	<0.2 UJ	<0.52 U	<0.2 U	<0.2 UJ
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	108-10-1	NS	ug/l	<50 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 UJ	<0.2 U	<0.2 UJ
Methylcyclohexane	108-87-2	NS	ug/l	NA	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U
Methylene Chloride	75-09-2	5	ug/l	<25 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
Naphthalene	91-20-3	**10**	ug/l	**25 J**	NA	NA	NA	NA	NA	NA	NA
n-Butylbenzene	104-51-8	**5**	ug/l	<25 U	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U	<0.2 UJ	<0.2 U
n-Propylbenzene	103-65-1	**5**	ug/l	**80**	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U	<0.2 UJ	<0.2 UJ
o-Xylene (1,2-Dimethylbenzene)	95-47-6	**5**	ug/l	**36**	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
p-Cymene (p-Isopropyltoluene)	CYMP	NS	ug/l	NA	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Sec-Butylbenzene	135-98-8	**5**	ug/l	**7.8 J**	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Styrene	100-42-5	5	ug/l	<25 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
T-Butylbenzene	98-06-6	5	ug/l	<25 U	<0.2 U	<0.2 UJ	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U
Tert-Butyl Alcohol	75-65-0	NS	ug/l	NA	3.52	<0.5 UJ	7.72	10.9 J	4.21 J	<0.5 U	<0.5 UJ
Tert-Butyl Methyl Ether	1634-04-4	10	ug/l	<25 U	<0.2 U	<0.2 U	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 UJ
Tetrachloroethene (PCE)	127-18-4	**5**	ug/l	<5 U	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Toluene	108-88-3	**5**	ug/l	<25 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Total 1,2-Dichloroethene (Cis and Trans)	540-59-0	NS	ug/l	<25 U	NA	NA	NA	NA	NA	NA	NA
Total Xylenes	1330-20-7	**5**	ug/l	**180**	<0.6 U	<0.6 U	<0.6 U	<0.6 U	<0.6 U	<0.6 U	<0.6 U
Total, 1,3-Dichloropropene (Cis And Trans)	542-75-6	0.4	ug/l	<5 U	NA	NA	NA	NA	NA	NA	NA
Trans-1,2-Dichloroethene	156-60-5	5	ug/l	<25 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Trans-1,3-Dichloropropene	10061-02-6	0.4	ug/l	<5 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Trans-1,4-Dichloro-2-Butene	110-57-6	5	ug/l	<25 U	NA	NA	NA	NA	NA	NA	NA
Trichloroethene (TCE)	79-01-6	5	ug/l	<5 U	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Trichlorofluoromethane	75-69-4	5	ug/l	<25 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U
Vinyl Acetate	108-05-4	NS	ug/l	<50 U	NA	NA	NA	NA	NA	NA	NA
Vinyl Chloride	75-01-4	2	ug/l	<10 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U

Table 1
Remedial Action Work Plan
Quarterly Groundwater Sample Analytical Results

4650 Broadway
New York, New York
NYSDEC BCP Site No.: C231123
Langan Project No.: 170505501

Notes:
CAS - Chemical Abstract Service
NS - No standard
ug/l = micrograms per liter
NA - Not Analyzed
RL - Reporting Limit
<RL - Not detected
Groundwater sample analytical results are compared to the New York State Department of Environmental Conservation (NYSDEC) Title 6 of the Official Compilation of New York Codes, Rules and Regulations (NYCRR) Part 703.5 and the NYSDEC Technical and Operational Guidance Series (TOGS) 1.1.1 Ambient Water Quality Standards and Guidance Values for Class GA Water (herein collectively referenced as "NYSDEC SGVs").

Qualifiers:
R = The sample results are unusable due to the quality of the data generated because certain criteria were not met. The analyte may or may not be present in the
J = The analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample.
UJ = The analyte was not detected at a level greater than or equal to the reporting limit (RL); however, the reported RL is approximate and may be inaccurate or
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

Exceedance Summary:
10 - Result exceeds NYSDEC SGVs

Table 2
Remedial Action Work Plan
Supplemental Soil Investigation Analytical Results

4650 Broadway
New York, New York
NYSDEC BCP Site No.: C231123
Langan Project No.: 170505501

Location Sample ID Laboratory ID Sample Date Sample Depth (feet bgs)	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	NYSDEC Part 375 Protection of Groundwater SCOs	TZ01 TZ01_8-9 L2114864-04 3/24/2021 8-9	TZ02 TZ02_5-6 L2114864-02 3/24/2021 5-6	TZ02 TZ02_8-9 L2114864-03 3/24/2021 8-9	TZ03 TZ03_5-6 L2114515-02 3/23/2021 5-6	TZ03 TZ03_8-9 L2114515-01 3/23/2021 8-9	TZ04 TZ04_8-9 L2114202-02 3/22/2021 8-9	TZ05 TZ05_7.5-8 L2114202-03 3/22/2021 7.5-8	TZ06 TZ06_8-9 L2115126-01 3/25/2021 8-9	TZ07 TZ07_8-9 L2115126-02 3/25/2021 8-9	TZ08 TZ08_8-9 L2115126-03 3/25/2021 8-9	TZ09 TZ09_8-9 L2115126-04 3/25/2021 8-9	TZ10 TZ10_8-9 L2114202-01 3/22/2021 8-9	TZ11 TZ11_8-9 L2115126-05 3/25/2021 8-9	TZ12 TZ12_8-9 L2115126-06 3/25/2021 8-9	TZ13 TZ13_8-9 L2115126-07 3/25/2021 8-9	TZ14 TZ14_8-9 L2115126-08 3/25/2021 8-9
Volatile Organic Compounds (mg/kg)																			
1,1,1,2-Tetrachloroethane	~	~	~	0.03 U	0.071 U	0.00057 U	0.00071 U	0.00042 U	0.00052 U	0.00056 U	0.00053 U	0.00056 U	0.032 U	0.00048 U	0.00053 U	0.00054 U	0.00047 U	0.029 UJ	0.00058 U
1,1,1-Trichloroethane	0.68	100	0.68	0.03 UJ	0.071 UJ	0.00057 UJ	0.00071 U	0.00042 U	0.00052 U	0.00056 U	0.00053 U	0.00056 U	0.032 U	0.00048 U	0.00053 U	0.00054 U	0.00047 U	0.029 UJ	0.00058 U
1,1,2,2-Tetrachloroethane	~	~	~	0.03 U	0.071 U	0.00057 U	0.00071 U	0.00042 U	0.00052 U	0.00056 U	0.00053 U	0.00056 U	0.032 U	0.00048 U	0.00053 U	0.00054 U	0.00047 U	0.029 UJ	0.00058 U
1,1,2-Trichloroethane	~	~	~	0.059 U	0.14 U	0.0011 U	0.0014 U	0.00083 U	0.001 U	0.0011 U	0.0011 U	0.0011 U	0.065 U	0.00096 U	0.0011 U	0.0011 U	0.00095 U	0.059 UJ	0.0012 U
1,1-Dichloroethane	0.27	26	0.27	0.059 U	0.14 U	0.0011 U	0.0014 U	0.00083 U	0.001 U	0.0011 U	0.0011 U	0.0011 U	0.065 U	0.00096 U	0.0011 U	0.0011 U	0.00095 U	0.059 UJ	0.0012 U
1,1-Dichloroethene	0.33	100	0.33	0.059 U	0.14 U	0.0011 U	0.0014 U	0.00083 U	0.001 U	0.0011 U	0.0011 U	0.0011 U	0.065 U	0.00096 U	0.0011 U	0.0011 U	0.00095 U	0.059 UJ	0.0012 U
1,1-Dichloropropene	~	~	~	0.03 U	0.071 U	0.00057 U	0.00071 U	0.00042 U	0.00052 U	0.00056 U	0.00053 U	0.00056 U	0.032 U	0.00048 U	0.00053 U	0.00054 U	0.00047 U	0.029 UJ	0.00058 U
1,2,3-Trichlorobenzene	~	~	~	0.12 U	0.28 U	0.0023 U	0.0028 UJ	0.0017 UJ	0.0021 U	0.0022 U	0.0021 UJ	0.0023 U	0.13 U	0.0019 UJ	0.0021 U	0.0022 UJ	0.0019 UJ	0.12 UJ	0.0023 U
1,2,3-Trichloropropane	~	~	~	0.12 U	0.28 U	0.0023 U	0.0028 U	0.0017 U	0.0021 U	0.0022 U	0.0021 U	0.0023 U	0.13 U	0.0019 U	0.0021 U	0.0022 U	0.0019 U	0.12 UJ	0.0023 U
1,2,4,5-Tetramethylbenzene	~	~	~	0.12 U	0.28 U	0.0017 J	0.0028 U	0.0017 U	0.0021 U	0.0022 U	0.0021 U	0.0023 U	0.02 J	0.0019 U	0.0021 U	0.0024	0.0012 J	0.15 J	0.0023 U
1,2,4-Trichlorobenzene	~	~	~	0.12 U	0.28 U	0.0023 U	0.0028 U	0.0017 U	0.0021 U	0.0022 U	0.0021 U	0.0023 U	0.13 U	0.0019 U	0.0021 U	0.0022 U	0.0019 U	0.12 UJ	0.0023 U
1,2,4-Trimethylbenzene	3.6	52	3.6	0.12 U	0.28 U	0.0023 U	0.0028 U	0.0017 U	0.0021 U	0.0022 U	0.0021 U	0.0023 U	0.48	0.0019 U	0.0021 U	0.0081	0.0018 J	1.7 J	0.0023 U
1,2-Dibromo-3-Chloropropane	~	~	~	0.18 U	0.42 U	0.0034 U	0.0043 UJ	0.0025 UJ	0.0032 U	0.0034 U	0.0032 UJ	0.0034 U	0.19 U	0.0029 UJ	0.0032 U	0.0032 UJ	0.0028 UJ	0.18 UJ	0.0035 U
1,2-Dibromoethane (Ethylene Dibromide)	~	~	~	0.059 U	0.14 U	0.0011 U	0.0014 U	0.00083 U	0.001 U	0.0011 U	0.0011 U	0.0011 U	0.065 U	0.00096 U	0.0011 U	0.0011 U	0.00095 U	0.059 UJ	0.0012 U
1,2-Dichlorobenzene	1.1	100	1.1	0.12 U	0.28 U	0.0023 U	0.0028 U	0.0017 U	0.0021 U	0.0022 U	0.0021 U	0.0023 U	0.13 U	0.0019 U	0.0021 U	0.0022 U	0.0019 U	0.12 UJ	0.0023 U
1,2-Dichloroethane	0.02	3.1	0.02	*0.059* UJ	*0.14* UJ	0.0011 UJ	0.0014 UJ	0.00083 UJ	0.001 U	0.0011 U	0.0011 U	0.0011 U	*0.065* U	0.00096 U	0.0011 U	0.0011 U	0.00095 U	*0.059* UJ	0.0012 U
1,2-Dichloropropane	~	~	~	0.059 U	0.14 U	0.0011 U	0.0014 U	0.00083 U	0.001 U	0.0011 U	0.0011 U	0.0011 U	0.065 U	0.00096 U	0.0011 U	0.0011 U	0.00095 U	0.059 UJ	0.0012 U
1,3,5-Trimethylbenzene (Mesitylene)	8.4	52	8.4	0.12 U	0.28 U	0.0023 U	0.0028 U	0.0017 U	0.0021 U	0.0022 U	0.0021 U	0.0023 U	0.12 J	0.0019 U	0.0021 U	0.0026	0.00071 J	0.53 J	0.0023 U
1,3-Dichlorobenzene	2.4	49	2.4	0.12 U	0.28 U	0.0023 U	0.0028 U	0.0017 U	0.0021 U	0.0022 U	0.0021 U	0.0023 U	0.13 U	0.0019 U	0.0021 U	0.0022 U	0.0019 U	0.12 UJ	0.0023 U
1,3-Dichloropropane	~	~	~	0.12 U	0.28 U	0.0023 U	0.0028 U	0.0017 U	0.0021 U	0.0022 U	0.0021 U	0.0023 U	0.13 U	0.0019 U	0.0021 U	0.0022 U	0.0019 U	0.12 UJ	0.0023 U
1,4-Dichlorobenzene	1.8	13	1.8	0.12 U	0.28 U	0.0023 U	0.0028 U	0.0017 U	0.0021 U	0.0022 U	0.0021 U	0.0023 U	0.13 U	0.0019 U	0.0021 U	0.0022 U	0.0019 U	0.12 UJ	0.0023 U
1,4-Diethyl Benzene	~	~	~	0.12 U	0.28 U	0.00058 J	0.0028 U	0.0017 U	0.0021 U	0.0022 U	0.0021 U	0.0023 U	0.042 J	0.0019 U	0.0021 U	0.0007 J	0.003	0.58 J	0.0023 U
1,4-Dioxane (P-Dioxane)	0.1	13	0.1	*4.7* U	*11* U	0.092 U	*0.11* UJ	0.066 UJ	0.084 U	0.09 U	0.085 UJ	0.09 U	*5.2* U	0.077 UJ	0.085 U	0.086 UJ	0.076 UJ	*4.7* UJ	0.092 U
2,2-Dichloropropane	~	~	~	0.12 UJ	0.28 UJ	0.0023 UJ	0.0028 U	0.0017 U	0.0021 U	0.0022 U	0.0021 U	0.0023 U	0.13 U	0.0019 U	0.0021 U	0.0022 U	0.0019 U	0.12 UJ	0.0023 U
2-Chlorotoluene	~	~	~	0.12 U	0.28 U	0.0023 U	0.0028 U	0.0017 U	0.0021 U	0.0022 U	0.0021 U	0.0023 U	0.13 U	0.0019 U	0.0021 U	0.0022 U	0.0019 U	0.12 UJ	0.0023 U
2-Hexanone	~	~	~	0.59 U	1.4 U	0.011 U	0.014 U	0.0083 U	0.01 U	0.011 U	0.011 U	0.011 U	0.65 U	0.0096 U	0.011 U	0.011 U	0.0095 U	0.59 UJ	0.012 U
4-Chlorotoluene	~	~	~	0.12 U	0.28 U	0.0023 U	0.0028 U	0.0017 U	0.0021 U	0.0022 U	0.0021 U	0.0023 U	0.13 U	0.0019 U	0.0021 U	0.0022 U	0.0019 U	0.12 UJ	0.0023 U
4-Ethyltoluene	~	~	~	0.12 U	0.28 U	0.0023 U	0.0028 U	0.0017 U	0.0021 U	0.0022 U	0.0021 U	0.0023 U	0.23	0.0019 U	0.0021 U	0.005	0.0011 J	0.94 J	0.0023 U
Acetone	0.05	100	0.05	*0.59* UJ	**0.76** J	0.011 UJ	**0.066** J	0.0083 J	0.01 U	0.011 U	0.011 UJ	0.007 J	*0.65* U	0.011 J	0.0091 J	0.011 UJ	0.0095 UJ	*0.59* UJ	0.012 U
Acrylonitrile	~	~	~	0.24 U	0.57 U	0.0046 U	0.0057 U	0.0033 U	0.0042 U	0.0045 U	0.0043 U	0.0045 U	0.26 U	0.0038 U	0.0042 U	0.0043 U	0.0038 U	0.23 UJ	0.0046 U
Benzene	0.06	4.8	0.06	0.03 U	*0.071* U	0.00057 U	0.00071 U	0.00042 U	0.00052 U	0.00056 U	0.00053 U	0.00056 U	0.0002 J	0.00048 U	0.00053 U	0.00054 U	0.00047 U	0.029 UJ	0.00058 U
Bromobenzene	~	~	~	0.12 U	0.28 U	0.0023 U	0.0028 U	0.0017 U	0.0021 U	0.0022 U	0.0021 UJ	0.0023 U	0.13 U	0.0019 UJ	0.0021 U	0.0022 UJ	0.0019 UJ	0.12 UJ	0.0023 U
Bromochloromethane	~	~	~	0.12 U	0.28 U	0.0023 U	0.0028 UJ	0.0017 UJ	0.0021 UJ	0.0022 UJ	0.0021 UJ	0.0023 U	0.13 U	0.0019 UJ	0.0021 UJ	0.0022 UJ	0.0019 UJ	0.12 UJ	0.0023 U
Bromodichloromethane	~	~	~	0.03 UJ	0.071 UJ	0.00057 UJ	0.00071 U	0.00042 U	0.00052 U	0.00056 U	0.00053 U	0.00056 U	0.032 U	0.00048 U	0.00053 U	0.00054 U	0.00047 U	0.029 UJ	0.00058 U
Bromoform	~	~	~	0.24 U	0.57 U	0.0046 U	0.0057 U	0.0033 U	0.0042 U	0.0045 U	0.0043 U	0.0045 U	0.26 U	0.0038 U	0.0042 U	0.0043 U	0.0038 U	0.23 UJ	0.0046 U
Bromomethane	~	~	~	0.12 U	0.28 U	0.0023 U	0.0028 U	0.0017 U	0.0021 UJ	0.0022 UJ	0.0021 U	0.0023 UJ	0.08 J	0.0019 U	0.0021 UJ	0.0022 U	0.0019 U	0.086 J	0.0023 UJ
Carbon Disulfide	~	~	~	0.59 U	1.4 U	0.011 U	0.014 UJ	0.0083 UJ	0.01 U	0.011 U	0.011 UJ	0.011 U	0.65 U	0.0096 UJ	0.011 U	0.011 UJ	0.0095 UJ	0.59 UJ	0.012 U
Carbon Tetrachloride	0.76	2.4	0.76	0.059 UJ	0.14 UJ	0.0011 UJ	0.0014 U	0.00083 U	0.001 U	0.0011 U	0.0011 U	0.0011 U	0.065 U	0.00096 U	0.0011 U	0.0011 U	0.00095 U	0.059 UJ	0.0012 U
Chlorobenzene	1.1	100	1.1	0.03 U	0.071 U	0.00057 U	0.00071 U	0.00042 U	0.00052 U	0.00056 U	0.00053 U	0.00056 U	0.032 U	0.00048 U	0.00053 U	0.00054 U	0.00047 U	0.029 UJ	0.00058 U
Chloroethane	~	~	~	0.12 U	0.28 U	0.0023 U	0.0028 U	0.0017 U	0.0021 UJ	0.0022 UJ	0.0021 U	0.0023 UJ	0.13 UJ	0.0019 U	0.0012 J	0.0022 U	0.0019 U	0.12 UJ	0.0023 UJ
Chloroform	0.37	49	0.37	0.088 U	0.21 U	0.0017 U	0.0021 U	0.0012 U	0.0016 U	0.0017 U	0.0016 U	0.0017 U	0.097 U	0.0014 U	0.0016 U	0.0016 U	0.0014 U	0.088 UJ	0.0017 U
Chloromethane	~	~	~	0.24 UJ	0.57 UJ	0.0046 UJ	0.0057 U	0.0033 U	0.0042 U	0.0045 U	0.0043 U	0.0045 U	0.26 U	0.0038 U	0.0042 U	0.0043 U	0.0038 U	0.23 UJ	0.0046 U
Cis-1,2-Dichloroethene	0.25	100	0.25	0.059 U	0.14 U	0.0011 U	0.0014 U	0.00083 U	0.001 U	0.0011 U	0.0011 U	0.0011 U	0.065 U	0.00096 U	0.0011 U	0.0011 U	0.00095 U	0.059 UJ	0.0012 U
Cis-1,3-Dichloropropene	~	~	~	0.03 U	0.071 U	0.00057 U	0.00071 U	0.00042 U	0.00052 U	0.00056 U	0.00053 U	0.00056 U	0.032 U	0.00048 U	0.00053 U	0.00054 U	0.00047 U	0.029 UJ	0.00058 U
Cymene	~	~	~	0.059 U	0.14 U	0.0011 U	0.0014 U	0.00083 U	0.001 U	0.0011 U	0.0011 U	0.0011 U	0.00083 J	0.00096 U	0.0011 U	0.0011 U	0.00095 U	0.033 J	0.0012 U
Dibromochloromethane	~	~	~	0.059 U	0.14 U	0.0011 U	0.0014 U	0.00083 U	0.001 U	0.0011 U	0.0011 U	0.0011 U	0.065 U	0.00096 U	0.0011 U	0.0011 U	0.00095 U	0.059 UJ	0.0012 U
Dibromomethane	~	~	~	0.12 U	0.28 U	0.0023 U	0.0028 UJ	0.0017 UJ	0.0021 UJ	0.0022 UJ	0.0021 U	0.0023 U	0.13 U	0.0019 U	0.0021 UJ	0.0022 U	0.0019 U	0.12 UJ	0.0023 U
Dichlorodifluoromethane	~	~	~	0.59 UJ	1.4 UJ	0.011 UJ	0.014 U	0.0083 U	0.01 U	0.011 U	0.011 U	0.011 U	0.65 U	0.0096 U	0.011 U	0.011 U	0.0095 U	0.59 UJ	0.012 U
Diethyl Ether (Ethyl Ether)	~	~	~	0.12 U	0.28 U	0.0023 U	0.0028 U	0.0017 U	0.0021 U	0.0022 U	0.0021 UJ	0.0023 U	0.13 U	0.0019 UJ	0.0021 U	0.0022 UJ	0.0019 UJ	0.12 UJ	0.0023 U
Ethylbenzene	1	41	1	0.059 U	0.14 U	0.0011 U	0.0014 U	0.00083 U	0.001 U	0.0011 U	0.0011 U	0.0011 U	0.15	0.001	0.00073 J	0.001 J	0.00034 J	0.048 J	0.0012 U
Hexachlorobutadiene	~	~	~	0.24 U	0.57 U	0.0046 U	0.0057 U	0.0033 U	0.0042 U	0.0045 U	0.0043 U	0.0045 U	0.26 U	0.0038 U	0.0042 U	0.0043 U	0.0038 U	0.23 UJ	0.0046 U
Isopropylbenzene (Cumene)	~	~	~	0.059 U	0.14 U	0.0011 U	0.0014 U	0.00083 U	0.001 U	0.0011 U	0.0011 U	0.0011 U	0.016 J	0.00014 J	0.00082 J	0.00075 J	0.00013 J	0.084 J	0.0012 U
M,P-Xylene	~	~	~	0.12 U	0.28 U	0.0023 U	0.0028 U	0.0017 U	0.0021 U	0.0022 U	0.0021 U	0.0023 U	1.8	0.0019 U	0.0021 U	0.0027	0.0019 U	0.23 J	0.0023 U
Methyl Ethyl Ketone (2-Butanone)	0.12	100	0.12	*0.59* UJ	*1.4* UJ	0.011 UJ	0.014 U	0.0083 UJ	0.01 U	0.011 U	0.011 UJ	0.011 U	*0.65* U	0.0096 UJ	0.011 U	0.011 UJ	0.0095 UJ	*0.59* UJ	0.012 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	~	~	~	0.59 U	1.4 U	0.011 U	0.014 UJ	0.0083 UJ	0.01 U	0.011 U	0.011 UJ	0.011 U	0.65 U	0.0096 UJ	0.011 U	0.011 UJ	0.0095 UJ	0.59 UJ	0.012 U
Methylene Chloride	0.05	100	0.05	*0.3* U	*0.71* U	0.0057 U	0.0071 UJ	0.0042 UJ	0.0052 U	0.0056 U	0.0053 UJ	0.0056 U	*0.32* U	0.0048 UJ	0.0053 U	0.0054 UJ	0.0047 UJ	*0.29* UJ	0.0058 U
Naphthalene	12	100	12	0.24 U	0.57 U	0.0046 U	0.0057 UJ	0.0033 UJ	0.0042 U	0.0045 U	0.0043 UJ	0.0045 U	0.16 J	0.0038 UJ	0.0042 U	0.0043 UJ	0.0038 UJ	0.12 J	0.0046 U
n-Butylbenzene	12	100	12	0.059 U	0.14 U	0.0011 U	0.0014 U	0.00083 U	0.001 U	0.0011 U	0.0011 U	0.0011 U	0.012 J	0.00096 U	0.0011 U	0.0002 J	0.00039 J	0.059 J	0.0012 U
n-Propylbenzene	3.9	100	3.9	0.059 U	0.14 U	0.0011 U	0.0014 U	0.00083 U	0.001 U	0.0011 U	0.0011 U	0.0011 U	0.049 J	0.00016 J	0.00059 J	0.0012	0.0004 J	0.27 J	0.0012 U
o-Xylene (1,2-Dimethylbenzene)	~	~	~	0.059 U	0.14 U	0.0011 U	0.0014 U	0.00083 U	0.001 U	0.0011 U	0.0011 U	0.0011 U	0.021 J	0.00096 U	0.0011 U	0.0011 U	0.00095 U	0.0016 J	0.0012 U
Sec-Butylbenzene	11	100	11	0.059 U	0.14 U	0.0011 U	0.0014 U	0.00083 U	0.001 U	0.0011 U	0.0011 U	0.0011 U	0.0011	0.00096 U	0.0011 U	0.00068 J	0.00034 J	0.038 J	0.0012 U
Styrene	~	~	~	0.059 U	0.14 U	0.0011 U	0.0014 U	0.00083 U	0.001 U	0.0011 U	0.0011 U	0.0011 U	0.065 U	0.00096 U	0.0011 U	0.0011 U	0.00095 U	0.059 UJ	0.0012 U
T-Butylbenzene	5.9	100	5.9	0.12 U	0.28 U	0.0023 U	0.0028 U	0.0017 U	0.0021 U	0.0022 U	0.0021 U	0.0023 U	0.13 U	0.0019 U	0.0021 U	0.0022 U	0.0019 U	0.12 UJ	0.0023 U
Tert-Butyl Methyl Ether	0.93	100	0.93	0.12 U	0.28 U	0.0023 U	0.0028 U	0.0017 U	0.0021 UJ	0.0022 UJ	0.0021 UJ	0.0023 U	0.13 U	0.0019 UJ	0.0021 UJ	0.0022 UJ	0.0019 UJ	0.12 UJ	0.0023 U
Tetrachloroethene (PCE)	1.3	19	1.3	0.03 U	0.071 U	0.00057 U	0.00071 U	0.00042 U	0.00052 U	0.00056 U	0.00053 U	0.00056 U	0.032 U	0.00048 U	0.00053 U	0.00054 U	0.00047 U	0.029 UJ	0.00058 U
Toluene	0.7	100	0.7	0.059 U	0.14 U	0.0011 U	0.0014 U	0.00083 U	0.001 U	0.0011 U	0.0011 U	0.0011 U	0.065 U	0.00096 U	0.0011 U	0.0011 U	0.00095 U	0.059 UJ	0.0012 U
Total 1,2-Dichloroethene (Cis and Trans)	~	~	~	0.059 U	0.14 U	0.0011 U	0.0014 U	0.00083 U	0.001 U	0.0011 U	0.0011 U	0.0011 U	0.065 U	0.00096 U	0.0011 U	0.0011 U	0.00095 U	0.059 UJ	0.0012 U
Total Xylenes	0.26	100	1.6	0.059 U	0.14 U	0.0011 U	0.0014 U	0.00083 U	0.001 U	0.0011 U	0.0011 U	0.0011 U	**1.8** J	0.00096 U	0.0011 U	0.0027	0.00095 U	0.23 J	0.0012 U
Total, 1,3-Dichloropropene (Cis And Trans)	~	~	~	0.03 U	0.071 U	0.00057 U	0.00071 U	0.00042 U	0.00052 U	0.00056 U	0.00053 U	0.00056 U	0.032 U	0.00048 U	0.00053 U	0.00054 U	0.00047 U	0.029 UJ	0.00058 U
Trans-1,2-Dichloroethene	0.19	100	0.19	0.088 U	*0.21* U	0.0017 U	0.0021 U	0.0012 U	0.0016 U	0.0017 U	0.0016 U	0.0017 U	0.097 U	0.0014 U	0.0016 U	0.0016 U	0.0014 U	0.088 UJ	0.0017 U
Trans-1,3-Dichloropropene	~	~	~	0.059 U	0.14 U	0.0011 U	0.0014 U	0.00083 U	0.001 U	0.0011 U	0.0011 U	0.0011 U	0.065 U	0.00096 U	0.0011 U	0.0011 U	0.00095 U	0.059 UJ	0.0012 U
Trans-1,4-Dichloro-2-Butene	~	~	~	0.3 U	0.71 U	0.0057 U	0.0071 U	0.0042 U	0.0052 U	0.0056 U	0.0053 U	0.0056 UJ	0.32 UJ	0.0048 U	0.0053 U	0.0054 U	0.0047 U	0.29 UJ	0.0058 UJ
Trichloroethene (TCE)	0.47	21	0.47	0.03 U	0.071 U	0.00057 U	0.00071 U	0.00042 U	0.00052 UJ	0.00056 UJ	0.00053 U	0.00056 U	0.032 U	0.00048 U	0.00053 UJ	0.00054 U	0.00047 U	0.029 UJ	0.00058 U
Trichlorofluoromethane	~	~	~	0.24 UJ	0.57 UJ	0.0046 UJ	0.0057 U	0.0033 U	0.0042 U	0.0045 U	0.0043 U	0.0045 U	0.26 U	0.0038 U	0.0042 U	0.0043 U	0.0038 U	0.23 UJ	0.0046 U
Vinyl Acetate	~	~	~	0.59 UJ	1.4 UJ	0.011 UJ	0.014 U	0.0083 U	0.01 U	0.011 U	0.011 U	0.011 U	0.65 U	0.0096 U	0.011 U	0.011 U	0.0095 U	0.59 UJ	0.012 U
Vinyl Chloride	0.02	0.9	0.02	*0.059* UJ	*0.14* UJ	0.0011 UJ	0.0014 U	0.00083 U	0.001 U	0.0011 U	0.0011 U	0.0011 U	*0.065* U	0.00096 U	0.0011 U	0.0011 U	0.00095 U	*0.059* UJ	0.0012 U
General Chemistry (%)																			
Total Solids	~	~	~	84.8	55.4	78.9	71	80.9	80.1	80.5	80.2	78.2	79.6	83.3	80.1	80	78.7	83.2 J	79.4

Notes provided on Page 1.
Concentrations above Unrestricted Use SCOs are bolded.
Concentrations above Restricted Use Restricted-Residential SCOs are shaded.
Concentrations above Protection of Groundwater SCOs are red.

Table 3
Track 1 Soil Cleanup Objectives
4650 Broadway
New York, New York
Langan Project No. 170505501
BCP Site No. C231123

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
2-Butanone	0.12
Acetone	0.05
Benzene	0.06
Carbon tetrachloride	0.76
Chlorobenzene	1.1
Chloroform	0.37
cis-1,2-Dichloroethylene	0.25
Ethyl Benzene	1
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
Tetrachloroethylene	1.3
Toluene	0.7
trans-1,2-Dichloroethylene	0.19
Trichloroethylene	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
Chromium, trivalent	30
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. SVOC: semivolatile organic compound
3. VOC: volatile organic compound
4. PCBs: polychlorinated biphenyls
5. mg/kg: milligram per kilogram

Table 4
Track 4 Soil Cleanup Objectives
4650 Broadway
New York, New York
Langan Project No. 170505501
BCP Site No. C231123

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 criteria shown 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 SCOs.
2. VOC: volatile organic compound
3. SVOC: semivolatile organic compound
4. PCBs: polychlorinated biphenyls
5. mg/kg: milligram per kilogram

Table 5
Track 1 Remedial Cost Estimate
4650 Broadway
New York, New York
Langan Project Number. 170505501
BCP Site No. C231123

Item No.	Description of Environmental Item	Quantity		Premium Unit Price		Estimated Premium
REMEDIAL ACTION CONTRACTOR FEES						
1	Remediation Facilities, Mobilization, Demobilization, and Site Maintenance - Remediation and decontamination facilities including trailer, site fencing, truck cleaning facilities, etc.	--		Allowance		$50,000
2	Asbestos Abatement - Accounts for abatment of asbestos-contaning materials, lead based paint, and other universal waste and hazardous wastes; and air monitoring during abatement activities	--		Allowance		$461,000
3	Demolition - Accounts for demolition of existing building	--		Allowance		$1,498,000
4	Management and Handling of Excavated Contaminated Materials - Accounts for excavation of material from hotspots containing concentrations exceeding Unrestricted Use (UU) Soil Cleanup Objectives (SCOs)	6,700	CY	$40	per CY	$268,000
5	Support of Excavation (SOE) - Accounts for SOE installation (soldier piles, lagging, and/or underpinning) to remove soil above UU SCOs.	--		Allowance		$200,000
6	Transport and Disposal of Historic Fill and Native Soil that Exceeds UU SCOs - Includes transport vehicles and disposal of material at a permitted facility.	1,800	Tons	$30	per Ton	$54,000
7	Transport and Disposal of Petroleum-Impacted Historic Fill Material that Exceeds Unrestriced Use Soil Cleanup Objectives - Includes transport vehicles and disposal of material at a permitted facility.	8,250	Tons	$70	per Ton	$577,500
8	Aboveground/Underground Storage Tank (AST/UST) Removal - Cleaning, removal, and disposal of known and potential USTs	--		Allowance		$20,000
9	Remedial Investigation Subcontractors - (Drilling Contractor, Laboratory Contractor, Geophysical Survey, etc.)	--		Allowance		$193,000
10	In-situ Groundwater Treatment Program - Accounts for the mobilization of the remediation contractor, installation of injection points, application of chemicals, chemical product costs, and implementation	--		Allowance		$900,000
11	Dewatering/Fluid Treatment - Accounts for design and installation and for the fees to operate and maintain the dewatering and treatment system.	--		Allowance		$100,000
12	Dust, Odor and Vapor Control - Includes odor, dust, and organic vapor control during remediation of the site. Assumes control measures will include, but not be limited to application of odor suppressant, foam or water.	3	Months	10,000	per Month	$30,000
13	Backfill - Import and placement of clean fill material to bring hotspots and the petroleum-impacted area to development grade. An additional 10% of material is included to account for compaction.	3,700	CY	$40	CY	$148,000
14	Vapor Barrier/Waterproofing Membrane - Accounts for installation of a vapor barrier/waterproofing membrane under the slab and along all subsurface foundation walls	65,000	SF	$13	per SF	$845,000
	REMEDIAL ACTION CONTRACTOR FEES SUBTOTAL					**$5,345,000**
ENGINEERING FEES						
1	Waste Characterization	--		Allowance		$50,000
2	Engineering Support, Construction Administration, and Design Coordination (During Construction)	3	Months	$15,000	per Month	$45,000
3	Community Air Monitoring - This fee includes equipment rental fees associated with implementation of Community Air Monitoring Plan (CAMP), which will be performed during ground-intrusive work including excavation and backfill. Includes remedial oversight.	3	Months	$40,000	per Month	$120,000
4	Engineering Special Inspection of SOE	1	Months	$35,000	per Month	$35,000
5	Remedial Investigation Work Plan (RIWP), Citizen Participation Plan (CPP), Technical Memorandum, Remedial Investigation Report (RIR), Interim Remedial Measure Work Plan (IRMWP), Remedial Action Work Plan (RAWP)	--		Lump Sum		$180,000
6	Citizen Participation Support, NYSDEC Coordination and Meetings	--		Lump Sum		$100,000
7	Post-Remediation Groundwater Treatment - This fee includes installation of post-remediation groundwater monitoring wells and quarterly groundwater monitoring and reporting for two years after product application has been completed.	--		Allowance		$180,000
8	Confirmation Sampling - To confirm source material removal (assumes analysis for VOCs, SVOCs, PCBs, pesticides, cyanide, and metals including hexavalent and trivalent chromium for each sample).	85	Samples	$1,500	per Sample	$127,500
9	Regulatory Agency Required Reporting - Remedial Design, BCP Documentation, and Closure Reporting	--		Allowance		$75,000
	ENGINEERING FEES SUBTOTAL					**$913,000**
	Remediation Contingency (10% of Contractor Fee Subtotal)					**$535,000**
	Total Estimated Fee					**$6,793,000**
	ESTIMATED REMEDIATION FEE - ALTERNATIVE I					**$6.8 MM**

General Assumptions and Conditions:
1. Cost estimate is based on Langan past experience and may be subject to change based on the Contractor's estimates.
2. The density used for conversion from cubic yards (CY) to tons was 1.5 tons per cubic yard.
3. Excavation depths were estimated using Remedial Investigation soil sample results. The site footprint is about 47,175 square feet. The remedial excavation assumes excavation of four 30-foot x 30-foot hotspots to 2 or 9 feet below cellar grade, excavation of the 12,500-square-foot petroleum-impacted area to 12 feet below cellar grade, and a 2:1 shoring to support excavation.
4. This estimate has been prepared for the purposes of comparing potential remedial alternatives. The information in this fee estimate is based on the available information regarding the site investigation and the anticipated scope of the remedial alternative. Changes in fee elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. This fee estimate is expected to be within -30% to +50% of the actual fee. Utilization of this fee estimate information beyond the stated purpose is not recommended. Langan is not licensed to provide financial or legal consulting services; as such, this fee estimate information is not intended to be utilized for complying with financial reporting requirements associated with liability services.
5. Assumes soil remaining in place meets the Track 1 UU SCOs.
6. Estimate excludes legal fees and insurance
7. Assumes duration of construction/remedial oversight will be 3 months. Construction environmental monitoring is required during remedial and construction-related excavation activities.
8. VOC = volatile organic compound; SVOC = semivolatile organic compound; PCBs = polychlorinated biphenyls; BCP = Brownfield Cleanup Program; NYSDEC = New York State Department of Environmental Conservation

Remedial Action Contractor Fee Assumptions:
Item 1 - This item includes mobilization and demobilization of construction equipment and materials necessary to implement the conceptual remediation plane and earthwork, i.e. temporary site fencing, installation of gates, mobilization, monitoring, line and grade, engineered truck wash.
Item 4 - This item includes management and handling of contaminated material. Soil handling includes excavation for off-site disposal.
Item 6 & 7 - The estimated volumes for the differing types of materials are based on the sampling results of Langan's December 2018 Remedial Investigation and March 2021 supplemental soil investigation. We have included an estimate for residual petroleum-impacted soil that may be encountered during excavation within the petroleum-impacted area.
Item 9 - this cost includes contractor fees (driller, laboratory, geophysical survey) and Langan field engineer associated with performing the Remedial Investigation (RI).
Item 10 - This item includes treatment of residual petroleum-impact groundwater across 25% of the site (about 12,500 square feet) through implementation of an injection-type in-situ chemical oxidation (ISCO) program.
Item 11 - This item assumes that localized dewatering will be required to excavate three hotspots and the petroleum-impacted area to 9 and 12 feet below cellar grade, respectively.
Item 12 - This item includes odor, dust, and organic vapor control during the excavation of historic-fill-impacted material, removal of USTs, and earthwork. Assumes control measures will include, but not be limited to application of odor suppressant, foam or water to open excavations and soil loaded into trucks.
Item 13 - Backfill placement and compaction assumes soil handling and management fees for the New York City area. Backfill will not contain concentrations of compounds above Track 1 UU SCOs.

Engineering Fee Assumptions:
Item 1 - This item includes in-situ waste characterization of soil for off-site disposal in accordance with the criteria of most disposal facilities. The waste characterization investigation will assist team in obtaining pre-approval from disposal facilities and understanding disposal costs. Sampling frequency is based on a rate of one sample set per 800 cubic yards. A representative suite (not disposal facility specific) of analyses was assumed.

Item 2 - This item includes environmental engineering support and construction administration i.e, answering contractor questions related to remediation during the bidding process and supporting the current site owner, as necessary, during the bid leveling process, submittal review, responses to Requests for Information (RFI), and coordination with development team and the architect, senior-level direction to field crews, health and safety support (including purchase and maintenance of appropriate personal protective equipment [PPE]), and two construction meetings per month.

Item 3 - This item includes, but is not limited to, implementation of a CAMP as required by the NYSDEC, the presence of an on-site engineer to observe and document the site remediation, remediation health and safety including purchase and maintenance of appropriate personal protective equipment (PPE), and daily field reporting to the NYSDEC.
Item 7 - If existing post-remediation monitoring wells are destroyed or become inaccessible during demolition or construction activities, additional monitoring wells will be installed. This includes installing six groundwater monitoring wells.
Item 8 - This item includes sampling frequency based on total square footage of the site at a rate of one sample per 900 square feet of base, plus Quality Assurance/Quality Control (QA/QC) samples, in accordance with NYSDEC DER-10 requirements. Twenty-eight (28) sidewall samples (4 per hotspot, and 12 along the perimeter of the petroleum-impacted area) are included. Samples will be analyzed for full NYSDEC Part 375 parameters, per- and poly-fluoroalkyl substances (PFAS), and 1,4-dioxane, and reported as Category B deliverables.

Item 9 - This estimate includes the preparation of a Final Engineering Report (FER), data validation and EQuIS submissions (confirmation endpoint data), monthly progress reports (during the post-construction phase), and citizen participation support (i.e., fact sheets and mailings to the site contact list).

Table 6
Track 4 Remedial Cost Estimate
4650 Broadway
New York, New York
Langan Project Number. 170505501
BCP Site No. C231123

Item No.	Description of Environmental Item	Quantity		Premium Unit Price		Estimated Premium
REMEDIAL ACTION CONTRACTOR FEES						
1	Remediation Facilities, Mobilization, Demobilization, and Site Maintenance - Remediation and decontamination facilities including trailer, site fencing, truck cleaning facilities, etc.	--		Allowance		$50,000
2	Asbestos Abatement - Accounts for abatment of asbestos-contaning materials, lead based paint, and other universal waste and hazardous wastes; and air monitoring during abatement activities	--		Allowance		$461,000
3	Demolition - Accounts for demolition of existing building	--		Allowance		$1,498,000
4	Management and Handling of Excavated Contaminated Materials - Accounts for excavation of material from up to 2 feet below cellar grade across the site footprint.	3,500	CY	$40	per CY	$140,000
5	Transport and Disposal of Historic Fill Material - Includes transport vehicles and disposal of material at a permitted facility.	5,250	Tons	$30	per Ton	$157,500
6	Aboveground/Underground Storage Tank (AST/UST) Removal - Cleaning, removal, and disposal of known and potential USTs	--		Allowance		$20,000
7	Remedial Investigation Subcontractors - (Drilling Contractor, Laboratory Contractor, Geophysical Survey, etc.)	--		Allowance		$193,000
8	In-situ Groundwater Treatment Program - Accounts for the mobilization of the remediation contractor, installation of injection points, application of chemicals, chemical product costs, and implementation	--		Allowance		$900,000
9	Dust, Odor and Vapor Control - Includes odor, dust, and organic vapor control during remediation of the site. Assumes control measures will include, but not be limited to application of odor suppressant, foam or water.	1	Months	10,000	per Month	$10,000
10	Site Cap Installation - Equivalent to the import and placement of a 2-foot-thick soil cap across the site footprint.	3,500	CY	$40	CY	$140,000
11	Vapor Barrier/Waterproofing Membrane - Accounts for installation of a vapor barrier/waterproofing membrane under the slab and along all subsurface foundation walls	65,000	SF	$13	per SF	$845,000
	REMEDIAL ACTION CONTRACTOR FEES SUBTOTAL					**$4,414,500**
ENGINEERING FEES						
1	In-situ Petroleum Area Sampling	--		Allowance		$25,000
2	Engineering Support, Construction Administration, and Design Coordination (During Construction)	1	Months	$15,000	per Month	$15,000
3	Community Air Monitoring - This fee includes equipment rental fees associated with implementation of CAMP, which will be performed during ground-intrusive work including excavation and backfill. Includes remedial oversight.	1	Months	$40,000	per Month	$40,000
4	Remedial Investigation Work Plan (RIWP), Citizen Participation Plan (CPP), Technical Memorandum, Remedial Investigation Report (RIR), Interim Remedial Measure Work Plan (IRMWP), Remedial Action Work Plan (RAWP)	--		Lump Sum		$180,000
5	Citizen Participation Support, NYSDEC Coordination and Meetings	--		Lump Sum		$100,000
6	Post-Remediation Groundwater Treatment - This fee includes installation of post-remediation groundwater monitoring wells and quarterly groundwater monitoring and reporting for two years after product application has been completed.	--		Allowance		$180,000
7	Confirmation Sampling - To confirm source material removal (assumes analysis for VOCs, SVOCs, PCBs, pesticides, cyanide, and metals including hexavalent and trivalent chromium for each sample).	56	Samples	$1,500	per Sample	$84,000
8	Regulatory Agency Required Reporting - Remedial Design, BCP Documentation, and Closure Reporting	--		Allowance		$100,000
	ENGINEERING FEES SUBTOTAL					**$724,000**
	Remediation Contingency (10% of Contractor Fee Subtotal)					**$442,000**
	Total Estimated Fee					**$5,581,000**
	ESTIMATED REMEDIATION FEE - ALTERNATIVE II					**$5.6 MM**

General Assumptions and Conditions:
1. Cost estimate is based on Langan past experience and may be subject to change based on the Contractor's estimates.
2. The density used for conversion from cubic yards (CY) to tons was 1.5 tons per cubic yard.
3. Excavation depths were estimated using Remedial Investigation soil sample results. The remedial excavation assumes excavation up to 2 feet below cellar grade across the site footprint (47,175 square feet).
4. This estimate has been prepared for the purposes of comparing potential remedial alternatives. The information in this fee estimate is based on the available information regarding the site investigation and the anticipated scope of the remedial alternative. Changes in fee elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. This fee estimate is expected to be within -30% to +50% of the actual fee. Utilization of this fee estimate information beyond the stated purpose is not recommended. Langan is not licensed to provide financial or legal consulting services; as such, this fee estimate information is not intended to be utilized for complying with financial reporting requirements associated with liability services.
5. Assumes all soil in the upper 2 feet and any soil above the groundwater table which exceeds the Protection of Groundwater (PGW) Soil Cleanup Objectives (SCOs) for contaminants of concern in groundwater will be removed as part of the remedy.
6. Estimate excludes legal fees and insurance
7. Assumes duration of construction/remedial oversight will be 1 month. Construction environmental monitoring is required during remedial and construction-related excavation activities.
8. VOC = volatile organic compound; SVOC = semivolatile organic compound; PCBs = polychlorinated biphenyls; BCP = Brownfield Cleanup Program; NYSDEC = New York State Department of Environmental Conservation

Remedial Action Contractor Fee Assumptions:
Item 1 - This item includes mobilization and demobilization of construction equipment and materials necessary to implement the conceptual remediation plane and earthwork, i.e. temporary site fencing, installation of gates, mobilization, monitoring, line and grade, engineered truck wash.
Item 4 - This item includes management and handling of contaminated material. Soil handling includes excavation for off-site disposal. Two feet below the cellar grade will be excavated across the site footprint (3,500 CY). Residual petroleum-impacted soil deeper than 2 feet below cellar grade will remain in place.
Item 7 - this cost includes contractor fees (driller, laboratory, geophysical survey) and Langan field engineer associated with performing the Remedial Investigation (RI).
Item 8 - This item includes treatment of residual petroleum-impact groundwater across 23% of the site (about 12,500 square feet) through implementation of an injection-type in-situ chemical oxidation (ISCO) program.
Item 9 - This item includes odor, dust, and organic vapor control during the excavation of historic-fill-impacted material, removal of USTs, and earthwork. Assumes control measures will include, but not be limited to application of odor suppressant, foam or water to open excavations and soil loaded into trucks.

Engineering Fee Assumptions:
Item 1 - This item includes an in-situ soil investigation within the petroleum-impacted area to assess the effectivness of the groundwater treatment program in reducing soil impacts.
Item 2 - This item includes environmental engineering support and construction administration i.e, answering contractor questions related to remediation during the bidding process and supporting the current site owner, as necessary, during the bid leveling process, submittal review, responses to Requests for Information (RFI), and coordination with development team and the architect, senior-level direction to field crews, health and safety support (including purchase and maintenance of appropriate personal protective equipment [PPE]), and two construction meetings per month.
Item 3 - This item includes, but is not limited to, implementation of a CAMP as required by the NYSDEC, the presence of an on-site engineer to observe and document the site remediation, remediation health and safety including purchase and maintenance of appropriate personal protective equipment (PPE), and daily field reporting to the NYSDEC.
Item 6 - If existing post-remediation monitoring wells are destroyed or become inaccessible during demolition or construction activities, additional monitoring wells will be installed. This includes installing six groundwater monitoring wells.
Item 7 - This item includes sampling frequency based on total square footage of the site at a rate of one sample per 900 square feet of base, plus Quality Assurance/Quality Control (QA/QC) samples, in accordance with NYSDEC DER-10 requirements. Samples will be analyzed for full NYSDEC Part 375 parameters, per- and poly-fluoroalkyl substances (PFAS), and 1,4-dioxane, and reported as Category B deliverables.
Item 8 - This estimate includes the preparation of a Final Engineering Report (FER), data validation and EQuIS submissions (confirmation endpoint data), monthly progress reports (during the post-construction phase), and citizen participation support (i.e., fact sheets and mailings to the site contact list).

APPENDIX A

BOUNDARY SURVEY

REFERENCES:

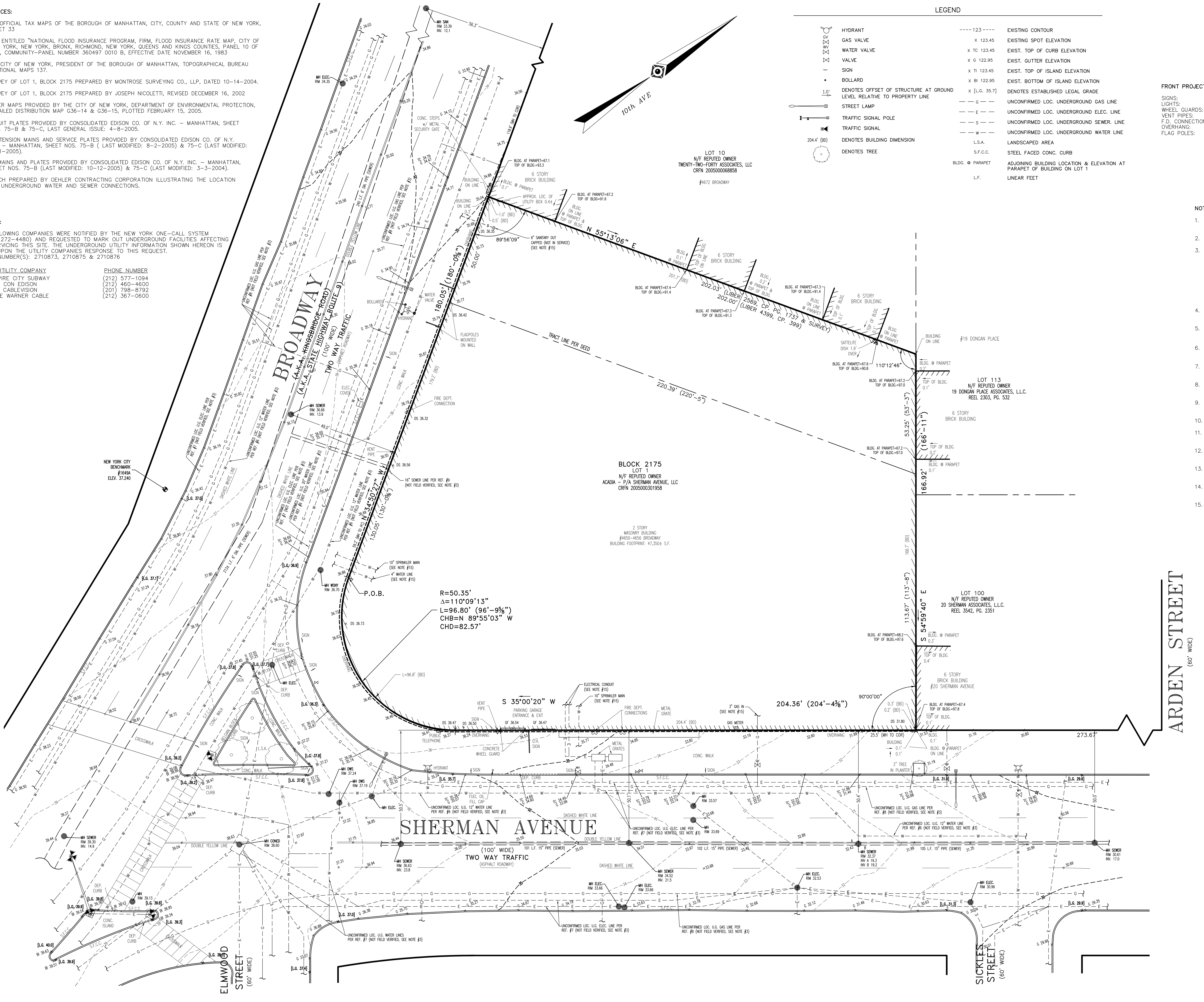
1. THE OFFICIAL TAX MAPS OF THE BOROUGH OF MANHATTAN, CITY, COUNTY AND STATE OF NEW YORK, SHEET 33
2. MAP ENTITLED "NATIONAL FLOOD INSURANCE PROGRAM, FIRM, FLOOD INSURANCE RATE MAP, CITY OF NEW YORK, NEW YORK, BRONX, RICHMOND, NEW YORK, QUEENS AND KINGS COUNTIES, PANEL 10 OF 131", COMMUNITY-PANEL NUMBER 360497 0010 B, EFFECTIVE DATE NOVEMBER 16, 1983
3. THE CITY OF NEW YORK, PRESIDENT OF THE BOROUGH OF MANHATTAN, TOPOGRAPHICAL BUREAU SECTIONAL MAPS 137.
4. SURVEY OF LOT 1, BLOCK 2175 PREPARED BY MONTROSE SURVEYING CO., LLP, DATED 10-14-2004.
5. SURVEY OF LOT 1, BLOCK 2175 PREPARED BY JOSEPH NICOLETTI, REVISED DECEMBER 16, 2002
6. WATER MAPS PROVIDED BY THE CITY OF NEW YORK, DEPARTMENT OF ENVIRONMENTAL PROTECTION, DETAILED DISTRIBUTION MAP G36-14 & G36-15, PLOTTED FEBRUARY 15, 2005.
7. CONDUIT PLATES PROVIDED BY CONSOLIDATED EDISON CO. OF N.Y. INC. – MANHATTAN, SHEET NOS. 75-B & 75-C, LAST GENERAL ISSUE: 4-8-2005.

   LOW TENSION MAINS AND SERVICE PLATES PROVIDED BY CONSOLIDATED EDISON CO. OF N.Y. INC. – MANHATTAN, SHEET NOS. 75-B (LAST MODIFIED: 8-2-2005) & 75-C (LAST MODIFIED: 5-11-2005).
8. GAS MAINS AND PLATES PROVIDED BY CONSOLIDATED EDISON CO. OF N.Y. INC. – MANHATTAN, SHEET NOS. 75-B (LAST MODIFIED: 10-12-2005) & 75-C (LAST MODIFIED: 3-3-2004).
9. SKETCH PREPARED BY OEHLER CONTRACTING CORPORATION ILLUSTRATING THE LOCATION OF UNDERGROUND WATER AND SEWER CONNECTIONS.

UTILITIES:

THE FOLLOWING COMPANIES WERE NOTIFIED BY THE NEW YORK ONE-CALL SYSTEM (1-800-272-4480) AND REQUESTED TO MARK OUT UNDERGROUND FACILITIES AFFECTING AND SERVICING THIS SITE. THE UNDERGROUND UTILITY INFORMATION SHOWN HEREON IS BASED UPON THE UTILITY COMPANIES RESPONSE TO THIS REQUEST.
SERIAL NUMBER(S): 2710873, 2710875 & 2710876

UTILITY COMPANY	PHONE NUMBER
EMPIRE CITY SUBWAY	(212) 577-1094
CON EDISON	(212) 460-4600
CABLEVISION	(201) 798-8792
TIME WARNER CABLE	(212) 367-0600

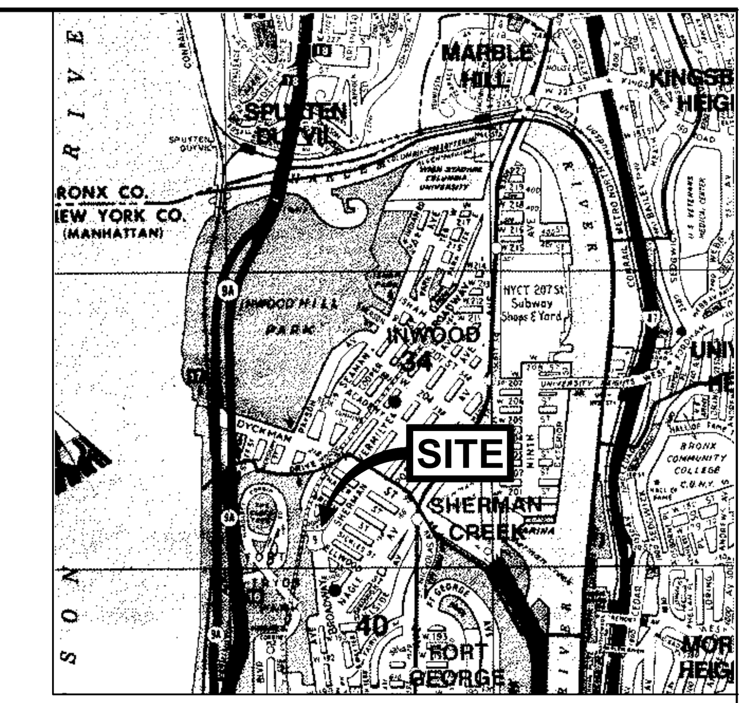


LEGEND

Symbol	Description	Symbol	Description
	HYDRANT	----123----	EXISTING CONTOUR
GV	GAS VALVE	X 123.45	EXISTING SPOT ELEVATION
WV	WATER VALVE	X TC 123.45	EXIST. TOP OF CURB ELEVATION
	VALVE	X G 122.95	EXIST. GUTTER ELEVATION
	SIGN	X TI 123.45	EXIST. TOP OF ISLAND ELEVATION
	BOLLARD	X BI 122.95	EXIST. BOTTOM OF ISLAND ELEVATION
1.0'	DENOTES OFFSET OF STRUCTURE AT GROUND LEVEL RELATIVE TO PROPERTY LINE	X [L.G. 35.7]	DENOTES ESTABLISHED LEGAL GRADE
	STREET LAMP	— — G — —	UNCONFIRMED LOC. UNDERGROUND GAS LINE
	TRAFFIC SIGNAL POLE	— — E — —	UNCONFIRMED LOC. UNDERGROUND ELEC. LINE
	TRAFFIC SIGNAL	— — S — —	UNCONFIRMED LOC. UNDERGROUND SEWER. LINE
204.4' (BD)	DENOTES BUILDING DIMENSION	— — W — —	UNCONFIRMED LOC. UNDERGROUND WATER LINE
	DENOTES TREE	L.S.A.	LANDSCAPED AREA
		S.F.C.C.	STEEL FACED CONC. CURB
		BLDG. @ PARAPET	ADJOINING BUILDING LOCATION & ELEVATION AT PARAPET OF BUILDING ON LOT 1
		L.F.	LINEAR FEET

FRONT PROJECTIONS:

SIGNS:	UP TO 10'±
LIGHTS:	UP TO 1.7'±
WHEEL GUARDS:	UP TO 0.6'±
VENT PIPES:	UP TO 0.8'±
F.D. CONNECTIONS:	UP TO 0.8'±
OVERHANG:	UP TO 1.0'±
FLAG POLES:	UP TO 6.9'±



VICINITY MAP

NOTES:

1. PROPERTY KNOWN AS LOT 1, BLOCK 2175 AS SHOWN ON THE OFFICIAL TAX MAPS OF THE BOROUGH OF MANHATTAN, CITY, COUNTY AND STATE OF NEW YORK.
2. AREA = 47,354 S.F. OR 1.087 AC.
3. LOCATION OF UNDERGROUND UTILITIES ARE APPROXIMATE. ALL LOCATIONS AND SIZES ARE BASED ON UTILITY MARK-OUTS, ABOVE GROUND STRUCTURES THAT WERE VISIBLE & ACCESSIBLE IN THE FIELD, AND THE MAPS AS LISTED IN THE REFERENCES AVAILABLE AT THE TIME OF THE SURVEY. AVAILABLE ASBUILT PLANS AND UTILITY MARKOUT DOES NOT ENSURE MAPPING OF ALL UNDERGROUND UTILITIES AND STRUCTURES. BEFORE ANY EXCAVATION IS TO BEGIN, ALL UNDERGROUND UTILITIES SHOULD BE VERIFIED AS TO THEIR LOCATION, SIZE AND TYPE BY THE PROPER UTILITY COMPANIES. CONTROL POINT ASSOCIATES, INC. DOES NOT GUARANTEE THE UTILITIES SHOWN COMPRISE ALL SUCH UTILITIES IN THE AREA EITHER IN SERVICE OR ABANDONED.
4. THIS PLAN IS BASED ON INFORMATION PROVIDED BY A SURVEY PREPARED IN THE FIELD BY CONTROL POINT ASSOCIATES, INC. AND OTHER REFERENCE MATERIAL AS LISTED HEREON.
5. THIS SURVEY WAS PREPARED WITHOUT THE BENEFIT OF A TITLE REPORT AND IS SUBJECT TO THE RESTRICTIONS, COVENANTS AND/OR EASEMENTS THAT MAY BE CONTAINED THEREIN.
6. BY GRAPHIC PLOTTING ONLY PROPERTY IS LOCATED IN FLOOD HAZARD ZONE C (AREAS OF MINIMAL FLOODING) PER REF. #2
7. THE EXISTENCE OF UNDERGROUND STORAGE TANKS, IF ANY, WAS NOT KNOWN AT THE TIME OF THE FIELD SURVEY.
8. THERE WERE NO NATURAL STREAMS OR WATERCOURSES VISIBLE AT THE TIME OF THE FIELD SURVEY.
9. THE OFFSETS SHOWN ARE NOT TO BE USED FOR THE CONSTRUCTION OF ANY STRUCTURE, FENCE, PERMANENT ADDITION, ETC.
10. ENCROACHMENTS AND VAULTS, IF ANY, BELOW SURFACE NOT SHOWN HEREON
11. SANITARY SEWER PIPE LENGTHS ARE MEASURED FROM CENTER OF MANHOLE TO CENTER OF MANHOLE.
12. THERE WERE NO NATURAL STREAMS OR WATERCOURSES VISIBLE AT THE TIME OF THE FIELD SURVEY.
13. ELEVATIONS ARE BASED UPON BOROUGH OF MANHATTAN HIGHWAY DATUM, REPUTED TO BE 2.750 FEET ABOVE MEAN SEA LEVEL AT SANDY HOOK, REF. BM # 1649A, ELEV.=37.240.
14. FEATURES ALONG AND IN BROADWAY AND SHERMAN AVENUE ARE PER FIELD LOCATIONS ON 9-31-2005 AND HAVE NOT BEEN FIELD VERIFIED.
15. UTILITIY SERVICES ENTERING BUILDING ARE PER FIELD LOCATION PERFORMED AT PARKING GARAGE LEVEL ON 4-30-2008.

GRAPHIC SCALE

20 0 10 20 40 80

(IN FEET)
1 inch = 20 ft.

No.	DESCRIPTION OF REVISION	DRAWN:	APPROVED:	DATE
4	REVISED TO ADD SEWER CONNECTION & REF. #9	G.J.S.	G.S.G.	2-12-09
3	REVISED TO SHOW SEWER INVERTS & DIMENSIONS	J.I.L.	G.S.G.	8-6-08
2	REVISE TO ADD ADJOINING BUILDING ELEVATIONS & UTILITIY SERVICES IN BUILDING	G.M.	G.S.G.	5-7-08
1	REVISED PER RECEIPT OF GAS & ELECTRIC UTILITY MAPPING	E.C.R.	G.S.G.	11-9-05

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

ONLY COPIES FROM THE ORIGINAL OF THIS SURVEY MARKED WITH AN ORIGINAL OF THE LAND SURVEYOR'S EMBOSSED SEAL SHALL BE CONSIDERED TO BE VALID TRUE COPIES.

NOT A VALID ORIGINAL DOCUMENT UNLESS EMBOSSED WITH RAISED IMPRESSION OR BLUE INK SEAL

2-12-2009
DATE

GREGORY S. GALLAS
NEW YORK PROFESSIONAL LAND SURVEYOR #50124

FIELD DATE: 2-01-05, 8-26-05, 9-31-05, 4-30-08
FIELD BOOK NO.: 04-26, 05-30, 08-04
FIELD BOOK PG.: 61-62, 34, 136

BOUNDARY & TOPOGRAPHIC SURVEY
ACADIA-P/A SHERMAN AVENUE, LLC
4650-4656 BROADWAY @ SHERMAN AVENUE
LOT 1, BLOCK 2175
BOROUGH OF MANHATTAN
CITY, COUNTY & STATE OF NEW YORK

DRAWN: R.W.T.
REVIEWED: E.C.R.

CONTROL POINT ASSOCIATES, INC.
35 TECHNOLOGY DRIVE
WARREN, NJ 07059
908.668.0099 - 908.668.9595 FAX
NEW BRITAIN CORPORATE CENTER
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APPROVED:	DATE	SCALE	FILE NO.	DWG. NO.
G.S.G.	10-14-2005	1"=20'	C05018C	1 OF 1

APPENDIX B

PROPOSED REDEVELOPMENT PLANS

(submitted under separate cover)

APPENDIX C

PREVIOUS ENVIRONMENTAL REPORTS AND WORK PLANS

(submitted under separate cover)

APPENDIX D

SUPPLEMENTAL SOIL INVESTIGATION DOCUMENTS

(laboratory reports submitted under separate cover)

LANGAN
ENGINEERING & ENVIRONMENTAL SERVICES

Technical Memorandum

989 Lenox Drive Lawrenceville, NJ 08648 T: 609.282.8000
Mailing Address: 989 Lenox Drive Lawrenceville, NJ 08648

To: Lamees Esmail, Langan Senior Staff Engineer

From: Joe Conboy, Langan Staff Chemist

Date: April 9, 2021

Re: Data Usability Summary Report
For 4650 Broadway
March 2021 Soil Samples
Langan Project No.: 170505504

This memorandum presents the findings of an analytical data validation of the data generated from the analysis of soil samples collected in March 2021 by Langan Engineering and Environmental Services ("Langan") at the 4650 Broadway site ("the site"). The samples were analyzed by Alpha Analytical Laboratories, Inc. (NYSDOH NELAP registration # 11148) for volatile organic compounds (VOCs), and total solids (%S) by the methods specified below.

- VOCs by SW-846 Method 8260C
- Total Solids by Standard Method 2540G

Table 1, attached, summarizes the laboratory and client sample identification numbers, sample collection dates, and analytical parameters subject to review.

Validation Overview

This data validation was performed in accordance with USEPA Region II Standard Operating Procedure (SOP) #HW-34A, "Trace Volatile Data Validation" (September 2016, Revision 1), USEPA Region II SOP #HW-33A, "Low/Medium Volatile Data Validation" (September 2016, Revision 1), the USEPA Contract Laboratory Program "National Functional Guidelines for Organic Superfund Methods Data Review" (EPA-540-R-2017-002, January 2017), and the specifics of the methods employed.

Validation includes review of the analytical data to verify that data are easily traceable and sufficiently complete to permit logical reconstruction by a qualified individual other than the originator. Items subject to review in this memorandum include holding times, sample preservation, instrument tuning, instrument calibration, laboratory blanks, laboratory control samples, system monitoring compounds, internal standard area counts, matrix spike/spike duplicate recoveries, target compound identification and quantification, chromatograms, overall system performance, trip blank and field blank sample results.

As a result of the review process, the following qualifiers may be assigned to the data in accordance with the USEPA's guidelines and best professional judgment:

- **R –** The sample results are unusable due to the quality of the data generated because certain criteria were not met. The analyte may or may not be present in the sample.
- **J –** The analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample.
- **UJ –** The analyte was not detected at a level greater than or equal to the reporting limit (RL); however, the reported RL is approximate and may be inaccurate or imprecise.
- **U –** The analyte was analyzed for, but was not detected at a level greater than or equal to the level of the RL or the sample concentration for results impacted by blank contamination.
- **NJ –** The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.

If any validation qualifiers are assigned these qualifiers should supersede any laboratory-applied qualifiers. Data that is not qualified as a result of this data validation is considered acceptable on the basis of the items specified for review. Data that is qualified as "R" are not sufficiently valid and technically supportable to be used for data interpretation. Data that is otherwise qualified due to minor data quality anomalies are usable, as qualified in Table 2 (attached).

MAJOR DEFICIENCIES:

Major deficiencies include those that grossly impact data quality and necessitate the rejection of results. No major deficiencies were identified.

MINOR DEFICIENCIES:

Minor deficiencies include anomalies that directly impact data quality and necessitate qualification, but do not result in unusable data. The section below describes the minor deficiencies that were identified.

VOCs by SW-846 Method 8260C

<u>L2114202</u>

The continuing calibration verification (CCV) analyzed on 3/24/2021 at 16:58 exhibited percent differences (%Ds) above the control limit for bromomethane (-73.8%), chloroethane (-32.3%), methyl tert butyl ether (21.7%), bromochloromethane (23.9%), and dibromomethane (21.1%). This CCV also exhibited a response factor (RF) below the control limit for trichloroethene (0.194). The associated results in samples TZ10_8-9, TZ04_8-9, and TZ05_7.5-8 are qualified as "UJ" based on potential indeterminate bias.

L2114515

The method blank (MB) for batch WG1479166 exhibited a detection of 2-butanone (2.5 ug/kg). The associated result in sample TZ03_5-6 is qualified as "U" at the reporting limit based on potential blank contamination.

The initial calibration (ICAL) for instrument VOA123 exhibited RFs below the control limit for acetone (0.066) and 1,4-dioxane (0.002). The associated results in samples TZ03_8-9 and TZ03_5-6 are qualified as "J" or "UJ" based on potential indeterminate bias.

The ICV analyzed on 2/23/2021 at 19:50 exhibited a %D above the control limit for carbon disulfide (-21.1%). This ICV also exhibited RFs below the control limit for 1,4-dioxane (0.00218) and acetone (0.066). The associated results in samples TZ03_8-9 and TZ03_5-6 are qualified as "UJ" based on potential indeterminate bias.

The CCV analyzed on 3/25/2021 at 16:22 exhibited %Ds above the control limit for methylene chloride (21.1%), bromochloromethane (21.3%), 2-butanone (21.9%), 1,2-dichloroethane (20.4%), dibromomethane (20.8%), 1,2-dibromo-3-chloropropane (23.6%), naphthalene (21.5%), and 1,2,3-trichlorobenzene (20.4%). This CCV also exhibited RFs below the control limit for acetone (0.06), 2-butanone (0.089), 1,4-dioxane (0.002), and 4-methyl-2-pentanone (0.099). The associated results in samples TZ03_8-9 and TZ03_5-6 are qualified as "UJ" based on potential indeterminate bias.

L2114864

The ICAL for instrument VOA100 exhibited a RF below the control limit for 2-butanone (0.087). The associated results in samples TZ02_5-6, TZ02_8-9, and TZ01_8-9 are qualified as "UJ" based on potential indeterminate bias.

The CCV analyzed on 3/29/2021 at 05:31 exhibited %Ds above the control limit for dichlorodifluoromethane (-61%), chloromethane (-36.4%), vinyl chloride (-23.7%), trichlorofluoromethane (-25.7%), acetone (-26.6%), carbon tetrachloride (-27.4%), 1,1,1-trichloroethane (-22.5%), 1,2-dichloroethane (-25.1%), bromodichloromethane (-21%), vinyl acetate (-27%), and 2,2-dichloropropane (-24.3%). This CCV also exhibited an RF below the control limit for 2-butanone (0.091). The associated results in samples TZ02_5-6, TZ02_8-9, and TZ01_8-9 are qualified as "J" or "UJ" based on potential indeterminate bias.

<u>L2115126</u>

Sample TZ13_8-9 exhibited percent recovery above the upper control limit (UCL) for the surrogate 4-bromofluorobenzene (299%) and below the lower control limit (LCL) for the surrogate dibromofluoromethane (56%). The associated results are qualified as "J" and "UJ" based on potential bias.

The ICAL for instrument VOA123 exhibited RFs below the control limit for acetone (0.066) and 1,4-dioxane (0.002). The associated results in samples TZ06_8-9, TZ09_8-9, TZ11_8-9, TZ12_8-9, and TZ13_8-9 are qualified as "J" or "UJ" based on potential indeterminate bias.

The ICV analyzed on 2/23/2021 at 19:50 exhibited a %D above the control limit for carbon disulfide (-21.2%) and RFs below the control limit for 1,4-dioxane (0.00218) and acetone (0.066). The associated results in samples TZ06_8-9, TZ09_8-9, TZ11_8-9, TZ12_8-9, and TZ13_8-9 are qualified as "UJ" based on potential indeterminate bias.

The ICV analyzed on 3/15/2021 at 00:55 exhibited a %D above the control limit for bromomethane (-53.7%). The associated results in samples TZ07_8-9, TZ08_8-9, TZ13_8-9, and TZ14_8-9 are qualified as "UJ" based on potential indeterminate bias.

The CCV analyzed on 3/27/2021 at 07:17 exhibited %Ds above the control limit for methylene chloride (22.1%), bromochloromethane (21.3%), 2-butanone (22.8%), bromobenzene (21.8%), 1,2-dibromo-3-chloropropane (23.6%), naphthalene (25.4%), 1,2,3-trichlorobenzene (20.1%), ethyl ether (21.4%), and methyl tert butyl ether (21.1%). This CCV also exhibited RFs below the control limit for acetone (0.058), 2-butanone (0.088), 1,4-dioxane (0.00211), and 4-methyl-2-pentanone (0.095). The associated results in samples TZ06_8-9, TZ09_8-9, TZ11_8-9, TZ12_8-9, and TZ13_8-9 are qualified as "UJ" based on potential indeterminate bias.

The CCV analyzed on 3/29/2021 at 05:55 exhibited %Ds above the control limit for bromomethane (-48.8%), chloroethane (-21%), and trans-1,4-dichloro-2-butene (28.3%). The associated results in samples TZ07_8-9, TZ08_8-9, TZ13_8-9, and TZ14_8-9 are qualified as "UJ" based on potential indeterminate bias.

OTHER DEFICIENCIES:

Other deficiencies include anomalies that do not directly impact data quality and do not necessitate qualification. The section below describes the other deficiencies that were identified.

VOCs by SW-846 Method 8260C

L2114202

The laboratory control sample/laboratory control sample duplicate (LCS/LCSD) for batch WG1478585 exhibited a percent recovery above the UCL for bromoform (174%, 166%). The associated results are non-detections. No qualification is necessary.

The MB for batch WG1478585 exhibited a detection of bromoform (1.6 ug/kg). The associated results are non-detections. No qualification is necessary.

L2114515

The MB for batch WG1479166 exhibited a detection of bromomethane (1.4 ug/kg). The associated results in sample TZ03_8-9 are non-detections. No qualification is necessary.

L2114864

The LCS for batch WG1479986 exhibited percent recoveries above the UCL for chloromethane (136%) and dichlorodifluoromethane (161%). The associated results are non-detections. No qualification is necessary.

L2115126

The LCS for batch WG1479964 exhibited a percent recovery above the UCL for bromomethane (149%). The associated results are non-detections. No qualification is necessary.

The LCS for batch WG1479972 exhibited a percent recovery above the UCL for bromomethane (149%). The associated results are non-detections. No qualification is necessary.

The MB for batch WG1479868 exhibited a detection of bromomethane (1.1 ug/kg). The associated results are non-detections. No qualification is necessary.

The MB for batch WG1479964 exhibited a detection of bromomethane (1.8 ug/kg). The associated results are non-detections. No qualification is necessary.

CONCLUSION:

On the basis of this evaluation, the laboratory appears to have followed the specified analytical methods with the exception of errors discussed above. If a given fraction is not mentioned above, that means that all specified criteria were met for that parameter. All of the data packages met ASP Category B requirements.

All data are considered usable, as qualified. In addition, completeness, defined as the percentage of analytical results that are judged to be valid, is 100%.

Signed:

Joe Conboy
Staff Chemist

LANGAN

Log of Boring **TZ01** Sheet 1 of 1

Project: 4650 Broadway	Project No.: 170505501
Location: New York, NY	Elevation and Datum: Approx. el 26 (NAVD 88)
Drilling Company: AARCO Environmental Services Corp.	Date Started: 3/24/21; Date Finished: 3/24/21
Drilling Equipment: Geoprobe 6610 DT	Completion Depth: 9 ft; Rock Depth: NA
Size and Type of Bit: 2-inch diameter Direct Push	Number of Samples: Disturbed 3; Undisturbed NA; Core NA
Casing Diameter (in): NA; Casing Depth (ft): NA	Water Level (ft.): First 4; Completion NA; 24 HR. NA
Casing Hammer: NA; Weight (lbs): NA; Drop (in): NA	Drilling Foreman: Charles Blumberg
Sampler: 2-inch diameter by 4-foot long acetete liner	Field Engineer: Andrew Nesci
Sampler Hammer: NA; Weight (lbs): NA; Drop (in): NA	

Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	PID Reading (ppm)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
R1A (0-6") Concrete R1B (6-30") Dark brown fine SAND, trace silt (moist)[FILL]	0–4	R-1	Macrocore	30/48		0.0 0.0 0.0 0.0 0.0	
R2A (0-18") Dark brown to brown fine SAND, trace silt (wet)[FILL] R2B (18-36") Dark gray fine SAND, trace silt (wet)[SP]	4–8	R-2	Macrocore	36/48		0.0 0.0 0.0 0.0 0.0 0.0	
R3 (0-12") Gray fine SAND, trace silt (wet)[SP]	8–9	R-3	Macrocore	12/12		0.0 0.0	Collect TZ01_8-9 Bottom of boring at 9 feet bgs. Borehole backfilled with clean soil cuttings and finished with concrete patch

Depth Scale: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

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Log of Boring **WC-12/TZ02** Sheet 1 of 1

Project: 4650 Broadway		Project No.: 170505501	
Location: New York, NY		Elevation and Datum: Approx. el 26 (NAVD 88)	
Drilling Company: AARCO Environmental Services Corp.		Date Started: 3/24/21	Date Finished: 3/24/21
Drilling Equipment: Geoprobe 6610 DT		Completion Depth: 9 ft	Rock Depth: NA
Size and Type of Bit: 2-inch diameter Direct Push		Number of Samples: Disturbed 3; Undisturbed NA; Core NA	
Casing Diameter (in): NA	Casing Depth (ft): NA	Water Level (ft.): First 4.5; Completion NA; 24 HR. NA	
Casing Hammer: NA; Weight (lbs): NA; Drop (in): NA		Drilling Foreman: Charles Blumberg	
Sampler: 2-inch diameter by 4-foot long acetete liner		Field Engineer: Andrew Nesci	
Sampler Hammer: NA; Weight (lbs): NA; Drop (in): NA			

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	PID Reading (ppm)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
		R1A (0-6") Concrete	0						
		R1B (6-24") Orangish brown fine SAND, trace silt (moist)[FILL]	0-2	R-1	Macrocore	36		0.0, 0.0, 0.0	Collect WC-12_1-2
		R1C (24-36") Brown fine SAND, trace silt (wet)[SP]	2-4					0.0, 0.0, 0.0	
		R2A (0-6") Dark brown fine SAND, trace silt (wet)[SP]	4-8	R-2	Macrocore	24		0.0	Collect TZ02_5-6; Petroleum-like staining and odors observed between 5.5 and 6 feet
		R2B (6-24") Gray fine SAND, some silt (wet)[SP]						0.0, 0.0, 0.0	
		R3 (0-12") Olive gray fine SAND, trace silt (wet)[SP]	8-9	R-3	Macrocore	12		0.0, 0.0	Collect TZ02_8-9
			9						Bottom of boring at 9 feet bgs. Borehole backfilled with clean soil cuttings and finished with concrete patch

Depth scale: 0–20 ft. Water level symbol at 4.5 ft.

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Log of Boring **WC-15/TZ03** Sheet 1 of 1

Project: 4650 Broadway		Project No.: 170505501	
Location: New York, NY		Elevation and Datum: Approx. el 26 (NAVD 88)	
Drilling Company: AARCO Environmental Services Corp.		Date Started: 3/23/21	Date Finished: 3/23/21
Drilling Equipment: Geoprobe 6610 DT		Completion Depth: 9 ft	Rock Depth: NA
Size and Type of Bit: 2-inch diameter Direct Push		Number of Samples: Disturbed 3; Undisturbed NA; Core NA	
Casing Diameter (in): NA	Casing Depth (ft): NA	Water Level (ft.): First 4.5; Completion NA; 24 HR. NA	
Casing Hammer: NA; Weight (lbs): NA; Drop (in): NA		Drilling Foreman: Charles Blumberg	
Sampler: 2-inch diameter by 4-foot long acetete liner		Field Engineer: Andrew Nesci	
Sampler Hammer: NA; Weight (lbs): NA; Drop (in): NA			

Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	PID Reading (ppm)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	R1A (0-6") Concrete	0	R-1	Macrocore	28/48		0.0	
	R1B (6-28") Dark brown fine SAND, trace silt (moist)[SP]	0–4					0.0, 0.0, 0.0, 0.0, 0.0	Collect WC-15_1-2
	R2A (0-16") Brown fine SAND, some silt (wet)[SP-SM]	4–8	R-2	Macrocore	42/48		0.0, 0.1, 0.8	Petroleum-like staining and odors observed between 5 and 6 feet. Collect TZ03_5-6.
	R2B (16-28") Dark brown fine SAND, trace silt (wet)[SP]						0.8, 0.0	
	R2C (28-38") Tan SILT, some fine sand (wet)[SP-SM]						0.0, 0.0	
	R2D (38-42") Gray fine SAND, trace silt (wet)[SP]							
	R3 (0-12") Brown to gray fine SAND, trace fine gravel (wet)[SP]	8–9	R-3	Macrocore	12/12		0.0, 0.0	Collect TZ03_8-9
		9						Bottom of boring at 9 feet bgs. Borehole backfilled with clean soil cuttings and finished with concrete patch

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Log of Boring **TZ04** Sheet 1 of 1

Project: 4650 Broadway		Project No.: 170505501	
Location: New York, NY		Elevation and Datum: Approx. el 26 (NAVD 88)	
Drilling Company: AARCO Environmental Services Corp.		Date Started: 3/22/21	Date Finished: 3/22/21
Drilling Equipment: Geoprobe 6610 DT		Completion Depth: 10 ft	Rock Depth: NA
Size and Type of Bit: 2-inch diameter Direct Push		Number of Samples: Disturbed 3; Undisturbed NA; Core NA	
Casing Diameter (in): NA	Casing Depth (ft): NA	Water Level (ft.): First 5.5; Completion NA; 24 HR. NA	
Casing Hammer: NA; Weight (lbs): NA	Drop (in): NA	Drilling Foreman: Dayvi Pachero	
Sampler: 2-inch diameter by 4-foot long acetete liner			
Sampler Hammer: NA; Weight (lbs): NA	Drop (in): NA	Field Engineer: Andrew Nesci	

Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	PID Reading (ppm)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	R1A (0-6") Concrete	0					0.0	
	R1B (6-24") Orangish brown fine SAND, some silt (moist)[FILL]	0.5–3	R-1A	Macrocore	24/48		0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0	
	R2 (0-24") Dark brown to orangish brown fine SAND, trace silt (wet)[SP-SM]	6–8	R-2	Macrocore	24/48		0.0, 0.0, 0.0, 0.0	
	R3 (0-24") Brown to olive brown fine SAND, trace silt, trace fine gravel (wet)[SP-SM]	8–10	R-3	Macrocore	24/24		0.0, 0.0, 0.0, 0.0	Collect TZ04_8-9
		10						Bottom of boring at 10 feet bgs. Borehole backfilled with clean soil cuttings and finished with concrete patch

Depth Scale: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

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Log of Boring **WC-28/TZ05** Sheet 1 of 1

Project: 4650 Broadway		Project No.: 170505501	
Location: New York, NY		Elevation and Datum: Approx. el 26 (NAVD 88)	
Drilling Company: AARCO Environmental Services Corp.		Date Started: 3/22/21	Date Finished: 3/22/21
Drilling Equipment: Geoprobe 6610 DT		Completion Depth: 8 ft	Rock Depth: NA
Size and Type of Bit: 2-inch diameter Direct Push		Number of Samples: Disturbed 2; Undisturbed NA; Core NA	
Casing Diameter (in): NA	Casing Depth (ft): NA	Water Level (ft.): First ∇ 4; Completion ▼ NA; 24 HR. ▼ NA	
Casing Hammer: NA; Weight (lbs): NA	Drop (in): NA	Drilling Foreman: Dayvi Pachero	
Sampler: 2-inch diameter by 4-foot long acetete liner		Field Engineer: Andrew Nesci	
Sampler Hammer: NA; Weight (lbs): NA	Drop (in): NA		

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	PID Reading (ppm)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
		R1A (0-6") Concrete	0					0.0	Collect WC28_0-1
		R1B (6-39") Orangish brown to olive brown fine SAND, trace silt, trace fine gravel (moist)[FILL]	0–4	R-1	Macrocore	39/48		0.0, 0.0, 0.0, 0.0, 0.0, 0.0	
		∇ (water level at 4 ft)	4						
		R2 (0-42") Olive brown fine SAND, some silt, trace fine gravel (wet)[SP-SM]	4–8	R-2	Macrocore	42/48		0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0	Collect TZ05_7.5-8
			8						Bottom of boring at 8 feet bgs. Borehole backfilled with clean soil cuttings and finished with concrete patch

Depth scale continues 9–20 with no further entries.

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Log of Boring **WC-22/TZ06** Sheet 1 of 1

Project: 4650 Broadway		Project No.: 170505501	
Location: New York, NY		Elevation and Datum: Approx. el 26 (NAVD 88)	
Drilling Company: AARCO Environmental Services Corp.		Date Started: 3/25/21	Date Finished: 3/25/21
Drilling Equipment: Geoprobe 6610 DT		Completion Depth: 9 ft	Rock Depth: NA
Size and Type of Bit: 2-inch diameter Direct Push		Number of Samples: Disturbed 3; Undisturbed NA; Core NA	
Casing Diameter (in): NA	Casing Depth (ft): NA	Water Level (ft.): First 5; Completion NA; 24 HR. NA	
Casing Hammer: NA; Weight (lbs): NA	Drop (in): NA	Drilling Foreman: Charles Blumberg	
Sampler: 2-inch diameter by 4-foot long acetete liner		Field Engineer: Andrew Nesci	
Sampler Hammer: NA; Weight (lbs): NA	Drop (in): NA		

Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	PID Reading (ppm)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	R1A (0-6") Concrete	0						
	R1B (6-42") Orangish brown fine SAND, trace silt (moist to wet)[FILL]	0–4	R-1	Macrocore	42/48		0.1, 0.6, 0.0, 0.0, 0.8, 0.0, 0.0	
	R2A (0-6") Orangish brown fine SAND, trace silt (moist to wet)[FILL]	4–8	R-2	Macrocore	36/48		0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0	
	R2B (6-36") Orangish brown fine SAND, some silt (wet)[SP-SM]							
	R3 (0-12") Light olive SAND, some silt (wet)[SP-SM]	8–9	R-3	Macrocore	12/12		0.0, 0.0	Collect TZ06_8-9
		9						Bottom of boring at 9 feet bgs. Borehole backfilled with clean soil cuttings and finished with concrete patch

Depth Scale: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

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Log of Boring **WC-23/TZ07** Sheet 1 of 1

Project: 4650 Broadway	Project No.: 170505501
Location: New York, NY	Elevation and Datum: Approx. el 26 (NAVD 88)
Drilling Company: AARCO Environmental Services Corp.	Date Started: 3/25/21 — Date Finished: 3/25/21
Drilling Equipment: Geoprobe 6610 DT	Completion Depth: 9 ft — Rock Depth: NA
Size and Type of Bit: 2-inch diameter Direct Push	Number of Samples — Disturbed: 3 — Undisturbed: NA — Core: NA
Casing Diameter (in): NA — Casing Depth (ft): NA	Water Level (ft.) — First: 5 — Completion: NA — 24 HR.: NA
Casing Hammer: NA — Weight (lbs): NA — Drop (in): NA	Drilling Foreman: Charles Blumberg
Sampler: 2-inch diameter by 4-foot long acetete liner	Field Engineer: Andrew Nesci
Sampler Hammer: NA — Weight (lbs): NA — Drop (in): NA	

Depth (ft)	Elev. (ft)	Sample Description	Number	Type	Recov. (in)	Penetr. resist BL/6in	PID Reading (ppm)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
0–0.5		R1A (0-6") Concrete	R-1	Macrocore	24/48			
0.5–1		R1B (6-12") Orangish brown fine SAND, trace silt (moist)[FILL]					0.0, 0.0	Collect WC-23_1-2
1–4		R1C (12-24") Dark brown fine SAND, trace silt (moist)[SP]					0.0, 0.0	
4–8		R2 (0-30") Dark brown to orangish brown SAND, trace silt (wet)[SP]	R-2	Macrocore	30/48		0.0, 0.0, 0.0, 0.0	
8–9		R3 (0-12") Orangish brown fine SAND, some silt (wet)[SP-SM]	R-3	Macrocore	12/12		0.0, 0.0	Collect TZ07_8-9
9								Bottom of boring at 9 feet bgs. Borehole backfilled with clean soil cuttings and finished with concrete patch

Depth Scale: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

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Log of Boring **WC-25/TZ08** Sheet 1 of 1

Project: 4650 Broadway		Project No.: 170505501	
Location: New York, NY		Elevation and Datum: Approx. el 26 (NAVD 88)	
Drilling Company: AARCO Environmental Services Corp.		Date Started: 3/25/21	Date Finished: 3/25/21
Drilling Equipment: Geoprobe 6610 DT		Completion Depth: 9 ft	Rock Depth: NA
Size and Type of Bit: 2-inch diameter Direct Push		Number of Samples: Disturbed 3; Undisturbed NA; Core NA	
Casing Diameter (in): NA	Casing Depth (ft): NA	Water Level (ft.): First 4; Completion NA; 24 HR. NA	
Casing Hammer: NA	Weight (lbs): NA; Drop (in): NA	Drilling Foreman: Charles Blumberg	
Sampler: 2-inch diameter by 4-foot long acetete liner		Field Engineer: Andrew Nesci	
Sampler Hammer: NA	Weight (lbs): NA; Drop (in): NA		

Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	PID Reading (ppm)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	R1A (0-6") Concrete	0						
	R1B (6-12") Orangish brown fine SAND, trace silt (moist)[FILL]		R-1	Macrocore	42/48		0.0	
	R1C (12-42") Dark brown fine SAND, trace silt (moist)[SP]	1–3					0.0, 0.0, 0.0, 0.0, 0.0	
	R2A (0-24") Dark brown fine SAND, trace silt (wet)[SP]	4–5	R-2	Macrocore	46/48		0.0, 0.0, 0.0	
	R2B (24-35") Brown fine SAND, some silt (wet)[SP-SM]	6					0.0, 7.1	
	R2C (35-46") Olive brown fine SAND, trace silt (wet)[SP]	7					9.3, 57.9	Petroleum-like odors observed between 7 and 9 feet
	R3 (0-12") Olive fine SAND, some silt (wet)[SP-SM]	8	R-3	Macrocore	12/12		57.5, 10.2	Collect TZ08_8-9
		9						Bottom of boring at 9 feet bgs. Borehole backfilled with clean soil cuttings and finished with concrete patch

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Log of Boring **WC-26/TZ09** Sheet 1 of 1

Project: 4650 Broadway		Project No.: 170505501	
Location: New York, NY		Elevation and Datum: Approx. el 26 (NAVD 88)	
Drilling Company: AARCO Environmental Services Corp.		Date Started: 3/25/21	Date Finished: 3/25/21
Drilling Equipment: Geoprobe 6610 DT		Completion Depth: 9 ft	Rock Depth: NA
Size and Type of Bit: 2-inch diameter Direct Push		Number of Samples — Disturbed: 3	Undisturbed: NA; Core: NA
Casing Diameter (in): NA	Casing Depth (ft): NA	Water Level (ft.) — First: 4	Completion: NA; 24 HR.: NA
Casing Hammer: NA	Weight (lbs): NA; Drop (in): NA	Drilling Foreman: Charles Blumberg	
Sampler: 2-inch diameter by 4-foot long acetete liner		Field Engineer: Andrew Nesci	
Sampler Hammer: NA	Weight (lbs): NA; Drop (in): NA		

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	PID Reading (ppm)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
		R1A (0-6") Concrete	0						
		R1B (6-48") Orangish brown fine SAND, trace silt (moist)[FILL]	0.5–4	R-1	Macrocore	48/48		0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0	
		R2A (0-24") Orangish brown fine SAND, trace silt (wet)[FILL]	4–6	R-2	Macrocore	42/48		0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0	
		R2B (24-42") Olive brown SAND, some silt (wet)[SP]	6–8						
		R3 (0-12") Brown fine SAND, trace silt (wet)[SP]	8–9	R-3	Macrocore	12/12		0.0, 0.0	Collect TZ09_8-9
			9						Bottom of boring at 9 feet bgs. Borehole backfilled with clean soil cuttings and finished with concrete patch

Depth scale: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

LANGAN

Log of Boring **WC-29/TZ10** Sheet 1 of 1

Project: 4650 Broadway	Project No.: 170505501
Location: New York, NY	Elevation and Datum: Approx. el 26 (NAVD 88)
Drilling Company: AARCO Environmental Services Corp.	Date Started: 3/22/21 / Date Finished: 3/22/21
Drilling Equipment: Geoprobe 6610 DT	Completion Depth: 10 ft / Rock Depth: NA
Size and Type of Bit: 2-inch diameter Direct Push	Number of Samples: Disturbed 3 / Undisturbed NA / Core NA
Casing Diameter (in): NA / Casing Depth (ft): NA	Water Level (ft.): First ▽ 4.5 / Completion ▼ NA / 24 HR. ▼ NA
Casing Hammer: NA / Weight (lbs): NA / Drop (in): NA	Drilling Foreman: Dayvi Pachero
Sampler: 2-inch diameter by 4-foot long acetete liner	Field Engineer: Andrew Nesci
Sampler Hammer: NA / Weight (lbs): NA / Drop (in): NA	

Depth (ft)	Sample Description	Number	Type	Recov. (in)	Penetr. resist BL/6in	PID Reading (ppm)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
0–0.5	R1A (0-6") Concrete	R-1	Macrocore	36/48		0.0, 0.0, 0.0, 0.0, 0.0	
0.5–4	R1B (6-36") Brown to dark brown fine SAND, trace silt (moist)[FILL]						
4–7	R2A (0-24") Orangish brown fine SAND, trace silt (wet)[FILL]	R-2	Macrocore	36/48		0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0	
7–8	R2B (24-36") Brown to dark brown silty fine SAND (wet)[SP-SM]						
8–10	R3 (0-24") Orangish brown fine SAND, some silt (wet)[SP-SM]	R-3	Macrocore	24/24		0.0, 0.0, 0.0, 0.0	Collect TZ10_8-9
10							Bottom of boring at 10 feet bgs. Borehole backfilled with clean soil cuttings and finished with concrete patch

Depth Scale: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

LANGAN

Log of Boring **TZ11** Sheet 1 of 1

Project: 4650 Broadway		Project No.: 170505501	
Location: New York, NY		Elevation and Datum: Approx. el 26 (NAVD 88)	
Drilling Company: AARCO Environmental Services Corp.		Date Started: 3/25/21	Date Finished: 3/25/21
Drilling Equipment: Geoprobe 6610 DT		Completion Depth: 12 ft	Rock Depth: NA
Size and Type of Bit: 2-inch diameter Direct Push		Number of Samples — Disturbed: 3; Undisturbed: NA; Core: NA	
Casing Diameter (in): NA	Casing Depth (ft): NA	Water Level (ft.) — First: 4; Completion: NA; 24 HR.: NA	
Casing Hammer: NA; Weight (lbs): NA	Drop (in): NA	Drilling Foreman: Charles Blumberg	
Sampler: 2-inch diameter by 4-foot long acetete liner		Field Engineer: Andrew Nesci	
Sampler Hammer: NA; Weight (lbs): NA	Drop (in): NA		

Depth (ft)	Sample Description	Sample Number	Type	Recov. (in)	PID Reading (ppm)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
0–0.5	R1A (0-6") Concrete	R-1A	Macrocore	42/48		
0.5–4	R1B (6-42") Orangish brown to dark brown fine SAND, trace silt (moist)[FILL]				11.5, 18.47, 10.0, 3.0, 5.4, 10.0	
4–5.5	R2A (0-18") Orangish brown fine SAND, trace silt (wet)[FILL]	R-2A	Macrocore	48/48	1.8, 4.4, 38.6	
5.5–6.5	R2B (18-30") Light olive silty fine SAND (wet)[SP-SM]				76.4, 1414	
6.5–8	R2C (30-48") Black to orangish brown fine SAND, trace silt (wet)[SP]				3701, 4143, 121.0	Petroleum-like staining and odors observed between 7 and 7.5 feet. Collect TZ11_8-9
8–10	R3A (0-24") Light olive fine SAND (wet)[SP]	R-3A	Macrocore	36/48	172.0, 315.8, 56.8, 9.0	
10–12	R3B (24-36") Black fine SAND, trace silt (wet)[SP]				42.0, 45.0	Petroleum-like staining and odors observed between 11 and 12 feet. Bottom of boring at 12 feet bgs. Borehole backfilled with clean soil cuttings and finished with concrete patch

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Log of Boring **TZ12** Sheet 1 of 1

Project: 4650 Broadway	Project No.: 170505501
Location: New York, NY	Elevation and Datum: Approx. el 26 (NAVD 88)
Drilling Company: AARCO Environmental Services Corp.	Date Started: 3/25/21; Date Finished: 3/25/21
Drilling Equipment: Geoprobe 6610 DT	Completion Depth: 9 ft; Rock Depth: NA
Size and Type of Bit: 2-inch diameter Direct Push	Number of Samples: Disturbed 3; Undisturbed NA; Core NA
Casing Diameter (in): NA; Casing Depth (ft): NA	Water Level (ft.): First ▽ 5; Completion NA; 24 HR. NA
Casing Hammer: NA; Weight (lbs): NA; Drop (in): NA	Drilling Foreman: Charles Blumberg
Sampler: 2-inch diameter by 4-foot long acetete liner	Field Engineer: Andrew Nesci
Sampler Hammer: NA; Weight (lbs): NA; Drop (in): NA	

Sample Description	Depth Scale (ft)	Number	Type	Recov. (in)	Penetr. resist BL/6in	PID Reading (ppm)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
R1A (0-6") Concrete	0						
R1B (6-18") Orangish brown fine SAND, trace silt (moist)[FILL]	0-1	R-1A	Macrocore	30/48		16.3, 4.3	
R1C (18-30")Brown fine SAND, trace silt (moist)[SP]	1.5-4					4.3, 4.7, 4.8, 9.4, 9.4	Petroleum-like odors observed between 3 and 9 feet
	4-5	R-2A	Macrocore	36/48		19.6, 20.5	
R2A (0-12") Olive brown fine SAND, some silt (wet)[SP-SM]	5-6					46.4, 1237	
R2B (12-30") Brown to black fine SAND, trace silt (wet)[SP-SM]	6-7.5					4908, 2382	Petroleum-like staining observed between 6 and 7 feet
R2C (30-36") Brown to orangish brown fine SAND, trace silt (wet)[SP]	7.5-8					151.8	
R3 (0-12") Orangish brown to brown fine SAND, trace silt (wet)[SP]	8-9	R-3	Macrocore	12/12		29.2, 27.5	Collected TZ12_8-9
	9						Bottom of boring at 9 feet bgs. Borehole backfilled with clean soil cuttings and finished with concrete patch

Depth scale: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

\\LANGAN.COM\DATA\NYC\DATA5\170505501\PROJECT DATA_DISCIPLINE\ENVIRONMENTAL\GINTLOGS\170505501_4650 BROADWAY_WC & SUPPLEMENTAL SOIL INVESTIGATION.GPJ ... 5/7/2021 2:02:05 AM ... Report: Log - LANGAN

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Log of Boring **WC-27/TZ13** Sheet 1 of 1

Project: 4650 Broadway		Project No.: 170505501	
Location: New York, NY		Elevation and Datum: Approx. el 26 (NAVD 88)	
Drilling Company: AARCO Environmental Services Corp.		Date Started: 3/25/21	Date Finished: 3/25/21
Drilling Equipment: Geoprobe 6610 DT		Completion Depth: 12 ft	Rock Depth: NA
Size and Type of Bit: 2-inch diameter Direct Push		Number of Samples: Disturbed 4; Undisturbed NA; Core NA	
Casing Diameter (in): NA	Casing Depth (ft): NA	Water Level (ft.): First ▽ 4; Completion ▼ NA; 24 HR. ▼ NA	
Casing Hammer: NA; Weight (lbs): NA; Drop (in): NA		Drilling Foreman: Charles Blumberg	
Sampler: 2-inch diameter by 4-foot long acetete liner		Field Engineer: Andrew Nesci	
Sampler Hammer: NA; Weight (lbs): NA; Drop (in): NA			

Sample Description	Depth Scale (ft)	Number	Type	Recov. (in)	Penetr. resist BL/6in	PID Reading (ppm)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
R1A (0-6") Concrete	0						
R1B (6-30") Orangish brown fine SAND, trace silt (moist)[FILL]	0-4	R-1	Macrocore	30/48		7.4, 9.2, 16.8, 5.2, 0.0	Collect WC-27_2-3
▽ (water level)	4						
R2A (0-12") Orangish brown fine SAND, trace silt (wet)[FILL]	4-8	R-2	Macrocore	42/48		61.1, 107.6, 174.6, 855.8, 3370, 1052, 49.3, 55.7	Petroleum-like odors observed between 5 and 9 feet
R2B (12-24") Light olive fine SAND, some silt (wet)[SP-SM]							Petroleum-like staining observed between 6.5 and 7.5 feet
R2C (24-36) Black fine SAND, trace silt (wet)[SP]							
R2D (36-42") Orangish brown fine SAND, trace silt (wet)[SP]							
R3 (0-12") Orangish brown to olive fine SAND, trace silt (wet)[SP]	8-9	R-3	Macrocore	12/12		50.2	Collect TZ13_8-9
R4 (0-24") Light olive fine SAND, some silt (wet)[SP-SM]	9-12	R-4	Macrocore	24/36		12.2, 10.2, 0.8, 0.3	
	12						Bottom of boring at 12 feet bgs. Borehole backfilled with clean soil cuttings and finished with concrete patch

Depth scale: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

\\LANGAN.COM\DATA\NYC\DATA5\170505501\PROJECT DATA_DISCIPLINE\ENVIRONMENTAL\GINTLOGS\170505501_4650 BROADWAY_WC & SUPPLEMENTAL SOIL INVESTIGATION.GPJ ... 5/7/2021 2:04:44 AM ... Report: Log - LANGAN

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Log of Boring **WC-24/TZ14** Sheet 1 of 1

Project: 4650 Broadway		Project No.: 170505501	
Location: New York, NY		Elevation and Datum: Approx. el 26 (NAVD 88)	
Drilling Company: AARCO Environmental Services Corp.		Date Started: 3/25/21	Date Finished: 3/25/21
Drilling Equipment: Geoprobe 6610 DT		Completion Depth: 9 ft	Rock Depth: NA
Size and Type of Bit: 2-inch diameter Direct Push		Number of Samples: Disturbed 3; Undisturbed NA; Core NA	
Casing Diameter (in): NA	Casing Depth (ft): NA	Water Level (ft.): First 5; Completion NA; 24 HR. NA	
Casing Hammer: NA; Weight (lbs): NA; Drop (in): NA		Drilling Foreman: Charles Blumberg	
Sampler: 2-inch diameter by 4-foot long acetete liner		Field Engineer: Andrew Nesci	
Sampler Hammer: NA; Weight (lbs): NA; Drop (in): NA			

Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	PID Reading (ppm)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	R1A (0-6") Concrete	0						
	R1B (6-30") Orangish brown fine SAND, trace silt, trace fine gravel (moist)[FILL]	1–4	R-1	Macrocore	30/48		0.0, 0.8, 0.8, 2.2, 2.7	
	R2A (0-12") Orangish brown fine SAND, trace silt (wet)[FILL]	4–5	R-2	Macrocore	48/48		0.2, 2.3	
	R2B (12-30") Black fine SAND, trace silt (wet)[SP]	5–6.5					36.0, 173.0	Petroleum-like staining and odors observed between 5 and 6.5 feet
	R2C (30-48") Olive brown fine SAND, some silt (wet)[SP-SM]	6.5–8					27.4, 8.4, 4.2	
	R3 (0-12") Olive brown fine SAND, trace silt (wet)[SP]	8–9	R-3	Macrocore	12/12		3.0, 1.3	2:20 PM - Collect TZ14_8-9
		9–20						Bottom of boring at 9 feet bgs. Borehole backfilled with clean soil cuttings and finished with concrete patch

APPENDIX E

HEALTH AND SAFETY PLAN

CONSTRUCTION HEALTH AND SAFETY PLAN

for

4650 BROADWAY
NEW YORK, NEW YORK
Manhattan Borough Tax Map
Block 2175, Lot 1
NYSDEC BCP Site No. C231123

Prepared For:

4650 Broadway Holdings LLC
c/o Adam America Real Estate
850 Third Avenue, Suite 16B
New York, 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 10001

LANGAN

May 2021
Langan Project Number: 170505504

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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 4650 Broadway in the Inwood neighborhood of Manhattan, New York (the "Site"). The Site is identified on the Manhattan Tax Map as Block 2175, Lot 1. 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 4650 Broadway in the Inwood neighborhood of New York, New York. The site is identified as Block 2175, Lot 1 on the Manhattan Borough Tax Map. The 47,175-square-foot lot was improved with a two-story parking garage with a full basement and partial sub-cellar. The property is located on the southwestern portion of the city block bound by Dongan Place to the north, Arden Street to the east, Sherman Avenue to the south, and Broadway to the west. The southern portion of the property building was operated by Park-it Pilot Parking LLC as a commercial parking garage. The northern portion of the building was used for storage of antique cars and construction materials.

Petroleum-impacted soil and groundwater were documented near three historical gasoline underground storage tanks (USTs) and a former petroleum tank room in the southern portion of the basement in 2004 and 2009. New York State Department of Environmental Conservation (NYSDEC) Spill No. 0902240 was reported, and the USTs and petroleum-impacted soil were subsequently removed. Endpoint sampling results indicate that soil impacts were remediated;

however, quarterly monitoring performed through January 2016 indicates that petroleum contamination persists in groundwater and may impact soil vapor.

Vehicle repair was conducted at the site between about 1928 and at least 1950. A site location map is included as Figure 1.

1.3 Summary of Work Tasks

1.3.1 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 excavate to specified depth at specified location on site. Concrete debris, where observed, 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). Langan may also screen soil with a Jerome® J405 mercury vapor analyzer (or equivalent) for mercury. 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 project manager (PM) and provide the specific language. Langan is not to sign hazardous waste manifests unless specifically instructed by the PM to do so. 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.

1.3.2 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. Langan personnel may also report concentrations of mercury above background using the Jerome® J405 mercury vapor analyzer (or equivalent).

1.3.3 Soil Sampling

As part of the excavation activities, soil samples (remediation outcome, 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).

Soil samples excavation endpoint or delineation sampling (along with quality assurance/quality control [QA/QC] samples) may be collected and subsequently submitted to a New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP)-certified laboratory and analyzed in accordance with work plan specifications.

1.3.4 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 as defined in the work plan 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.

1.3.5 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.

1.3.6 Excavation Backfill

Areas of the site that were excavated may be backfilled to development grade (i.e., the grade required to complete construction of the foundation and sidewalk extension) or as otherwise stated in the work pan. Non-impacted site material or imported material will meet specifications defined in the work plan including regulatory specifications. Langan will observe and record trucks importing fill material and, when required by the work plan, collect appropriate samples for possible submission for analysis.

1.3.7 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.

1.3.8 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.

1.3.9 Groundwater Sampling

Groundwater samples may be collected from one or more of the existing on-site monitoring wells in accordance with the Langan Low Flow Groundwater Sampling SOP (SOP #12). Groundwater samples will be submitted to an NYSDOH ELAP-certified laboratory and analyzed for constituents as specified in the work plan.

1.3.10 Construction Dewatering

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

1.3.11 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.

1.3.12 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.

1.3.13 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.

1.3.14 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.

1.3.15 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 Julia Leung or in her absence, Brian Gochenaur; their responsibilities include 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 E.

3.1 Specific Task Safety Analysis

3.1.1 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.

3.1.2 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.

3.1.3 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).

3.1.4 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.

3.1.5 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.

3.1.6 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.

3.1.7 Product Recovery Well Bailing

If encountered, free product recovery requires the donning of Tyvek™ suits, Tyvek™ boots and chemical resistant gloves in addition to the standard PPE and cut resistant gloves when cutting sampling-tubing to length. In addition, Langan will place plastic sheeting around the recovery well head to control spillage during product recovery. Langan will also keep on hand and readily available product absorbing pads to use as needed.

3.1.8 Groundwater Gauging and Sampling

Sampling groundwater requires the donning of chemical resistant gloves in addition to the standard PPE and cut resistant gloves when cutting sampling-tubing to length.

3.1.9 Construction Dewatering

The contractor shall be responsible for handling all contaminated groundwater removed from the site in accordance with federal, state and local regulations; including any sampling, treatment and disposal. Dewatering discharge is likely to require treatment and in accordance with a NYSDEC SPDES permit. Alternatively, the contractor may provide sufficient containerized storage to allow for testing of groundwater prior to and after treatment and before disposal.

If required, Langan may sample dewatering treatment system liquids from either a discharge standpipe or a storage tank. Prior to collecting the samples, Langan will don the necessary PPE including nitrile gloves and if necessary, facial splash guard. Samples may be collected from either the direct discharge standpipe or from a sample port or valve built into the storage tank. Sample ports and valves may only be sampled if they are accessible at ground level. Sampling from heights over 6 feet is prohibited unless Langan field personnel are fully accredited in fall protection and is wearing approved fall protection safety apparatus. The discharge samples will be submitted to a NYSDOH ELAP-certified laboratory for analysis in accordance with the work plan.

3.1.10 Construction Activity Inspection

Construction Activity including ISS activities will be completed by a contractor. The contractor is solely responsible to operate equipment in a safe fashion and in accordance with the manufactures' recommendation. Langan personnel will observe construction activities including ISS in accordance with specification in the work plan and record the data the work plan requires. Construction and ISS 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.

3.1.11 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.

3.1.12 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

No radiation hazards are known or expected at the site.

3.3 Physical Hazards

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

3.3.1 Explosion

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

3.3.2 Heat Stress

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

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

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

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

To monitor the worker, measure:

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

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

- Adjust work schedules.
- Mandate work slowdowns as needed.
- Perform work during cooler hours of the day if possible or at night if adequate lighting can be provided.
- Provide shelter (air-conditioned, if possible) or shaded areas to protect personnel during rest periods.
- Maintain worker's body fluids at normal levels. This is necessary to ensure that the cardiovascular system functions adequately. Daily fluid intake must approximately equal the amount of water lost in sweat, id., eight fluid ounces (0.23 liters) of water must be ingested for approximately every eight ounces (0.23 kg) of weight lost. The normal thirst mechanism is not sensitive enough to ensure that enough water will be drunk to replace lost sweat. When heavy sweating occurs, encourage the worker to drink more. The following strategies may be useful:
    - Maintain water temperature 50° to 60°F (10° to 16.6°C).
    - Provide small disposal cups that hold about four ounces (0.1 liter).

- Have workers drink 16 ounces (0.5 liters) of fluid (preferably water or dilute drinks) before beginning work.
- Urge workers to drink a cup or two every 15 to 20 minutes, or at each monitoring break. A total of 1 to 1.6 gallons (4 to 6 liters) of fluid per day are recommended, but more may be necessary to maintain body weight.
- Train workers to recognize the symptoms of heat related illness.

3.3.3 Cold-Related Illness

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

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

<u>Prevention of Cold-Related Illness</u> - 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 G.

4.0 PERSONNEL TRAINING

4.1 Basic Training

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

4.2 Initial Site-Specific Training

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

4.3 Tailgate Safety Briefings

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

- Work plan for the day;
- Review of safety information relevant to planned tasks and environmental conditions;
- New activities/task being conducted;
- Results of Jobsite Safety Inspection Checklist;

- Changes in work practices;
- Safe work practices; and
- Discussion and remedies for noted or observed deficiencies.

5.0 MEDICAL SURVEILLANCE

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

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

6.0 PERSONAL PROTECTIVE EQUIPMENT

6.1 Levels of Protection

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

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

Level D Protection (as needed)

- Safety glasses with side shields or chemical splash goggles
- Safety boots/shoes
- Coveralls (Tyvek® or equivalent)
- Hard hat

- Long sleeve work shirt and work pants
- Nitrile gloves
- Hearing protection
- Reflective safety vest

Level D Protection (Modified, as needed)

- Safety glasses with sideshields or chemical splash goggles
- Safety boots/shoes (toe-protected)
- Disposable chemical-resistant boot covers
- Coveralls (polycoated Tyvek or equivalent to be worn when contact with wet contaminated soil, groundwater, or non-aqueous phase liquids is anticipated)
- Hard hat
- Long sleeve work shirt and work pants
- Nitrile gloves
- Hearing protection (as needed)
- Personal floatation device (for work within 5 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) and mercury vapor. 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, mercury vapor, and dust will be established prior to intrusive activities within the AOC at an upwind location. A notation of BKD levels will be referenced in the daily monitoring log. BKD levels are a function of prevailing conditions. BKD levels will be taken in an appropriate upwind location as determined by the HSO.

Table 4 lists the instrument action levels.

8.0 COMMUNITY AIR MONITORING PROGRAM

Community air monitoring will be conducted in compliance with the site-specific CAMP outlined below.

CAMP for the IRM and Amended IRMWP include real-time continuous monitoring for VOCs, particulates and when specified by the work plan, mercury vapor, at the upwind and downwind perimeter of each designated work area when certain activities are in progress. Continuous monitoring is required for all ground-intrusive activities and during demolition of metals-contaminated or potentially metals-contaminated structures. Mercury vapor analyzers will only be added to the CAMP stations during ground-intrusive activities on the western portion of the site.

In addition, as specified in the work plan, a directly down-wind work zone station (within 25 feet of the work zone) will continuously monitor for mercury vapor. Continuous monitoring is required for all ground-intrusive activities and during demolition of metals-contaminated or potentially metals-contaminated structures.

The following equipment (or equivalent) will be used for CAMP monitoring:

- MiniRAE 3000 PIDs (for VOCs)
- Jerome® J405 mercury vapor analyzers
- TSI DustTrak™ aerosol monitors (for particulate matter less than 10 microns in diameter [PM10]).

Monitoring for particulates, VOCs, and odors and/or mercury vapor will be conducted during all ground-intrusive activities by the field professional. The work zone is defined as the general area in which machinery is operating in support of work plan activities. A portable PID will be used within the work zone to screen excavated soil and for periodic monitoring of VOCs during work plan activities. A Jerome® J405 mercury vapor analyzer (or equivalent) will also be used within the work zone in accordance with the attached CHASP. The site perimeter will be visually monitored for fugitive dust emissions.

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

- If total VOC levels exceed 5 parts per million (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 work 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 will resume if the total organic vapor level 200 feet downwind of the work 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 work zone, work will be shut down.

The following actions will be taken based on elevated PM10 concentrations and/or visual dust observations:

- If the downwind PM10 concentration is 100 micrograms per cubic meter (µg/m³) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work zone, 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 zone.
- 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.

The following actions will be taken based on mercury vapor concentrations:

- If the downwind mercury vapor level is 3 µg/m³ for the 15-minute period, then boring installation and excavation activities will be halted and all exposed soil will be covered with polyethylene sheeting and/or containerized in closed 55-gallon drums, and work will cease. If levels readily decrease (per instantaneous readings) below 3 µg/m³ above background, work activities will resume with continued monitoring.
- If mercury vapor levels at the downwind perimeter of the work zone persist at levels in excess of 10 µg/m³ above background, 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 mercury vapor level 200 feet downwind of the work 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 3 µg/m³ above background for the 15-minute average.

The action level for mercury vapor in a residential setting is 1.0 μg/m³ for a 15-minute average[1] above background; this action level will be conservatively used to determine the potential risk to public health represented by mercury vapor at the site. Mercury vapor monitoring will be performed at the site perimeter and within 25 feet downwind of the work zone during ground-intrusive activities in the western portion of the site (i.e. in the area of known mercury impacts to soil). If no sustained 15-minute average mercury vapor concentrations exceed 1.0 μg/m³ during the course of a representative data set of site activities, the Langan may consult with the NYSDEC and NYSDOH to determine if continued mercury vapor monitoring is required as part of ongoing CAMP implementation.

Concentrations detected above the CAMP action levels will be reported to the NYSDEC and NYSDOH project managers and included in daily reports and the CCR. In addition, a map showing the location of the downwind, upwind, and work zone (if present) air monitoring stations will be included in each daily report.

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

[1] Reference to the March 22, 2012 Chemical Specific Health Consultation, prepared for Joint EPA/ATSDR National Mercury Cleanup Policy Workgroup - Action Levels For Elemental Mercury Spills, Section 2.2.1 Residential Settings – Normal Occupancy

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:

Bronx-Lebanon Hospital Center
1276 Fulton Avenue
Bronx, New York
718-590-1800

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

11.0 STANDING ORDERS/SAFE WORK PRACTICES

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

12.0 SITE SECURITY

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

13.0 UNDERGROUND UTILITIES

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

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

- Use safe digging procedures when applicable.
- Stay at least 10 feet from all equipment performing subsurface work.

14.0 SITE SAFETY INSPECTION

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

15.0 HAND AND POWER TOOLS

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

16.0 EMERGENCY RESPONSE

16.1 General

This section establishes procedures and provides information for use during a project emergency. Emergencies happen unexpectedly and quickly, and require an immediate response; therefore, contingency planning and advanced training of staff is essential. Specific elements of emergency support procedures that are addressed in the following subsections include communications, local emergency support units, and preparation for medical emergencies, first aid for injuries incurred on site, record keeping, and emergency site evacuation procedures. In case of emergency, in addition to 911, call *Incident Intervention®* at 1-888-479-7787 to report their injuries. For all other communications, contact the Langan Incident Hotline at **(800) 9-LANGAN** (800-952-6426) extension 4699 as soon as possible.

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

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

- Name, address, home phone
- Age, height, weight

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

A sample medical data sheet is included in Attachment T.

16.2 Responsibilities

16.2.1 Health and Safety Officer (HSO)

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

16.2.2 Emergency Coordinator

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

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

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

16.2.3 Site Personnel

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

16.3 Communications

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

16.4 Local Emergency Support Units

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

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

16.5 Pre-Emergency Planning

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

16.6 Emergency Medical Treatment

The procedures and rules in this 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 D). Langan's written hazard communication program, in compliance with 29 CFR 1910.1200, is maintained by the HSM.

18.7 Documentation

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

18.7.1 Accident and Injury Report Forms

18.7.1.1 Accident/Incident Report

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

18.7.1.2 First Aid Treatment Record

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

18.7.1.3 OSHA Form 300

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

19.0 CONFINED SPACE ENTRY

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

20.0 HASP ACKNOWLEDGEMENT FORM

All Langan personnel and contractors will sign this 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

Printed Name	Signature	Company	Date

Printed Name	Signature	Company	Date

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 – 1.3.15	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 – 1.3.15	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 – 1.3.15	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 – 1.3.15	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 – 1.3.15	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 – 1.3.15	Noise	Excavation equipment, hand tools, drilling equipment.	Wear hearing protection; maintain safe distance from construction activities	Seek medical attention as required
1.3.1 – 1.3.15	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 – 1.3.15	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 – 1.3.15	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 – 1.3.15	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 – 1.3.15	1,1'-Biphenyl 1,1-Biphenyl Biphenyl Phenyl benzene Diphenyl	92-52-4	None	1 mg/m3 100 mg/m3	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 – 1.3.15	1,1-Dichloroethane Asymmetrical dichloroethane Ethylidene chloride 1,1-Ethylidene dichloride 1,1-DCA	75-34-3	PID	100 ppm 3000 ppm	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the skin; central nervous system depression; liver, kidney, lung damage	Eye: Irrigate immediately Skin: Soap flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	1,2,3-Trichloropropane Allyl trichloride Glycerol trichlorohydrin Glyceryl trichlorohydrin Trichlorohydrin	96-18-4	PID	50 ppm 100 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation eyes, nose, throat; central nervous system depression; In Animals: liver, kidney injury; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately

1.3.1 – 1.3.15	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 – 1.3.15	1,2,4-Trimethylbenzene	95-63-6	PID	None None	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat, respiratory system; bronchitis; hypochromic anemia; headache, drowsiness, lassitude (weakness, exhaustion), dizziness, nausea, incoordination; vomiting, confusion; chemical pneumonitis (aspiration liquid)	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	1,2-Dichlorobenzene	95-50-1	PID	50 ppm 200 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eye, swelling periorbital (situated around the eye); profuse rhinitis; headache, anorexia, nausea, vomiting; weight loss, jaundice, cirrhosis; in animals: liver, kidney injury; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	1,2-Dichloroethane Ethylene dichloride 1,2-DCA DCE[1] Ethane dichloride Dutch liquid, Dutch oil Freon 150 Glycol dichloride	107-06-2	PID	1 ppm 50 ppm	Groundwater Soil Vapor	inhalation, ingestion, skin absorption, skin and/or eye contact	irritation to the eyes, corneal opacity; central nervous system depression; nausea, vomiting; dermatitis; liver, kidney, cardiovascular system damage; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately

1.3.1 – 1.3.15	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 sym-Dichloroethylene Dichloroethylenes	159-59-2 156-60-5 540-59-0	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 – 1.3.15	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 – 1.3.15	1,3-Butadiene Biethylene Bivinyl Butadiene Divinyl Erythrene Vinylethylene	106-99-0	PID	1 ppm 2000 ppm	Vapor	inhalation, skin and/or eye contact (liquid)	irritation to the eyes, nose, throat; drowsiness, dizziness; liquid: frostbite; teratogenic, reproductive effects; [potential occupational carcinogen]	Eye: Frostbite Skin: Frostbite Breathing: Respiratory support

1.3.1 – 1.3.15	1,4-Dioxane 1,4-Dioxacyclohexane [1,4]Dioxane p-Dioxane [6]-crown-2 Diethylene dioxide Diethylene ether Dioxan Dioxane 1,4-Dioxane	123-91-1	PID	100 ppm 500 ppm	Groundwater Soil Vapor	Inhalation, ingestion, skin and/or eye contact	Irritant to eyes, skin, mucous membranes and respiratory system. May be harmful by ingestion, skin absorption and inhalation	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	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) 1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	27619-97-2	NA	NA NA	Groundwater	inhalation, skin or eye contact, ingestion	irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS) 8 : 2 Fluorotelomer sulfonate 8 : 2 FTSA 8:2 Fluorotelomersulfonate (8:2 FTS)	39108-34-4	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 – 1.3.15	2-(N-Methylperfluorooctanesulfonamido)acetic acid N-MeFOSAA N-methylperfluorooctane sulfonamidoacetic acid 2-(N-methyl-perfluorooctane sulfonamido) acetic acid Glycine N-[(heptadecafluorooctyl)sulfonyl]-N-methyl- N-methyl perfluorooctane-sulfonamidoacetic acid NMeFOSAA	2355-31-9	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 – 1.3.15	2,2,4-Trimethylpentane Isooctane	540-84-1	PID	NA NA	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat, respiratory system; bronchitis; hypochromic anemia; headache, drowsiness, lassitude (weakness, exhaustion), dizziness, nausea, incoordination; vomiting, confusion; chemical pneumonitis (aspiration liquid)	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	2,4-Dichlorophenoxyacetic acid 2,4-D hedonal trinoxol Dichlorophenoxyacetic Acid	94-75-7	NA	10 ppm 100 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, nose, respiratory system; headache, lassitude (weakness, exhaustion), dizziness, confusion, malaise (vague feeling of discomfort), drowsiness, unsteady gait; narcosis; defatting dermatitis; possible liver injury; reproductive effects	Eye: Irrigate immediately Skin: Water flush Breathing: Respiratory support Swallow: Medical attention
1.3.1 – 1.3.15	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 – 1.3.15	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 – 1.3.15	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
1.3.1 – 1.3.15	4-Isopropyltoulene 1-Methyl-4-(1-methylethyl)benzene 4-Isopropyltoluene; 4-Methylcumene; 1-Methyl-4-isopropylbenzene Dolcymene Camphogen Paracymene Cymene p-Cymene p-Isopropyltoluene	99-87-6	PID	NA NA	Soil Groundwater Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, mucous membrane; dermatitis; headache, narcosis, coma	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	4-Methyl-2-pentanone Hexone Isobutyl methyl ketone Methyl isobutyl ketone MIBK	108-10-1	PID	100 ppm 500 ppm	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, mucous membrane; headache, narcosis, coma; dermatitis; in animals: liver, kidney damage	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately

1.3.1 – 1.3.15	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 – 1.3.15	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 – 1.3.15	Acrylonitrile Acrylonitrile monomer AN Cyanoethylene Propenenitrile 2-Propenenitrile VCN, Vinyl cyanide	107-13-1	PID	1 ppm 85 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin; asphyxia; headache; sneezing; nausea, vomiting; lassitude (weakness, exhaustion), dizziness; skin vesiculation; scaling dermatitis; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Water wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	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 – 1.3.15	Anthracene	120-12-7	PID	0.2 mg/m3 80 mg/m3 (Coal Pitch Tar)	Soil	inhalation, skin or eye contact, ingestion	irritation to the skin, eyes, mucous membranes and upper respiratory tract, abdominal pain if ingested.	Eye: Irrigate immediately, seek medical attention immediately, Skin: Soap wash immediately, Breathing: Move to fresh air, refer to medical attention; Swallow: refer to medical attention
1.3.1 – 1.3.15	Antimony	7440-36-0	None	0.5 mg/m3 50 mg/m3	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 – 1.3.15	Aroclor 1242	53469-21-9	None	0.5 mg/m3 5 mg/m3	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 – 1.3.15	Aroclor 1248	12672-26-6	None	0.5 mg/m3 5 mg/m3	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 – 1.3.15	Aroclor 1254	11097-69-1	None	0.5 mg/m3 5 mg/m3	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 – 1.3.15	Aroclor 1260	11096-82-5	None	0.5 mg/m3 5 mg/m3	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 – 1.3.15	Aroclor 1268	11100-14-4	None	0.5 mg/m3 5 mg/m3	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 – 1.3.15	Arsenic	NA	None	0.5 mg/m3 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 – 1.3.15	Barium	10022-31-8	None	0.5 mg/m3 50 mg/m3	Groundwater Soil	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, upper respiratory system; skin burns; gastroenteritis; muscle spasm; slow pulse	Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	Benzene Benzol Phenyl hydride Alkyl benzene isomers	71-43-2	PID	3.19 mg/m3 1,595 mg/mg3	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; lassitude (weakness, exhaustion) [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	Benzo(a)anthracene Benzanthracene Benzanthrene 1,2-Benzanthracene Benzo[b]phenanthrene Tetraphene	56-55-3	PID	0.2 mg/m3 80 mg/m3 (Coal Pitch Tar)	Groundwater Soil	inhalation, skin or eye contact, ingestion	dermatitis, bronchitis, [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	Benzo(a)pyrene	50-32-8	PID	0.2 mg/m3 80 mg/m3 (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 – 1.3.15	Benzo(b)fluoranthene	205-99-2	PID	0.2 mg/m3 80 mg/m3 (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 – 1.3.15	Benzo(g,h,i)perylene Benzo(ghi)perylene	191-24-2	PID	0.2 mg/m3 80 mg/m3 (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 – 1.3.15	Benzo(k)fluoranthene	207-08-9	PID	0.2 mg/m3 80 mg/m3 (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 – 1.3.15	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 – 1.3.15	Beryllium	7440-41-7	None	0.002 mg/m3 4 mg/m3	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 – 1.3.15	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/m3 5000 mg/m3	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 – 1.3.15	Bromochloromethane Bromochloromethane Borothene Chloromethyl bromide Halon 1011 Methylene bromochloride Methyl chlorobromide Monochloromonobromomethane Chlorobromomethane Fluorocarbon 1011	74-97-5	None	200 ppm 2000 ppm	Groundwater Soil	inhalation, ingestion, skin and/or eye contact	irritation eyes, skin, throat; confusion, dizziness, central nervous system depression; pulmonary edema	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately

1.3.1 – 1.3.15	Cadmium	7440-43-9	None	0.005 mg/m3 9 mg/m3	Soil	inhalation, ingestion	pulmonary edema, dyspnea (breathing difficulty), cough, chest tightness, substernal (occurring beneath the sternum) pain; headache; chills, muscle aches; nausea, vomiting, diarrhea; anosmia (loss of the sense of smell), emphysema, proteinuria, mild anemia; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	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 – 1.3.15	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

1.3.1 – 1.3.15	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 – 1.3.15	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 – 1.3.15	Chromium Total Chromium Chromium, Total	7440-47-3	None	1.0 mg/m3 250 mg/m3	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 – 1.3.15	Chrysene Benzo[a]phenanthrene 1,2-Benzphenanthrene	218-01-9	PID	0.2 mg/m3 80 mg/m3 (Coal Pitch Tar)	Groundwater Soil	inhalation, absorption, ingestion, consumption	irritation to eye, skin, and respiratory, gastrointestinal irritation nausea, vomit, diarrhea [potential occupational carcinogen]	Eyes: Irrigate immediately Skin: Soap wash promptly. Breath: Respiratory support Swallow: Medical attention immediately

1.3.1 – 1.3.15	Cobalt	7440-48-4	None	0.1mg/m3 20 mg/m3	Soil	inhalation, ingestion, skin and/or eye contact	Cough, dyspnea (breathing difficulty), wheezing, decreased pulmonary function; weight loss; dermatitis; diffuse nodular fibrosis; resp hypersensitivity, asthma	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	Copper	7440-50-8	None	1.0 mg/m3 100 mg/m3	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 – 1.3.15	Cumene Cumol Isopropylbenzene 2-Phenyl propane 1-methylethy lbenzene	98-82-8	PID	50 ppm 900 ppm	Groundwater Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, mucous membrane; dermatitis; headache, narcosis, coma	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately

1.3.1 – 1.3.15	Cyanide	57-12-5	None	5 mg/m3 25 mg/m3	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
1.3.1 – 1.3.15	Cyclohexane Benzene hexahydride Hexahydrobenzene Hexamethylene Hexanaphthene	110-82-7	PID	300 ppm 1300 ppm	Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, respiratory system; drowsiness; dermatitis; narcosis, coma	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately

1.3.1 – 1.3.15	DDT 4,4-DDT 4,4'-DDT p,p'-DDT Dichlorodiphenyltrichloroethan e 1,1,1-Trichloro-2,2-bis(p-chlorophenyl)ethane	50-29-3	None	1 mg/m3 500 mg/m3	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 – 1.3.15	Dibenz(a,h)anthracene Dibenzo(a,h)anthracene Dibenzo[a,h]anthracene	53-70-3	PID	0.2 mg/m3 80 mg/m3 (Coal Pitch Tar)	Groundwater Soil	inhalation, absorption, ingestion, consumption	irritation to eyes, skin, respiratory, and digestion [potential occupational carcinogen]	Eyes: Irrigate immediately Skin: Soap wash promptly. Breath: Respiratory support PID Swallow: Medical attention immediately
1.3.1 – 1.3.15	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 – 1.3.15	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 – 1.3.15	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 – 1.3.15	Di-n-octyl phthalate Di-n-cotylphthalate Di-n-octylphthalate Di-sec octyl phthalate Dioctyl phthalate DEHP, Di(2-ethylhexyl)phthalate, DOP, bis-(2-Ethylhexyl)phthalate, Octyl phthalate	117-84-0	None	5 mg/m3 5000 mg/m3	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 – 1.3.15	Ethanol Absolute alcohol Alcohol cologne spirit drinking alcohol ethane monoxide ethylic alcohol EtOH ethyl alcohol ethyl hydrate ethyl hydroxide ethylol grain alcohol hydroxyethane methylcarbinol	64-17-5	PID	1000 ppm 3300 ppm	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose; headache, drowsiness, lassitude (weakness, exhaustion), narcosis; cough; liver damage; anemia; reproductive, teratogenic effects	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Fresh air Swallow: Medical attention immediately

1.3.1 – 1.3.15	Ethyl benzene Ethylbenzene Ethylbenzol Phenylethane	100-41-4	PID	435 mg/m3 3,472 mg/m3	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 – 1.3.15	Ethyl chloride Chloroethane Hydrochloric ether Monochloroethane Muriatic ether Hydrochloric ether	75-00-3	PID	1000 ppm 3800 ppm	Groundwater Soil Vapor	inhalation, skin absorption (liquid), ingestion (liquid), skin and/or eye contact	incoordination, inebriation; abdominal cramps; cardiac arrhythmias, cardiac arrest; liver, kidney damage	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	Fluoranthene Benzo(j, k)fluorene	206-44-0	PID	0.2 mg/m3 80 mg/m3 (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 – 1.3.15	Fluorene	86-73-7	PID	0.2 mg/m3 80 mg/m3 (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 – 1.3.15	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 – 1.3.15	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 – 1.3.15	Helium	7440-59-7	Helium Detector	NA NA	NA	inhalation	dizziness, headache, and nausea	Breathing: Respiratory support
1.3.1 – 1.3.15	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 – 1.3.15	Hexavalent Chromium Chromium VI Chromium, Hexavalent	18540-29-9	None	1.0 mg/m3 250 mg/m3	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 – 1.3.15	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/m3 80 mg/m3 (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 – 1.3.15	Iron	7439-89-6	None	10 mg/m3 NA	Groundwater Soil	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, mucous membrane; abdominal pain, diarrhea, vomiting	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	Isopropyl alcohol Iso-Propyl Alcohol Carbinol IPA Isopropanol 2-Propanol sec-Propyl alcohol Rubbing alcohol Isopropylalcohol	67-63-0	PID	400 ppm 2000 ppm	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, nose, throat; drowsiness, dizziness, headache; dry cracking skin; in animals: narcosis	Eye: Irrigate immediately Skin: Water flush Breathing: Respiratory support Swallow: Medical attention immediately

1.3.1 – 1.3.15	Lead	7439-92-1	None	0.050 mg/m3 100 mg/m3	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 – 1.3.15	Magnesium	7439-95-4	None	15 mg/m3 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 – 1.3.15	Manganese	7439-96-5	None	5 mg/m3 500 mg/m3	Groundwater Soil	inhalation, ingestion	aerosol is irritating to the respiratory tract	Eye: Irrigate immediately Skin: Soap flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	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 – 1.3.15	Mercury	7439-97-6	None	0.1 mg/m3 10 mg/m3	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 – 1.3.15	Methoxychlor 4,4'-Methoxychlor p,p'-Dimethoxydiphenyltrichloroethane DMDT Methoxy-DDT 2,2-bis(p-Methoxyphenyl)-1,1,1-trichloroethane 1,1,1-Trichloro-2,2-bis-(p-methoxyphenyl)ethane	72-43-5	None	15 mg/m3 5000 mg/m3	Groundwater Soil Vapor	inhalation, ingestion	fasciculation, trembling, convulsions; kidney, liver damage; [potential occupational carcinogen]	Skin: Soap wash Breathing: Fresh air Swallow: Medical attention immediately
1.3.1 – 1.3.15	Methyl Bromide Bromomethane Monobromomethane	74-83-9	PID	20 ppm 250 ppm	Soil Groundwater Vapor	inhalation, skin absorption (liquid), skin and/or eye contact (liquid)	irritation to the eyes, skin, respiratory system; muscle weak, incoordination, visual disturbance, dizziness; nausea, vomiting, headache; malaise (vague feeling of discomfort); hand tremor; convulsions; dyspnea (breathing difficulty); skin vesiculation; liquid: frostbite; [potential occupational carcinogen]	Eye: Irrigate immediately (liquid) Skin: Water flush immediately (liquid) Breathing: Respiratory support

1.3.1 – 1.3.15	Methyl Chloride Chloromethane Monochloromethane Refrigerant-40 R-40	74-87-3	NA	100 ppm 2000 ppm	Groundwater Soil	inhalation, skin and/or eye contact	dizziness, nausea, vomiting; visual disturbance, stagger, slurred speech, convulsions, coma; liver, kidney damage; liquid: frostbite; reproductive, teratogenic effects; [potential occupational carcinogen]	Eye: Frostbite Skin: Frostbite Breathing: Respiratory support
1.3.1 – 1.3.15	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
1.3.1 – 1.3.15	Methylcyclohexane Methyl cyclohexane Methylcyclohexane Hexahydrotoluene Cyclohexylmethane Toluene hexahydride	108-87-2	PID	500 ppm 1200 ppm	Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat; dizziness, drowsiness; in animals: narcosis	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	Methylene Chloride Dichloromethane Methylene dichloride	75-09-2	PID	25 ppm 2300 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin; lassitude (weakness, exhaustion), drowsiness, dizziness; numb, tingle limbs; nausea; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately

1.3.1 – 1.3.15	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 – 1.3.15	Naphthalene Naphthalin Tar camphor White tar	91-20-3	PID	50 mg/m3 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 – 1.3.15	n-Butylbenzene Butylbenzene 1-phenylbutane	104-51-8	PID	NA NA	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin; dry nose, throat; headache; low blood pressure, tachycardia, abnormal cardiovascular system stress; central nervous system, hematopoietic depression; metallic taste; liver, kidney injury	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately

1.3.1 – 1.3.15	N-ethyl perfluorooctane sulfonamido acetic acid NEtFOSAA N-ethyl perfluorooctane sulfonamido acetic acid (N-EtFOSAA) N-Ethylperfluorooctanesulfonamide N-Ethyl Perfluorooctanesulfonamidoacetic Acid N-ethyl perfluorooctane-sulfonamidoacetic acid N-Ethyl-N-[(heptadecafluorooctyl)sulphonyl]glycine 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
1.3.1 – 1.3.15	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 – 1.3.15	Nickel	7440-02-0	None	NA 10 mg/m3	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 – 1.3.15	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 – 1.3.15	Non-Flammable Gas Mixture CALGAS (Equipment Calibration Gas : Oxygen Isobutylene Nitrogen	7782-44-7 115-11-7 7727-37-9	PID	NA/NA NA/NA NA/NA	NA	inhalation	dizziness, headache, and nausea	Breathing: Respiratory support
1.3.1 – 1.3.15	n-Propylbenzene Isocumene Propylbenzene 1-Phenylpropane 1-Propylbenzene Phenylpropane	103-65-1	PID	NA NA	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin; dry nose, throat; headache; low blood pressure, tachycardia, abnormal cardiovascular system stress; central nervous system, hematopoietic depression; metallic taste; liver, kidney injury	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	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 – 1.3.15	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 – 1.3.15	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 – 1.3.15	Pentachlorophenol PCP; Penta; 2,3,4,5,6-Pentachlorophenol	87-86-5	PID	0.5 mg/m3 2.5 mg/m3	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 – 1.3.15	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 – 1.3.15	Perfluorobutanoic Acid Heptafluorobutyric acid Heptafluorobutanoic acid Perfluorobutyric acid PFBA	375-22-4	NA	None None	Groundwater	inhalation, skin or eye contact, ingestion	irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	Perfluorodecanesulfonic Acid PFDS	335-77-3	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 – 1.3.15	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 – 1.3.15	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 – 1.3.15	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 – 1.3.15	Perfluoroheptanoic acid Perfluoroheptanoic acid Tridecafluoroheptanoic acid PFHpA	375-85-9	NA	None None	Groundwater	inhalation, skin or eye contact, ingestion	irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	Perfluorohexanesulfonic Acid perfluorohexanesulfonate perfluorohexanesulfonic acid Perfluorohexane-1-sulphonic 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 – 1.3.15	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 – 1.3.15	Perfluoronoanoic Acid Perfluorononanoic Acid PFNA perfluoro-n-nonanoic acid perfluorononanoate	375-95-1	NA	None None	Groundwater	Groundwater	inhalation, skin or eye contact, ingestion; strong acid	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	Perfluorooctanesulfonamide Erfluoroctylsulfonamide Perfluorooctane sulfonamide Heptadecafluorooctanesulphon amide 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 – 1.3.15	Perfluorooctanesulfonic Acid PFOS	1763-23-1	NA	None None	Groundwater	inhalation, skin or eye contact, ingestion	irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	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 – 1.3.15	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 – 1.3.15	Perfluorotetradecanoic Acid PFTA	376-06-7	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 – 1.3.15	Perfluorotridecanoic Acid PFTrDA Sodium 1H,1H,2H,2H-Perfluorodecane Sulfonate (8:2) (8:2FTS)	72629-94-8	NA	None None	Groundwater	inhalation, skin or eye contact, ingestion	irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	Perfluoroundecanoic Acid PFUnA PFUnDA Perfluoroundecanoic Acid Henicosafluoroundecanoic Acid	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 – 1.3.15	p-Ethyltoluene 4-Ethyltoluene 1-ethyl-4-methyl-benzene 1-methyl-4-ethylbenzene	622-96-8	NA	NA NA	Soil	ingestion, skin and/or eye contact	irritation to the eyes, skin, mucous membrane; headache; dermatitis; narcosis, coma	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	p-Ethyltoluene 4-Ethyltoluene 1-ethyl-4-methyl-benzene 1-methyl-4-ethylbenzene	622-96-8	NA	NA NA	Soil	ingestion, skin and/or eye contact	irritation to the eyes, skin, mucous membrane; headache; dermatitis; narcosis, coma	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	Phenanthrene	85-01-8	PID	0.2 mg/m3 80 mg/m3 (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 – 1.3.15	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

1.3.1 – 1.3.15	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 – 1.3.15	Propylene dichloride Dichloro-1,2-propane 1,2-Dichloropropane	78-87-5	PIDL	75 ppm 400 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, respiratory system; drowsiness, dizziness; liver, kidney damage; in animals: central nervous system depression; [potential occupational carcinogen]	irritation to the eyes, skin, respiratory system; drowsiness, dizziness; liver, kidney damage; in animals: central nervous system depression; [potential occupational carcinogen]

1.3.1 – 1.3.15	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
1.3.1 – 1.3.15	Pyrene benzo[def]phenanthrene	129-00-0	PID	0.2 mg/m3 80 mg/m3 (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 – 1.3.15	sec-Butylbenzene	135-98-8	PID	10 ppm 100 ppm	Groundwater Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, nose, throat; inhalation: nausea or vomiting	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately

1.3.1 – 1.3.15	Selenium	7782-49-2	None	1 mg/m3 0.2 mg/m3	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 – 1.3.15	Silver	7440-22-4	None	0.01mg/m3 10 mg/m3	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 – 1.3.15	Sodium 1H,1H,2H,2H-perfluorooctanesulfonate 2-(Perfluorohexyl)ethane-1-sulfonic Acid Sodium Salt ,3,4,4,5,5,6,6,7,7,8,8,8-Tridecafluoro-1-octanesulfonic Acid Sodium Salt; Sodium 1H,1H,2H,2H-perfluoro-1-[1,2-13C2]-octane sulfonate (6:2) Sodium Salt; 3,3,4,4,5,5,6,6,7,7,8,8,8-Tridecafluorooctane-1-sulfonic Acid Sodium Salt; 3,3,4,4,5,5,6,6,7,7,8,8,8-Tridecafluorooctanesulfonic Acid Sodium Salt; 6:2 FTS Impurity: Sodium 1H, 1H, 2H, 2H-Perfluorooctane Sulfonic (6:2) Sodium 1H,1H,2H,2H-Perfluorooctane Sulfonate (6:2)	27619-94-9	NA	None None	Groundwater	inhalation, skin or eye contact, ingestion	irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately

1.3.1 – 1.3.15	Styrene Ethenyl benzene Phenylethylene Styrene monomer Styrol Vinyl benzene	100-42-5	PID	100 ppm 700 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, nose, respiratory system; headache, lassitude (weakness, exhaustion), dizziness, confusion, malaise (vague feeling of discomfort), drowsiness, unsteady gait; narcosis; defatting dermatitis; possible liver injury; reproductive effects	Eye: Irrigate immediately Skin: Water flush Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	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 – 1.3.15	tert-Butylbenzene t-Butylbenzene 2-Methyl-2-phenylpropane Pseudobutylbenzene	98-06-6	PID	10 ppm NA	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	eye, skin irritation; dry nose, throat; headaches; low blood pressure, tachycardia; abnormal cardiovascular system; central nervous system depression; hematopoietic depression	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.15	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 – 1.3.15	Thallium	7440-28-0	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 – 1.3.15	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 – 1.3.15	Total PCBs Chlorodiphenyl (42% chlorine) Aroclor® 1242 PCB Polychlorinated biphenyl	53469-21-9	None	0.5 mg/m3 5 mg/m3	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 – 1.3.15	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 – 1.3.15	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 – 1.3.15	Trichlorofluoromethane Fluorotrichloromethane Freon® 11 Monofluorotrichloromethane Refrigerant 11 Trichloromonofluoromethane Freon 11	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 – 1.3.15	Trivalent Chromium Chromium III Chromium, Trivalent	NA	None	1.0 mg/m3 250 mg/m3	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 – 1.3.15	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 – 1.3.15	Zinc	7440-62-2	None	15 mg/m3 500 mg/m3	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[2]	No Respirator, no further action
>5ppm but </= 15 ppm at the parameter of the work area	Work temporarily halted and monitoring continues If instantaneous readings decrease below 5 ppm above background, work activities will resume with continued monitoring
>5ppm but </= 25 ppm at the downwind parameter of the hot zone	Work activities will be halted Source of vapors identified Corrective actions taken to abate emissions Continued monitoring Workers will don appropriate respirators and work can resume if vapor levels 200 feet downwind or the hot zone or half the distance to the nearest potential receptor or residential/commercial structure, Work can continue when vapor levels be whichever is less – but in no case less than 20 feet, is below 5 ppm above background for the 15-minute average
>25ppm at the parameter of the hot zone	Activities will shut down

Particulate Monitoring Action Levels	**Action Required**
Background to 100 micrograms per cubic meter ($\mu g/m^3$)[3] , no dust observed	No further action
Background to 100 $\mu g/m^3$, dust observed leaving the work area	Dust suppression must be employed
100 to 150 $\mu g/m^3$ at the downwind parameter of the hot zone	Work activities will be halted Source of dust identified Dust suppression activities initiated Corrective actions taken to abate emissions Continued monitoring Workers will don appropriate respirators 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.
>150 $\mu g/m^3$ at the parameter of the hot zone	Activities will shut down

[2] VOC concentrations are 15-minute averages above site background (upwind parameter)
[3] Particulate concentrations are 15 minute averages above site background (upwind parameter)

TABLE 5
EMERGENCY NOTIFICATION LIST

ORGANIZATION	CONTACT	TELEPHONE
Local Police Department		911
Local Fire Department		911
Ambulance/Rescue Squad		911
Hospital	Bronx-Lebanon Hospital Center	911 or 718-590-1800
Langan Incident Hotline		800-952-6426 ex 4699
Medical Treatment Hotline	Incident Intervention	888-449-7787
Langan Environmental Project Manager	Julia Leung Brian Gochenaur	917-892-3222 (cell) 347-320-2756 (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	Yehoshua Fruchthandler	212-266-8293
National Response Center (NRC)		800-424-8802
Chemical Transportation Emergency Center (Chemtrec)		800-424-9300
Center for Disease Control (CDC)		404-639-3534
EPA (RCRA Superfund Hotline)		800-424-9346
TSCA Hotline		202-554-1404
Poison Control Center		800-222-1222

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

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

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

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

a For work levels of 250 kilocalories/hour.

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

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

TABLE 7

HEAT INDEX

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

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

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

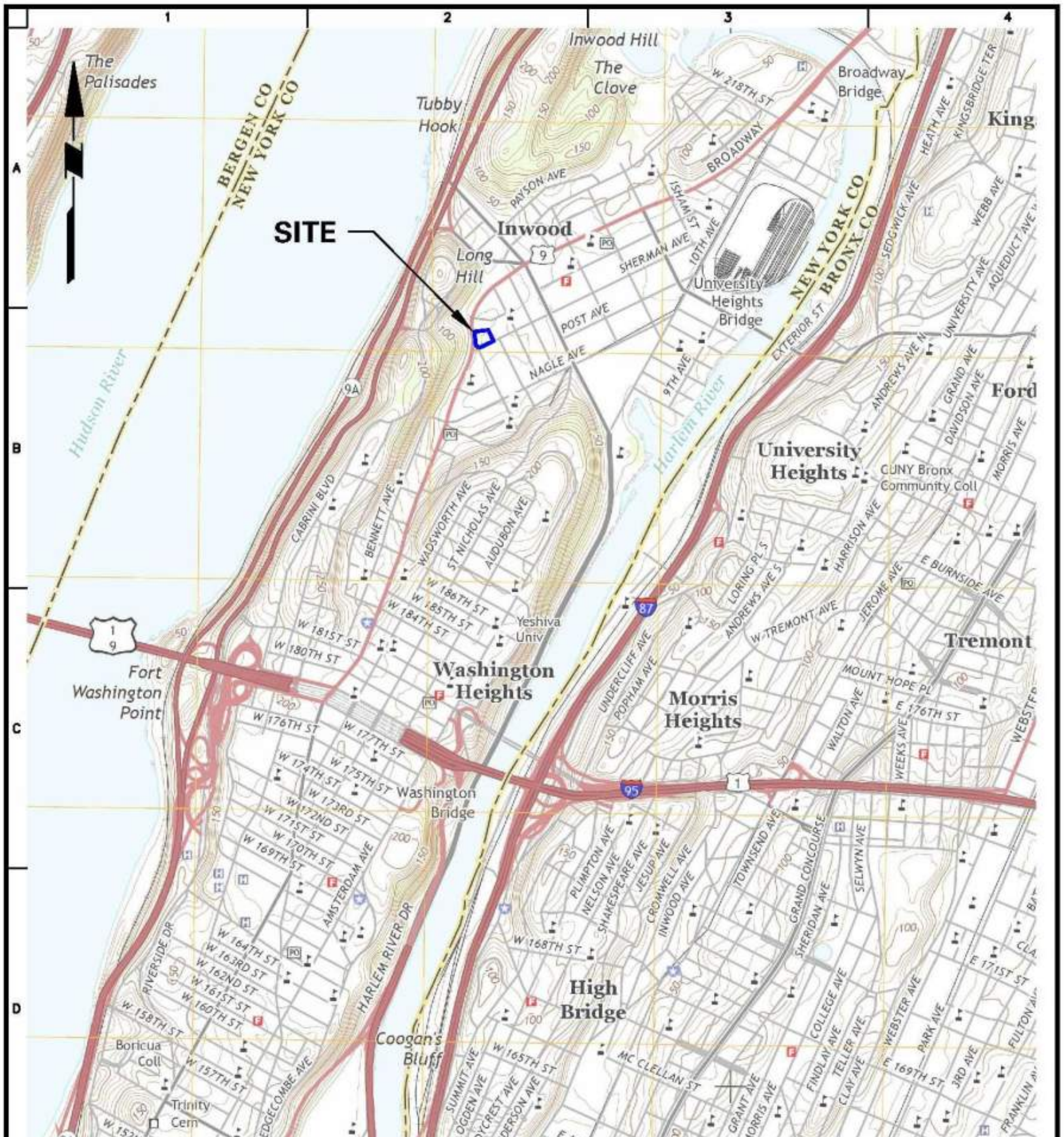
Note: Exposure to full sunshine can increase Heat Index values by up to 15 degrees F.

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

FIGURES

FIGURE 1

Site Location Map



BASEMAP REFERENCE: USGS 7.5-MINUTE SERIES QUADRANGLE MAP OF CENTRAL PARK, NY, DATED 2016

2000 0 1000 2000

SCALE IN FEET

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

LANGAN	Project	Figure Title	Project No.	Figure No.
21 Penn Plaza, 360 West 31st Street, 8th Floor New York, NY 10001 T: 212.479.5400 F: 212.479.5444 www.langan.com	4650 BROADWAY	SITE LOCATION MAP	170505501	1
Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C. S.A. Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C. Langan Engineering and Environmental Services, Inc. Langan CT, Inc. Langan International LLC Collectively known as Langan	BLOCK No. 2175, LOT No.1		Date 11/30/2017	
	NEW YORK NEW YORK		Scale 1" = 2,000'	
			Drawn By KMS / Checked By SK	
			Submission Date DECEMBER 2017	Sheet 1 of 2

Filename: \\langan.com\data\NYC\data5\170505501\Project Data\CAD\Environmental\Phase I ESA\Phase I Figures_recover.dwg Date: 12/6/2017 Time: 12:21 User: ksimmons Style Table: Langan.stb Layout: Fig 1 - Site Location Map

FIGURE 2
HOSPITAL ROUTE PLAN

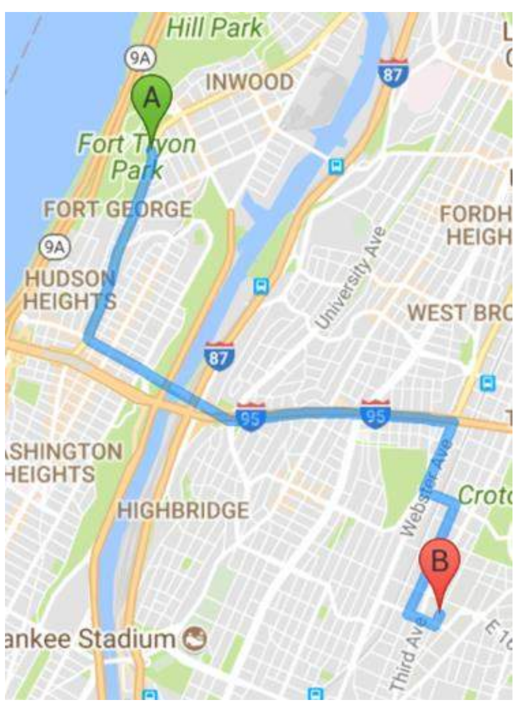
HOSPITAL ROUTE PLAN

Hospital Location: **Bronx-Lebanon Hospital Center**
1276 Fulton Avenue
Bronx, New York
718-590-1800

START: 4650 Broadway, New York, NY

1. Head south on Broadway toward Sherman Avenue
2. Turn left onto West 181st Street
3. Continue onto McNally Plaza
4. Continue onto Washing Bridge
5. Keep left at the fork, follow signs for I-95 N/I-87/Cross Bronx Expy/New England/Eastern L.I. and merge onto I-95 N
6. Take exit 2B for Webster Avenue
7. Turn right onto Webster Avenue
8. Turn left onto Claremont Parkway
9. Turn right onto Washington Avenue
10. Turn left onto East 168th Street
11. Turn left onto Fulton Avenue, destination will be on the right.

END: Bronx-Lebanon Hospital Center, 1276 Fulton Avenue, Bronx, NY



ATTACHMENT A

STANDING ORDERS

STANDING ORDERS

GENERAL

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

TOOLS AND HEAVY EQUIPMENT

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

ATTACHMENT B

DECONTAMINATION PROCEDURES

PERSONNEL DECONTAMINATION

LEVEL C DECONTAMINATION

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

LEVEL D DECONTAMINATION

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

EQUIPMENT DECONTAMINATION

GENERAL:

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

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

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

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

MONITORING EQUIPMENT:

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

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

RESPIRATORS:

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

ATTACHMENT C

EMPLOYEE EXPOSURE/
INJURY INCIDENT REPORT

EMPLOYEE INCIDENT/INJURY REPORT
LANGAN ENGINEERING & ENVIRONMENTAL SERVICES

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

Affected Employee Name: ________________________________ Date: ____

Incident type: ☐ Injury ☐ Report Only/No Injury

☐ Near Miss ☐ Other: ___________________________________ _______

EMPLOYEE INFORMATION (Person completing Form)

Employee Name: _________________________________ Employee No: ____

Title: ____ Office Location: ____

Length of time employed or date of hire: ____

Mailing address: ____

____

Sex: M ☐ F ☐ Birth date: ____________

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

ACCIDENT INFORMATION

Project: ____ Project #: ____

Date & time of incident: ________________________ Time work started & ended: ____

Site location: ____

Incident Type: Possible Exposure ☐ Exposure ☐ Physical Injury ☐

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

____

Exact location incident occurred:

____

____

Describe work being done:___________________________________

____

____

____

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

____

____

____

Describe in detail how the incident occurred:

____

____

____

____

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

____

____

____

____

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

____

____

List the names of other persons affected during this incident:

____

____

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

____

____

Weather conditions during incident:
____

MEDICAL CARE INFORMATION

Did affected employee receive medical care? Yes ☐ No ☐

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

____

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

____

Length of stay at the facility? ________

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

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

Has the employee returned to work? Yes ☐ No ☐

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

If Yes, please describe:
____

____

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

If Yes, please describe:
____

HEALTH & SAFETY INFORMATION

Was the operation being conducted under an established site specific 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

MATERIAL SAFETY DATA SHEETS

SAFETY DATA SHEETS

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

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

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

ATTACHMENT F

JOBSITE SAFETY INSPECTION CHECKLIST

Jobsite Safety Inspection Checklist

Date: ______________________ **Inspected By:** ______________________

Location: ______________________ **Project #:** ______________________

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

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

____

____

____

Notes: ______________________________

____

____

____

ATTACHMENT G

JOB SAFETY ANALYSIS FORM

LANGAN

Job Safety Analysis (JSA)
Health and Safety

JSA TITLE: **JSA NUMBER:**	**DATE CREATED:** **CREATED BY:** **REVISION DATE:** **REVISED BY:**

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

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

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

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

LANGAN

Job Safety Analysis (JSA)
Health and Safety

JSA Title: 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: **Subsurface Investigation**
JSA Number: **JSA030-01**

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

S – Stop, *what has changed?*
T – Think *about the task*
E – Evaluate *potential hazards*
P – Plan *safe approach*
S - Start *task /* **Stop** *& regroup*

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

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

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

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

LANGAN	Job Safety Analysis (JSA) Health and Safety
JSA Title: **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.	**S – Stop**, *what has changed?* **T – Think** *about the task* **E – Evaluate** *potential hazards* **P – Plan** *safe approach* **S - Start** *task /* **Stop** *& regroup*

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
5. Drive to sample location	6. Rough/Off Road terrain	1. Pay attention to road conditions such as road erosion, unprotected embankments, and soft road conditions.
6. 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.
7. 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.
8. 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.)		

<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: 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.

S – Stop, *what has changed?*
T – Think *about the task*
E – Evaluate *potential hazards*
P – Plan *safe approach*
S - Start *task /* **Stop** *& regroup*

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
9. Unpack/Transport equipment to work area.	7. Back Strains 8. Slip/Trips/Falls 9. Cuts/Abrasions from equipment 4. Contusions from dropped equipment	6. Use proper lifting techniques/Use wheeled transport 7. Minimize distance to work area/Unobstructed path to work area/follow good housekeeping procedures. Mark slip/trip/fall hazards with orange safety cones. 8. Wear proper PPE (leather gloves, long sleeves). 4. Wear proper PPE (Langan approved safety shoes).
10.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.
11.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.
12.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.
13.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
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 19. Heat Stress/ Cold Stress 20. Eye Injuries	17. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards 18. 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 19. Wear Langan approved safety shoes 20. Use proper lifting techniques / Consider load location, task repetition, and load weigh when evaluating what is safe or unsafe to lift / Obtain assistance when possible 21. Wear high visibility clothing & vest / Use cones or signs to designate work area 22. Be aware of surroundings at all times, including the presence of wildlife/ Do not approach stray dogs / Carry/use dog/animal repellant / Use bug spray when needed 23. Wear hearing protection 24. Wear hard hat / Avoid areas were overhead hazards exist. 25. Wear proper attire for weather conditions (sunscreen or protective clothing in sunlight, layers for cold weather) / Drink plenty of fluids to avoid dehydration / Takes breaks as necessary to avoid heat/cold stress 26. Wear safety glasses
Additional items.		
Additional Items identified while in the field. (Delete row if not needed.)		

<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: **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.

S – ***Stop,*** *what has changed?*
T – ***Think*** *about the task*
E – ***Evaluate*** *potential hazards*
P – ***Plan*** *safe approach*
S - ***Start*** *task /* ***Stop*** *& regroup*

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. Transport equipment to work area	10. Back Strain 11. Slips/ Trips/ Falls 12. Traffic 13. Cuts/abrasions from equipment 14. Contusions from dropped equipment	1. Use proper lifting techniques / Use wheeled transport 2. Minimize distance to work area / Have unobstructed path to work area / Follow good housekeeping procedures 3. Wear proper PPE (high visibility vest or clothing) 4. Wear proper PPE (leather gloves, long sleeves) 5. Wear proper PPE (safety shoes)
16. 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
17. 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
18. All activities	21. Slips/ Trips/ Falls 22. Hand injuries, cuts or lacerations during manual handling of materials 23. Foot injuries 24. Back injuries 25. Traffic 26. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.) 27. High Noise levels 28. Overhead hazards	27. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards 28. Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery or dirty objects before handling / Wear leather/ cut-resistant gloves 29. Wear Langan approved safety shoes 30. Use proper lifting techniques / Consider load location, task repetition, and load weigh when evaluating what is safe or unsafe to lift / Obtain assistance when possible

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
4. All activities (cont'd)	29. Heat Stress/ Cold Stress 30. Eye Injuries	31. Wear high visibility clothing & vest / Use cones or signs to designate work area 32. Be aware of surroundings at all times, including the presence of wildlife/ Do not approach stray dogs / Carry/use dog/animal repellant / Use bug spray when needed 33. Wear hearing protection 34. Wear hard hat / Avoid areas were overhead hazards exist. 35. Wear proper attire for weather conditions (sunscreen or protective clothing in sunlight, layers for cold weather) / Drink plenty of fluids to avoid dehydration / Takes breaks as necessary to avoid heat/cold stress 36. Wear safety glasses
Additional items.		
Additional Items identified while in the field. (Delete row if not needed.)		

Print Name	Sign Name	Date
Prepared by:		
Reviewed by:		

LANGAN

Job Safety Analysis (JSA)
Health and Safety

JSA Title: **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.

S – Stop, *what has changed?*
T – Think *about the task*
E – Evaluate *potential hazards*
P – Plan *safe approach*
S - Start *task /* **Stop** *& regroup*

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
19.Unpack/Transport equipment to work area.	15.Back Strains 16.Slip/Trips/Falls 17.Cuts/Abrasions from equipment 18.Contusions from dropped equipment	9. Use proper lifting techniques/Use wheeled transport 10. Minimize distance to work area/Unobstructed path to work area/follow good housekeeping procedures. Mark slip/trip/fall hazards with orange safety cones. 11. Wear proper PPE (leather gloves, long sleeves). 12. Wear proper PPE (Langan approved safety shoes).
20.Initial Site Arrival-Site Assessment	9. Traffic	7. Situational awareness (be alert of your surroundings). Secure area from through traffic.
21.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.
22.Sampling from bridges	3. Struck by vehicles	3. Wear appropriate PPE (Safety Vest). Use buddy system and orange safety cones.
23. Icing of Samples/ Transporting coolers/equipment from work area.	31. Back Strains 32. Slips/Trips/Falls 33. Cuts/Abrasions from equipment 34. Pinch/Crushing Hazards.	37. Drain coolers of water. Use proper lifting techniques. Use wheeled transport. 38. Have unobstructed path from work area. Aware of surroundings. 39. Wear proper PPE (Leather gloves, long sleeves) 40. Wear proper PPE (Leather gloves, long sleeves)
24. 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.
25. 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 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	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 41. Wear high visibility clothing & vest / Use cones or signs to designate work area 42. Be aware of surroundings at all times, including the presence of wildlife/ Do not approach stray dogs / Carry/use dog/animal repellant / Use bug spray when needed 43. Wear hearing protection 44. Wear hard hat / Avoid areas were overhead hazards exist. 45. Wear proper attire for weather conditions (sunscreen or protective clothing in sunlight, layers for cold weather) / Drink plenty of fluids to avoid dehydration / Takes breaks as necessary to avoid heat/cold stress 46. Wear safety glasses
Additional items.		
Additional Items identified while in the field. (Delete row if not needed.)		

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

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

JSA Title: **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.

S – *Stop,* *what has changed?*
T – *Think* *about the task*
E – *Evaluate* *potential hazards*
P – *Plan* *safe approach*
S - *Start* *task /* ***Stop*** *& regroup*

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
26. Transport equipment to work area	19. Back Strain 20. Slips/Trips/Falls 21. Traffic 22. Cuts/abrasions/contusions from equipment	13. Use proper lifting techniques / Use wheeled transport 14. Minimize distance to work area / Have unobstructed path to work area / Follow good housekeeping procedures 15. Wear proper PPE (high visibility vest or clothing) 16. Wear proper PPE (leather gloves, long sleeves, safety shoes)
27.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)
28.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
29.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
30. All activities	41. Slips/ Trips/ Falls 42. Hand injuries, cuts or lacerations during manual handling of materials 43. Foot injuries 44. Back injuries	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

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
	45. Traffic 46. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.) 47. High Noise levels 48. Overhead hazards 49. Heat Stress/ Cold Stress 50. Eye Injuries	49. Wear proper PPE (Langan approved safety shoes) 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: **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.

S – Stop, *what has changed?*
T – Think *about the task*
E – Evaluate *potential hazards*
P – Plan *safe approach*
S - Start *task /* **Stop** *& regroup*

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
31.Transport equipment to work area	23.Back Strain 24.Slips/ Trips/ Falls 25.Traffic 26.Cuts/abrasions from equipment 27.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)
32.Installation of piping from vapor wells to skid connections and from discharge pipping to effluent stack	11. Pinch fingers when connecting pipes 12.Slips/ Trips/ Falls 13.Machinery Hazards	3. Wear proper PPE (leather gloves) 4. 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 5. Wear proper PPE (safety vest) / Maintain safe distance from operating machinery
33.Remediation equipment installation	13. Back strain when lifting heavy equipment 14. Slips/ Trips/ Falls 15. Traffic	5. Use proper lifting techniques / Use wheeled transport / Minimize distance to vehicle 6. 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 7. Wear proper PPE (safety vest)
34. All activities	51. Slips/ Trips/ Falls 52. Hand injuries, cuts or lacerations during manual handling of materials 53. Foot injuries 54. Back injuries 55. Traffic	57. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards 58. Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery or dirty objects before handling / Wear leather/ cut-resistant gloves 59. Wear Langan approved safety shoes

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
4. All activities (cont'd)	56. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.) 57. High Noise levels 58. Overhead hazards 59. Heat Stress/ Cold Stress 60. Eye Injuries	60. Use proper lifting techniques / Consider load location, task repetition, and load weigh when evaluating what is safe or unsafe to lift / Obtain assistance when possible 61. Wear high visibility clothing & vest / Use cones or signs to designate work area 62. Be aware of surroundings at all times, including the presence of wildlife/ Do not approach stray dogs / Carry/use dog/animal repellant / Use bug spray when needed 63. Wear hearing protection 64. Wear hard hat / Avoid areas were overhead hazards exist. 65. Wear proper attire for weather conditions (sunscreen or protective clothing in sunlight, layers for cold weather) / Drink plenty of fluids to avoid dehydration / Takes breaks as necessary to avoid heat/cold stress 66. Wear safety glasses
Additional items.		
Additional Items identified while in the field. (Delete row if not needed.)		

Print Name	Sign Name	Date
Prepared by:		
Reviewed by:		

LANGAN

Job Safety Analysis (JSA)
Health and Safety

JSA Title: **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.

<u>S</u> – ***Stop***, *what has changed?*
<u>T</u> – ***Think*** *about the task*
<u>E</u> – ***Evaluate*** *potential hazards*
<u>P</u> – ***Plan*** *safe approach*
<u>S</u> - ***Start*** *task /* ***Stop*** *& regroup*

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
35. Move equipment to work site	28. Back strain when lifting equipment 29. Slips/ Trips/ Falls while moving equipment 30. Traffic (if applicable) 31. Pinched fingers or running over toes during geoprobe set-up 32. 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
36. Calibration of monitoring equipment	14. Skin or eye contact with calibration chemicals 15. Pinch fingers in monitoring equipment	10. Wear proper PPE (safety glasses/ goggles) 11. Wear proper PPE (leather gloves)
37. Set-up geoprobe rig	16. Geoprobe rig movement	11. All field personnel should stay clear of the geoprobe rig while moving / Use a spotter when backing up the geoprobe
38. 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)
39. Remove and open acetate liner	61. 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)	62. Cuts/lacerations when cutting acetate liner open 63. Exposure to hazardous vapors 64. 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)
40. 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
41. 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	67. Use drum cart for moving drums / Use proper lifting techniques / Do not lift heavy loads without assistance 68. Wear proper PPE (cut-resistant or leather gloves) 69. Wear proper PPE (cut-resistant or leather gloves) 70. Wear proper PPE (nitrile gloves underneath work gloves) 71. Follow good housekeeping procedures / Ensure route to move drum and storage space is free from obstructions 72. 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: Site Inspection
JSA Number: JSA024-01

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

S – ***Stop,*** *what has changed?*
T – ***Think*** *about the task*
E – ***Evaluate*** *potential hazards*
P – ***Plan*** *safe approach*
S - ***Start*** *task /* ***Stop*** *& regroup*

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
42. Jobsite Pre-briefing	33. None	22. Review JSA, SOP's, and discuss hazards that may be present and control measures for present hazards while on-site.

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
2. Working near railroads	1. Passing Trains. 2. Slip/Trips/Falls.	1. Wear reflective vest/ Stay away from tracks/ Do not cross tracks within 10 ft. of train car or when there is a train within view/listen for train horn. 2. Be aware of tripping hazards/ Follow good housekeeping procedures/ Mark significant hazards with spray paint or cones.
3. Walking around site	6. Uneven terrain 7. Wildlife: Stray animals, mice/rats, vectors (i.e. mosquitoes, bees, etc.) 8. Weather: Heat/cold stress 9. Slip/Trips/Falls 10. Foot injuries 11. Eye injuries	9. Pay attention to surrounding area (puddles, wet, frozen, uneven areas); Mark with cones or spray paint. 10. Use bug spray/ Avoid stray animals/Use repellant when needed. 11. Dress for the correct weather situation/ Use sunscreen or protective clothing in sunlight, layers in cold weather/ Drink plenty of fluids/ Take breaks when needed. 4. Be aware of tripping hazards/ Follow good housekeeping procedures/ Mark significant hazards with spray paint or cones. 5. Wear proper PPE (Langan approved safety shoes)/ Change wet socks during cold weather. 6. Wear proper PPE (safety glasses/goggles).
4. Working near road	1. Passing vehicles 2. Slip/Trips/Falls	1. Wear reflective vest/ Stay away from roadway/ Use buddy system/ Place signage or cones when needed. 2. Be aware of tripping hazards/ Follow good housekeeping procedures/ Mark significant hazards with spray paint or cones.
5. All activities	65. Slips/ Trips/ Falls 66. Hand injuries, cuts or lacerations during manual handling of materials 67. Foot injuries 68. Back injuries 69. Traffic 70. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.) 71. High Noise levels 72. Overhead hazards 73. Heat Stress/ Cold Stress 74. Eye Injuries	73. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards 74. Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery or dirty objects before handling / Wear leather/ cut-resistant gloves 75. Wear Langan approved safety shoes 76. Use proper lifting techniques / Consider load location, task repetition, and load weigh when evaluating what is safe or unsafe to lift / Obtain assistance when possible 77. Wear high visibility clothing & vest / Use cones or signs to designate work area 78. Be aware of surroundings at all times, including the presence of wildlife/ Do not approach stray dogs / Carry/use dog/animal repellant / Use bug spray when needed 79. Wear hearing protection 80. Wear hard hat / Avoid areas were overhead hazards exist. 81. Wear proper attire for weather conditions (sunscreen or protective clothing in sunlight, layers for cold weather) / Drink plenty of fluids to avoid dehydration / Takes breaks as necessary to avoid heat/cold stress 82. Wear safety glasses
Additional items.		

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
Additional Items identified while in the field. (Delete row if not needed.)		

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

LANGAN

Job Safety Analysis (JSA)
Health and Safety

JSA Title: **Building Construction Oversight**
JSA Number: **JSA006-01**

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

S – ***Stop,*** *what has changed?*
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S - ***Start*** *task /* ***Stop*** *& regroup*

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
43.Transport equipment to work area	34.Back Strain 35.Slips/ Trips/ Falls 36.Traffic 37.Cuts/abrasions from equipment 38.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)
44.Drilling/anchor boilt installation	16. Hazards associated with drilling, flying objects, heavy equipment, ground level hazards and dust 17.Slips/ Trips/ Falls 18.Hazards associated with concrete work	6. Maintain a safe distance from drilling operation / Wear proper PPE (hard hat, safety glasses, safety shoes, safety vest) 7. Be aware of potential trip hazards / Follow good housekeeping procedures / Mark significant below-grade hazards (i.e. holes, trenches) with safety cones or spray paint / Wear the proper PPE (safety shoes) 8. Maintain a safe distance from pouring operation
45.Steel building erection	17. Overhead hazards, falling objects 18. Pinching/crushing hazards	8. Wear proper PPE (hard had, safety glasses, safety vest) / Be aware of overhead hazards and maintain a safe distance of at least 10 ft. 9. All personnel should make others aware of moving objects or their inten to move objects / Avoid areas where pinching and crushing hazards are possible
46. All activities	75. Slips/ Trips/ Falls 76. Hand injuries, cuts or lacerations during manual handling of materials 77. Foot injuries 78. Back injuries 79. Traffic	83. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards 84. Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery or dirty objects before handling / Wear leather/ cut-resistant gloves 85. Wear Langan approved safety shoes

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
4. All activities (cont'd)	80. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.) 81. High Noise levels 82. Overhead hazards 83. Heat Stress/ Cold Stress 84. Eye Injuries	86. Use proper lifting techniques / Consider load location, task repetition, and load weigh when evaluating what is safe or unsafe to lift / Obtain assistance when possible 87. Wear high visibility clothing & vest / Use cones or signs to designate work area 88. Be aware of surroundings at all times, including the presence of wildlife/ Do not approach stray dogs / Carry/use dog/animal repellant / Use bug spray when needed 89. Wear hearing protection 90. Wear hard hat / Avoid areas were overhead hazards exist. 91. Wear proper attire for weather conditions (sunscreen or protective clothing in sunlight, layers for cold weather) / Drink plenty of fluids to avoid dehydration / Takes breaks as necessary to avoid heat/cold stress 92. Wear safety glasses
Additional items.		
Additional Items identified while in the field. (Delete row if not needed.)		

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

LANGAN

Job Safety Analysis (JSA)
Health and Safety

JSA Title: **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.

S – Stop, *what has changed?*
T – Think *about the task*
E – Evaluate *potential hazards*
P – Plan *safe approach*
S - Start *task /* **Stop** *& regroup*

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
47.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)
48. Remove well cover	19.Scrape knuckles/hand 20.Strain wrist/bruise palm 21.Pinch fingers or hand	9. Wear proper PPE (leather gloves) 10. Using a hammer, tap the end of the wrench to loosen grip of bolts 11. Wear proper PPE (leather gloves)
49. Remove well cap and lock	19. Well can pops from pressure 20. Exposure to hazardous substances through inhalation or dermal exposure 21. Scrape knuckles/hand 22. Strain write/bruise palm	10. Remove cap slowly to relieve pressure / Do not place face over well when opening / Wear proper PPE (safety glasses) 11. Use direct air monitoring/reading instrument (i.e. PID) / Be familiar with and follow actions prescribed in the HASP / Wear proper PPE (nitrile gloves) 12. Wear proper PPE (leather gloves) 13. Using hammer, tap the end of the wrench to loosen grip
50. Measure head-space vapor levels	1. Exposure to hazardous substances through inhalation	1. Do not place face over well when collecting measurement
51. 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)
52. 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

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
53. 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)
54. 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
55. 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	85. Slips/ Trips/ Falls 86. Hand injuries, cuts or lacerations during manual handling of materials 87. Foot injuries 88. Back injuries 89. Traffic 90. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.)	93. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards 94. Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery or dirty objects before handling / Wear leather/ cut-resistant gloves 95. Wear Langan approved safety shoes

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
	91. High Noise levels 92. Overhead hazards 93. Heat Stress/ Cold Stress 94. Eye Injuries	96. Use proper lifting techniques / Consider load location, task repetition, and load weigh when evaluating what is safe or unsafe to lift / Obtain assistance when possible 97. Wear high visibility clothing & vest / Use cones or signs to designate work area 98. Be aware of surroundings at all times, including the presence of wildlife/ Do not approach stray dogs / Carry/use dog/animal repellant / Use bug spray when needed 99. Wear hearing protection 100. Wear hard hat / Avoid areas were overhead hazards exist. 101. Wear proper attire for weather conditions (sunscreen or protective clothing in sunlight, layers for cold weather) / Drink plenty of fluids to avoid dehydration / Takes breaks as necessary to avoid heat/cold stress 102. Wear safety glasses
Additional items.		
Additional Items identified while in the field. (Delete row if not needed.)		

Print Name	Sign Name	Date
Prepared by:		
Reviewed by:		

LANGAN

Job Safety Analysis (JSA)
Health and Safety

JSA Title: **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.

S – Stop, *what has changed?*
T – Think *about the task*
E – Evaluate *potential hazards*
P – Plan *safe approach*
S - Start *task /* **Stop** *& regroup*

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
56.Move equipment to work site	39.Back strain when lifting equipment 40.Slips/ Trips/ Falls while moving equipment 41.Traffic (if applicable) 42.Pinched fingers or running over toes during geoprobe set-up 43.Overturn drilling rig while transporting to loading dock on flat-bed tow truck	23. 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 24. 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 25. Wear high visibility safety vests or clothing / Exercise caution 26. Wear proper PPE (cut-resistant gloves) / Stay alert, be aware of geoprobe rig at all times 27. 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
57.Calibration of monitoring equipment	22.Skin or eye contact with calibration chemicals 23.Pinch fingers in monitoring equipment	12. Wear proper PPE (safety glasses/ goggles) 13. Wear proper PPE (leather gloves)
14. Set-up geoprobe rig	23. 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	12. Underground utilities 13. High noise levels	12. Clean all subsurface soil borings to a minimum of 5 feet below grade 13. 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)	95. Pinched fingers while removing macrocore 96. Cuts/lacerations when cutting acetate liner open 97. Exposure to hazardous vapors 98. 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	103. Use drum cart for moving drums / Use proper lifting techniques / Do not lift heavy loads without assistance 104. Wear proper PPE (cut-resistant or leather gloves) 105. Wear proper PPE (cut-resistant or leather gloves) 106. Wear proper PPE (nitrile gloves underneath work gloves) 107. Follow good housekeeping procedures / Ensure route to move drum and storage space is free from obstructions 108. 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.)		

<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: **Monitoring Well Development** **JSA Number:** **JSA026-01**	TAKE 5
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.	S – ***Stop,*** *what has changed?* T – ***Think*** *about the task* E – ***Evaluate*** *potential hazards* P – ***Plan*** *safe approach* S - ***Start*** *task /* ***Stop*** *& regroup*

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
58. Transport equipment to work area	44. Back Strains 45. Slips/Trips/Falls 46. Traffic 47. Cuts/Abrasions/Contusions from equipment	28. Use proper lifting techniques/ Use wheeled transport/ use buddy system when lifting equipment. 29. Minimize distance from work area/ unobstructed path to collection points and vehicle/ Follow good housekeeping procedures. 30. Wear high-visibility vest or clothing/Exercise caution/ Use traffic cones or signage if needed. 31. Wear proper PPE (leather gloves, long sleeves, Langan approved safety shoes).
59. Measure depth of water	24. Exposure to hazardous substances 25. Pinched fingers	17. Wear proper PPE (Nitrile gloves, Safety glasses/Face shield). 18. Wear proper PPE (cut-resistant gloves).
60. Install Tremie pipe in the monitoring well and connect to water source.	24. Hand injuries during installation (pinched fingers/hands). 25. Back strain from holding Tremie pipe. 26. 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).
61. 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	14. Hand injuries during pump installation and sample tubing cutting. 15. Back strain 16. Electric shock 17. Exhaust gases from generator 18. Burns from hot equipment	14. Wear proper PPE when installing pump and cutting sample tubing (Nitrile and cut-resistant gloves)/ Use tubing cutter. 15. 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. 16. 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)		17. Position generator so that exhaust is flowing away from work area. 18. 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)
62. 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.	99. Hand injuries 100. Face injuries 101. Contaminated spray from water	109. Wear proper PPE (cut-resistant gloves and nitrile gloves). 110. Wear proper PPE (face shield and safety glasses)/do not stand over well opening. 111. 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.
63. 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.
64. 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. 112. Wear proper PPE (leather gloves, long sleeves, Langan approved safety shoes).
65. All activities	1. Slips/ Trips/ Falls 2. Hand injuries, cuts or lacerations during manual handling of materials 3. Foot injuries 102. Back injuries 103. Traffic 104. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.) 105. High Noise levels 106. Overhead hazards 107. Heat Stress/ Cold Stress 108. 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:		

ATTACHMENT H

TAILGATE SAFETY BRIEFING FORM

LANGAN TAILGATE SAFETY BRIEFING

Date:__________________________ Time: ______________________________________

Leader:_______________________________ Location:____________________________________

Work Task:

____

____

SAFETY TOPICS (*provide some detail of discussion points*)

Chemical Exposure Hazards and Control:____

____

Physical Hazards and Control: ____

Air Monitoring: ____

PPE: ____

______

Communications:____

Safe Work Practices: ____

____

Emergency Response: ____

Hospital/Medical Center Location: ____

Phone Nos.: ____

Other: ____

FOR FOLLOW-UP (the issues, responsibilities, due dates, etc.)

____

____

____

ATTENDEES

PRINT NAME	COMPANY	SIGNATURE

APPENDIX F

CITIZEN PARTICIPATION PLAN

NEW YORK STATE OF OPPORTUNITY. | Department of Environmental Conservation

Brownfield Cleanup Program

Citizen Participation Plan
for
4650 Broadway
C231123

January 2019

4650 Broadway
New York, NY 10040

www.dec.ny.gov

Contents

*** * * * ***

Note: The information presented in this Citizen Participation Plan was current as of the date of its approval by the New York State Department of Environmental Conservation. Portions of this Citizen Participation Plan may be revised during the site's investigation and cleanup process.

Applicant: **4650 Broadway Holdings LLC**
Site Name: **4650 Broadway ("site")**
Site Address: **4650 Broadway, New York, NY 10040**
Site County: **New York County**
Site Number: **C231123**

1. What is New York's Brownfield Cleanup Program?

New York's Brownfield Cleanup Program (BCP) works with private developers to encourage the voluntary cleanup of contaminated properties known as "brownfields" so that they can be reused and developed. These uses include recreation, housing, and business.

A *brownfield* is any real property that is difficult to reuse or redevelop because of the presence or potential presence of contamination. A brownfield typically is a former industrial or commercial property where operations may have resulted in environmental contamination. A brownfield can pose environmental, legal, and financial burdens on a community. If a brownfield is not addressed, it can reduce property values in the area and affect economic development of nearby properties.

The BCP is administered by the New York State Department of Environmental Conservation (NYSDEC) which oversees Applicants who conduct brownfield site investigation and cleanup activities. An Applicant is a person who has requested to participate in the BCP and has been accepted by NYSDEC. The BCP contains investigation and cleanup requirements, ensuring that cleanups protect public health and the environment. When NYSDEC certifies that these requirements have been met, the property can be reused or redeveloped for the intended use.

For more information about the BCP, go online at:
http://www.dec.ny.gov/chemical/8450.html .

2. Citizen Participation Activities

Why NYSDEC Involves the Public and Why It Is Important

NYSDEC involves the public to improve the process of investigating and cleaning up contaminated sites, and to enable citizens to participate more fully in decisions that affect their health, environment, and social well-being. NYSDEC provides opportunities for citizen involvement and encourages early two-way communication with citizens before decision-makers form or adopt final positions.

Involving citizens affected and interested in site investigation and cleanup programs is important for many reasons. These include:

- Promoting the development of timely, effective site investigation and cleanup programs that protect public health and the environment

- Improving public access to, and understanding of, issues and information related to a particular site and that site's investigation and cleanup process

- Providing citizens with early and continuing opportunities to participate in NYSDEC's site investigation and cleanup process

- Ensuring that NYSDEC makes site investigation and cleanup decisions that benefit from input that reflects the interests and perspectives found within the affected community

- Encouraging dialogue to promote the exchange of information among the affected/interested public, State agencies, and other interested parties that strengthens trust among the parties, increases understanding of site and community issues and concerns, and improves decision making.

This Citizen Participation (CP) Plan provides information about how NYSDEC will inform and involve the public during the investigation and cleanup of the site identified above. The public information and involvement program will be carried out with assistance, as appropriate, from the Applicant.

Project Contacts

Appendix A identifies NYSDEC project contact(s) to whom the public should address questions or request information about the site's investigation and cleanup program. The public's suggestions about this CP Plan and the CP program for the site are always welcome. Interested people are encouraged to share their ideas and suggestions with the project contacts at any time.

Locations of Reports and Information

The locations of the reports and information related to the site's investigation and cleanup program also are identified in Appendix A. These locations provide convenient access to important project documents for public review and comment. Some documents may be placed on the NYSDEC web-site. If this occurs, NYSDEC will inform the public in fact sheets distributed about the site and by other means, as appropriate.

Site Contact List

Appendix B contains the site contact list. This list has been developed to keep the community informed about, and involved in, the site's investigation and cleanup process. The site contact list will be used periodically to distribute fact sheets that provide updates about the status of the project. These will include notifications of upcoming activities at the site (such as fieldwork), as well as availability of project documents and announcements about public comment periods.
The site contact list includes, at a minimum:

- Chief executive officer and planning board chairperson of each county, city, town and village in which the site is located;
- Residents, owners, and occupants of the site and properties adjacent to the site;
- The public water supplier which services the area in which the site is located;
- Any person who has requested to be placed on the site contact list;
- The administrator of any school or day care facility located on or near the site for purposes of posting and/or dissemination of information at the facility;
- Location(s) of reports and information.

The site contact list will be reviewed periodically and updated as appropriate. Individuals and organizations will be added to the site contact list upon request. Such requests should be submitted to the NYSDEC project contact(s) identified in Appendix A. Other additions to the site contact list may be made at the discretion of the NYSDEC project manager, in consultation with other NYSDEC staff as appropriate.

Note: The first site fact sheet (usually related to the draft Remedial Investigation Work Plan) is distributed both by paper mailing through the postal service and through DEC Delivers, its email listserv service. The fact sheet includes instructions for signing up with the appropriate county listserv to receive future notifications about the site. See http://www.dec.ny.gov/chemical/61092.html .

Subsequent fact sheets about the site will be distributed exclusively through the listserv, except for households without internet access that have indicated the need to continue to receive site information in paper form. Please advise the NYSDEC site project manager identified in Appendix A if that is the case. Paper mailings may continue during the investigation and cleanup process for some sites, based on public interest and need.

CP Activities

The table at the end of this section identifies the CP activities, at a minimum, that have been and will be conducted during the site's investigation and cleanup program. The flowchart in Appendix D shows how these CP activities integrate with the site investigation and cleanup process. The public is informed about these CP activities through fact sheets and notices distributed at significant points during the program. Elements of the investigation and cleanup process that match up with the CP activities are explained briefly in Section 5.

- **Notices and fact sheets** help the interested and affected public to understand contamination issues related to a site, and the nature and progress of efforts to investigate and clean up a site.

- **Public forums, comment periods and contact with project managers** provide opportunities for the public to contribute information, opinions and perspectives that have potential to influence decisions about a site's investigation and cleanup.

The public is encouraged to contact project staff at any time during the site's investigation and cleanup process with questions, comments, or requests for information.

This CP Plan may be revised due to changes in major issues of public concern identified in Section 3 or in the nature and scope of investigation and cleanup activities. Modifications may include additions to the site contact list and changes in planned citizen participation activities.

Technical Assistance Grant

NYSDEC must determine if the site poses a significant threat to public health or the environment. This determination generally is made using information developed during the investigation of the site, as described in Section 5.

If the site is determined to be a significant threat, a qualifying community group may apply for a Technical Assistance Grant (TAG). The purpose of a TAG is to provide funds to the qualifying group to obtain independent technical assistance. This assistance helps the TAG recipient to interpret and understand existing environmental information about the nature and extent of contamination related to the site and the development/implementation of a remedy.

An eligible community group must certify that its membership represents the interests of the community affected by the site, and that its members' health, economic well-being or enjoyment of the environment may be affected by a release or threatened release of contamination at the site.

As of the date the declaration (page 2) was signed by the NYSDEC project manager, the significant threat determination for the site had not yet been made.

To verify the significant threat status of the site, the interested public may contact the NYSDEC project manager identified in Appendix A.

For more information about TAGs, go online at
http://www.dec.ny.gov/regulations/2590.html

Note: The table identifying the citizen participation activities related to the site's investigation and cleanup program follows on the next page:

Citizen Participation Activities	Timing of CP Activity(ies)
Application Process:	
• Prepare site contact list • Establish document repository(ies)	At time of preparation of application to participate in the BCP.
• Publish notice in Environmental Notice Bulletin (ENB) announcing receipt of application and 30-day public comment period • Publish above ENB content in local newspaper • Mail above ENB content to site contact list • Conduct 30-day public comment period	When NYSDEC determines that BCP application is complete. The 30-day public comment period begins on date of publication of notice in ENB. End date of public comment period is as stated in ENB notice. Therefore, ENB notice, newspaper notice, and notice to the site contact list should be provided to the public at the same time.
After Execution of Brownfield Site Cleanup Agreement (BCA):	
• Prepare Citizen Participation (CP) Plan	Before start of Remedial Investigation **Note:** Applicant must submit CP Plan to NYSDEC for review and approval within 20 days of the effective date of the BCA.
Before NYSDEC Approves Remedial Investigation (RI) Work Plan:	
• Distribute fact sheet to site contact list about proposed RI activities and announcing 30-day public comment period about draft RI Work Plan • Conduct 30-day public comment period	Before NYSDEC approves RI Work Plan. If RI Work Plan is submitted with application, public comment periods will be combined and public notice will include fact sheet. Thirty-day public comment period begins/ends as per dates identified in fact sheet.
After Applicant Completes Remedial Investigation:	
• Distribute fact sheet to site contact list that describes RI results	Before NYSDEC approves RI Report
Before NYSDEC Approves Remedial Work Plan (RWP):	
• Distribute fact sheet to site contact list about draft RWP and announcing 45-day public comment period • Public meeting by NYSDEC about proposed RWP (if requested by affected community or at discretion of NYSDEC project manager) • Conduct 45-day public comment period	Before NYSDEC approves RWP. Forty-five day public comment period begins/ends as per dates identified in fact sheet. Public meeting would be held within the 45-day public comment period.
Before Applicant Starts Cleanup Action:	
• Distribute fact sheet to site contact list that describes upcoming cleanup action	Before the start of cleanup action.
After Applicant Completes Cleanup Action:	
• Distribute fact sheet to site contact list that announces that cleanup action has been completed and that NYSDEC is reviewing the Final Engineering Report • Distribute fact sheet to site contact list announcing NYSDEC approval of Final Engineering Report and issuance of Certificate of Completion (COC)	At the time the cleanup action has been completed. **Note:** The two fact sheets are combined when possible if there is not a delay in issuing the COC.

3. Major Issues of Public Concern

This section of the CP Plan identifies major issues of public concern that relate to the site. Additional major issues of public concern may be identified during the course of the site's investigation and cleanup process.

At this time, there are no known issues of public concern. However, once the remediation commences, there may be concerns regarding odors, noise or truck traffic coming from the Site since there will be building demolition and extensive soil excavation activities. A Community Air Monitoring Plan (CAMP) and a site-specific Health & Safety Plan (HASP) will be designed to minimize off-site impacts to the community.

Additional major issues of public concern may be identified during the course of the Site's cleanup process. If issues are identified, the public will be kept informed.

The Site is located in an Environmental Justice Area. Environmental justice is defined as the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.

Environmental justice efforts focus on improving the environment in communities, specifically minority and low-income communities, and addressing disproportionate adverse environmental impacts that may exist in those communities.

The Site in located in an Environmental Justice Area and has a large Hispanic-American population nearby. Therefore, all future fact sheets will need to be translated into Spanish.

4. Site Information

Appendix C contains a map identifying the location of the site.

Site Description

The site is located at 4650 Broadway in the Inwood neighborhood of New York, New York, and is identified on the Manhattan Borough Tax Map as Block 2175, Lot 1. The 47,175-square foot lot is located at the southwestern corner of the city block bound by Dongan Place to the north, Arden Street to the east, Sherman Avenue to the south, and Broadway to the west and is improved with a two-story parking garage with a full cellar and partial sub-cellar. The southern part of the building is operated by Park-it Pilot

Parking LLC as a commercial parking garage, and the northern part of the building is used to store antique cars and construction materials.

Database:

- **location – 4650 Broadway, New York, NY**
- **setting - urban**
- **site size – 1.087 Acres**
- **adjacent properties – Mix of residential, commercial, industrial and cultural use throughout the area.**

History of Site Use, Investigation, and Cleanup

The site was an undeveloped vacant lot until at least 1928. By1928 the existing two-story building with a cellar was constructed across the entire footprint of the site and was occupied by an automotive garage and service facility. By 1968, the northern portion of the building was occupied by offices with an elevator in the northwestern corner, and the southern portion of the building remained as an automotive garage and service facility. Two gasoline tanks are shown in the southwestern corner of the building in Sanborn maps from 1977 through 1994. According to NYSDEC Petroleum Bulk Storage (PBS) database records, three 550-gallon gasoline Underground Storage Tanks (USTs) were removed from the site in August 2009. Additionally, two No.2 fuel oil USTs (one 5,000-gallon and one 2,500-gallon) and one 5,000-gallon No. 4 fuel oil above ground storage tank (AST) were removed from the site in 1998. The site is listed under NYSDEC PBS Facility ID 2-077666.

Langan completed a Remedial Investigation at the site between April and September 2018 to determine, to the extent practical, the nature and extent of contamination in soil, groundwater, and soil vapor at the site and to provide data sufficient to support the evaluation of remedial action alternatives and the preparation of a Remedial Action Work Plan (RAWP). The investigation included advancement of 39 soil borings, installation of 15 permanent groundwater monitoring wells, and eight soil vapor probes, and collection of soil, groundwater, and soil vapor samples. Field observations and laboratory analytical results are summarized below:

1. <u>Stratigraphy</u>: Historic fill predominantly consisting of brown, fine- to medium-grained sand with varying amounts of silt, gravel, and concrete was encountered across the site from below the cellar slab to depths ranging from about 2 to 7.5 feet below cellar grade (16 to 21.5 feet bgs). Native soil encountered below historic fill predominantly consists of fine- to medium-grained sand with varying amounts of gravel and silt. Bedrock was encountered during a geotechnical investigation performed by Langan in April and May 2018 and consists of gneiss, mica schist, and marble. The top of bedrock varies from about 30 to 88 feet

below cellar grade. The bedrock surface is irregular and generally slopes down to the west and to the north. Boring data indicates bedrock is shallowest within the southeastern part of the site.

2. Hydrogeology: Synoptic groundwater measurements were collected on May 9, 2018 from nine of the monitoring wells installed during the April 2018 Remedial Investigation. Groundwater elevations range between el 20.62 to el 21.6 feet, which corresponds to depths of about 4.1 to 4.9 feet below cellar grade (about 18.1 to 18.9 feet bgs). Groundwater flow is to the northeast. Underground utilities and other subsurface structures may locally influence the direction of groundwater flow.

3. Petroleum Impacts in Soil, Groundwater and Soil Vapor: Petroleum impacts were identified across an area of roughly 12,500 square feet, occupying about 25% of the southern part of the site. Petroleum-related Volatile Organic Compounds (VOCs) were detected above the Part 375 Unrestricted Use (UU) and/or Restricted Use – Restricted Residential (RRU) Soil Cleanup Objectives (SCOs) in soil samples collected between 6 and 10 feet below cellar grade (about 20 to 24 feet bgs) within this area. Photoionization detector (PID) headspace readings of up to 875 ppm, petroleum-like odors, and petroleum-related VOCs above the NYSDEC Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1 Ambient Water Quality Standards and Guidance Values for Drinking Water (class GA) (collectively referred to as the Standards and Guidance Values [SGVs]) were observed at monitoring well locations within the petroleum-impacted area. Petroleum-related contamination was localized to the southern-central part of the site, which formerly contained three, 550-gallon gasoline underground storage tanks (USTs) and a petroleum tank room. Petroleum-related VOCs in soil and groundwater are related to the historical petroleum bulk storage at the site, but may also be related to the historical use of the site as an automotive service facility.

   Petroleum-related Semi-Volatile Organic Compounds (SVOCs) above SGVs were observed in groundwater samples collected from upgradient monitoring wells. The source of polycyclic aromatic hydrocarbon (PAH)-impacted groundwater is likely related to the former petroleum spill at the south adjoining property.

4. Historic Fill: Laboratory analytical results indicate that the historic fill contains SVOCs, metals, and polychlorinated biphenyls (PCBs) at concentrations above the Part 375 UU and/or RRU SCOs. The deepest samples exceeding the SCOs were found between 7 and 8 feet below cellar grade (21 to 22 feet bgs).

5. Native Soil: Mercury and seven PAHs were detected above Part 375 UU and/or RRU SCOs in a native soil sample collected between 7 to 8 feet below cellar grade (21 to 22 feet bgs) in soil boring RSB07; however, these detections are likely a result of infiltration of historic fill material into the borehole during sample

collection. Manganese and acetone were also detected above the Part 375 UU SCOs; however, manganese is a naturally occurring metal, and acetone is a common laboratory contaminant.

6. Soil Vapor: The soil vapor samples contained chlorinated VOC concentrations which were not detected in the indoor air sample. The Tetrachloroethylene (PCE) and Trichloroethylene (TCE) concentrations detected in soil vapor may be indicative of a chemical release associated with historical site use, or may be related to the historical use of the southern-adjoining property as a dry cleaning facility. The petroleum-related VOCs detected in the sub-slab soil vapor are likely related to the open petroleum spill in the south-central part of the site. The petroleum-related VOCs detected in indoor air may be related to either the open on-site spill in the south central portion of the site, or to automotive emissions from the current use as a parking garage.

5. Investigation and Cleanup Process

Application

The Applicant was accepted into the New York's Brownfield Cleanup Program as a Volunteer. This means that the Applicant was not responsible for the disposal or discharge of the contaminants or whose ownership or operation of the site took place after the discharge or disposal of contaminants. The Volunteer characterized the nature and extent of contamination on-site, and conducted a "qualitative exposure assessment," a process that characterizes the actual or potential exposures of people, fish and wildlife to contaminants on the Site and to contamination that has migrated from the Site.

The Applicant in its Application proposes that the Site will be used for unrestricted purposes.

To achieve this goal, the Applicant conducted investigation activities at the Site. The Brownfield Cleanup Agreement executed by NYSDEC and the Applicant sets forth the responsibilities of each party in conducting future remediation activities at the Site.

Investigation

The Applicant conducted an investigation of the site officially called a "remedial investigation" (RI).

The site investigation had several goals:

1) Define the nature and extent of contamination in soil, surface water, groundwater and any other parts of the environment that may be affected;

2) Identify the source(s) of the contamination;
3) Assess the impact of the contamination on public health and the environment; and
4) Provide information to support the development of a proposed remedy to address the contamination or the determination that cleanup is not necessary.

The investigation is complete and the Applicant prepared and submitted a report that summarized the results. This report also recommended cleanup action that is needed to address site-related contamination. The investigation report is subject to review and approval by NYSDEC.

NYSDEC will use the information in the investigation report to determine if the site poses a significant threat to public health or the environment. If the site is a “significant threat,” it must be cleaned up using a remedy selected by NYSDEC from an analysis of alternatives prepared by the Applicant and approved by NYSDEC. If the site does not pose a significant threat, the Applicant may select the remedy from the approved analysis of alternatives.

Interim Remedial Measures

An Interim Remedial Measure (IRM) is an action that can be undertaken at a site when a source of contamination or exposure pathway can be effectively addressed before the site investigation and analysis of alternatives are completed. An Interim Remedial Measure Work Plan (IRMWP) was submitted to the NYSDEC concurrently with the BCP Application. If an IRM is likely to represent all or a significant part of the final remedy, NYSDEC will require a 30-day public comment period.

Remedy Selection

When the investigation of the site has been determined to be complete, the project likely would proceed in one of two directions:

1. The Applicant may recommend in its investigation report that no action is necessary at the site. In this case, NYSDEC would make the investigation report available for public comment for 45 days. NYSDEC then would complete its review, make any necessary revisions, and, if appropriate, approve the investigation report. NYSDEC would then issue a “Certificate of Completion” (described below) to the Applicant.

or

2. The Applicant may recommend in its investigation report that action needs to be

taken to address site contamination. After NYSDEC approves the investigation report, the Applicant may then develop a cleanup plan, officially called a “Remedial Work Plan”. The Remedial Work Plan describes the Applicant’s proposed remedy for addressing contamination related to the site.

When the Applicant submits a draft Remedial Work Plan for approval, NYSDEC would announce the availability of the draft plan for public review during a 45-day public comment period.

Cleanup Action

NYSDEC will consider public comments, and revise the draft cleanup plan if necessary, before approving the proposed remedy. The New York State Department of Health (NYSDOH) must concur with the proposed remedy. After approval, the proposed remedy becomes the selected remedy. The selected remedy is formalized in the site Decision Document.

The Applicant may then design and perform the cleanup action to address the site contamination. NYSDEC and NYSDOH oversee the activities. When the Applicant completes cleanup activities, it will prepare a Final Engineering Report (FER) that certifies that cleanup requirements have been achieved or will be achieved within a specific time frame. NYSDEC will review the report to be certain that the cleanup is protective of public health and the environment for the intended use of the site.

Certificate of Completion

When NYSDEC is satisfied that cleanup requirements have been achieved or will be achieved for the site, it will approve the FER. NYSDEC then will issue a Certificate of Completion (COC) to the Applicant. The COC states that cleanup goals have been achieved, and relieves the Applicant from future liability for site-related contamination, subject to certain conditions. The Applicant would be eligible to redevelop the site after it receives a COC.

Site Management

The purpose of site management is to ensure the safe reuse of the property if contamination will remain in place. Site management is the last phase of the site cleanup program. This phase begins when the COC is issued. Site management incorporates any institutional and engineering controls required to ensure that the remedy implemented for the site remains protective of public health and the environment. All significant activities are detailed in a Site Management Plan.

An *institutional control* is a non-physical restriction on use of the site, such as a deed restriction that would prevent or restrict certain uses of the property. An institutional control may be used when the cleanup action leaves some contamination that makes the site suitable for some, but not all uses.

An *engineering control* is a physical barrier or method to manage contamination. Examples include: caps, covers, barriers, fences, and treatment of water supplies.

Site management also may include the operation and maintenance of a component of the remedy, such as a system that pumps and treats groundwater. Site management continues until NYSDEC determines that it is no longer needed.

Appendix A -
Project Contacts and Locations of Reports and Information

Project Contacts

For information about the site's investigation and cleanup program, the public may contact any of the following project staff:

New York State Department of Environmental Conservation (NYSDEC):

Manfred Magloire
Project Manager
NYSDEC Region 2
Division of Environmental Remediation
47-20 21st Street
Long Island City, NY 11101
Email: manfred.magliore@dec.ny.gov
Tel: (718) 482-4078

New York State Department of Health (NYSDOH):

Arunesh Ghosh, Project Manager
NYS Department of Health
Bureau of Environmental Exposure
Investigation
Empire State Plaza
Corning Tower, Room 1787
Albany, NY 12237
Phone: (518) 402-7860
E-mail: BEEI@health.ny.gov

Locations of Reports and Information

The facilities identified below are being used to provide the public with convenient access to important project documents:

Inwood Public Library
4790 Broadway
New York, NY 10034
Phone: (212) 942-2445
Attn: Danita Nichols
Hours: Mon-Thurs 10am-7pm
Fri-Sat 10am-5pm
Sunday 1pm-5pm

Manhattan Community Board 12
530 West 166th Street, 6th Floor
New York, NY 10032
Phone: (212) 568-8500
Sha Ally, Chairwoman
Ebenezer Smith, District Manager
Steve Simon, Environmental Committee

Appendix B - Site Contact List

Local Elected & Government Officials	
Hon. Charles Schumer U.S. Senate 780 Third Ave., Suite 2301 New York, NY 10017	Hon. Kirsten Gillibrand U.S. Senate 780 Third Ave., Suite 2601 New York, NY 10017
Mayor Bill de Blasio City Hall New York, NY 10007 Hon. Scott Stringer NYC Comptroller 1 Centre Street New York, NY 10007 Hon. Letitia James 1 Centre Street, 15th Floor New York, NY 10007 Hon. Carmen N. De La Rosa NYS Assemblywoman 210 Sherman Ave Suite A & C New York, NY 10034 Manhattan Community Board 12 530 West 166th Street, 6th Floor New York, NY 10032 Phone: (212) 568-8500 Shahabuddeen A. Ally, Esq., Chairperson Mr. Ebenezer Smith, District Manager ebcsmith@cb.nyc.gov	Hon. Gale Brewer Manhattan Borough President 1 Centre Street, 19th Floor New York, NY 10007 (212) 669-8300 Hon. Ydanis Rodriguez NYC Councilman 618 W. 177th Street, Ground Floor New York, NY 10033 Hon. Marisol Alcantara NYS Senator, 31st District 5030 Broadway, Suite 701 and 702 New York, NY 10034 Hon. Adriano Espaillat U.S. House of Representatives, 13th District 163 West 125th Street, #508 New York, NY 10027

	Milton Tingling, County Clerk 60 Centre Street, Room 141B New York, NY 10007
News Media	
Manhattan Times 5030 Broadway Suite 807 New York, NY 10019 New York Daily News 4 New York Plaza New York, NY 10004 New York Amsterdam News 2340 Ferderick Douglass Boulevard New York, NY 10027	New York Post 1211 Avenue of the Americas New York, NY 10036 Spectrum NY 1 News 75 Ninth Avenue New York, NY 10011 Hoy Nueva York 1 MetroTech Center, 18th Floor Brooklyn, NY 11201 El Diario La Prensa 1 MetroTech Center, 18th Floor Brooklyn, NY 11201
Public Water Supply	
New York City Department of Environmental Protection 59-17 Junction Boulevard, 8th Floor Flushing, NY 11373 Attn: Vincent Sapienza - Commissioner	New York City Municipal Water Finance Authority 255 Greenwich Street, 6th Floor New York, NY 10007
Schools and Daycare Facilities	
Our Lady Queen of Martyrs School (about 350 feet northeast of the Site) Andrew Woods, Principal 71-91 Arden Street New York, New York 10040 (212) 567-3190	Middle School 322 (about 400 feet south of the Site) Erica Zigelman, Principal 4600 Broadway New York, New York 10040 (212) 304-0853
I.S. 218 Salome Urena (about 400 feet south of the Site) June Barnett, Principal 4600 Broadway New York, New York 10040 (212) 567-2322	Public School 152 Dyckman Valley (about 450 feet southeast of the Site) Julia Pietri, Principal 93 Nagle Avenue New York, New York 10040 (212) 567-5456

The Y Nursery School (about 790 feet south of the Site) Susan Herman, Director 54 Nagle Avenue New York, New York 10040 (212) 569-6200	Learn and Play (about 1,200 feet northwest of the Site) Mary Perselis, Director 1795 Riverside Drive New York, New York 10034 (212) 569-9292
High School for Excellence (about 1,300 feet northeast of the Site) Tyona Washington, Principal 650 Academy Street New York, New York 10034 (212) 569-1022	First Steps Group Day Care (about 1,300 feet north of the Site) Felisa Martinez, Director 49 Payson Avenue New York, New York 10034 (212) 942-5654
B & J Wonderland Daycare #4 (about 1,670 feet south of the Site) Fadyl Feliz, Assistant Director of Operations 4500 Broadway New York, New York 10040 (646) 544-6134	Amistad Dual Language School (about 1,725 feet northeast of the Site) Robin Edmonds, Principal 4862 Broadway New York, New York 10034 (212) 544-8021
Muscota New School (about 1,725 feet northeast of the Site) Camille Wallin, Principal 4862 Broadway New York, New York 10034 (212) 544-0614	Professor Juan Bosch Public School (about 1,775 feet southeast of the Site) Deidre Budd, Principal 12 Ellwood Street New York, New York 10040 (212) 569-0327
My Little Dream Daycare (about 1,830 feet northeast of the Site) Tanya Vargas, Director 71 Vermilyea Avenue New York, New York 10034 (347) 712-8577	The Equity Project Charter School (about 1,970 feet southeast of the Site) Zeke Vanderhoek, Principal 549 Audubon Avenue New York, New York 10040 (646) 254-6451
The College Academy (about 1,970 feet southeast of the Site) Timothy Sigerson, Principal 549 Audubon Avenue New York, New York 10040 (212) 927-1841	Washington Heights Academy (about 2,150 feet northeast of the Site) Renzo Martinez, Principal 202 Sherman Avenue New York, New York 10034 (212) 304-3320

Success Academy (about 2265 feet southwest of the Site) Kelsey Depalo, Principal 701 Fort Washington Avenue New York, New York 10040 (646) 558-0027	Little Daydreamers Early Learning Center (about 2,300 feet northeast of the Site) Deborah Leiba, Assistant 103 Seaman Avenue New York, New York 10034 (917) 771-9028
Reyes Daycare (about 2,380 feet northeast of the Site) Contact name unavailable 115 Vermilyea Avenue New York, New York 10034 (212) 942-9697	Inwood Academy for Leadership (about 2,420 feet east of the Site) Christina Reyes, Director 433 West 204th Street New York, New York 10034 (646) 665-5570
Little Jewel Childcare, Inc. (about 2,600 feet northeast of the Site) Contact name unavailable 4915 Broadway New York, New York 10034 (917) 378-1608	Happy Shiny Faces Daycare (about 2,630 feet northeast of the Site) Natalia Grullon, Primary Daycare Provider 136 Seaman Avenue New York, New York 10034 (347) 327-2485
Adjacent Property Owners	
Twenty-Two-Forty Associates 4672 Broadway (Owner) 381 Park Ave South New York, NY 10016 (212) 889-4406	19 Dongan Place Associates 19 Dongan Place (Owner) 20 West 55th Street, Penthouse L New York, NY 10019 (212) 7520-2670
20 Sherman Holding LP 20 Sherman Avenue (Owner) 1024 Broadway Woodmere, NY 11598 (516) 374 - 6080	9 Sherman Associates 9 Sherman Avenue (Owner) 9-21 Sherman Avenue New York, NY 10034 (718) 884-7676
Terrastone Ellwood Holdings 1 Sherman Avenue (Owner) 286B Cedarbridge Avenue Lakewood, NJ 08701 (732) 987-9306	QUEEN OF MARTYRS HEAD START 71-91 ARDEN STREET NEW YORK, NY10040

Community, Civic, Religious and Other Environmental Organizations:

Fort Tryon Park Trust
Executive Director
P.O. Box 1044
Fort George Station
New York, NY 10040

Consolidated Edison
Caroline Kretz, Director
Consolidated Edison Corporate Affairs
4 Irving Place, Room 1428
New York, NY 10003

Engine 95 Ladder 36
29 VERMILYEA AVENUE
New York, NY10034

Stephen Feldheim, President
34th Precinct Police Council
4295 Broadway
New York, NY 10033

Comite Residente Post Avenue, Inc
210 Sherman Avenue, #12F,
New York, NY 10034

Fireside Pentecostal Assembly
71 Thayer St
New York, NY 10040

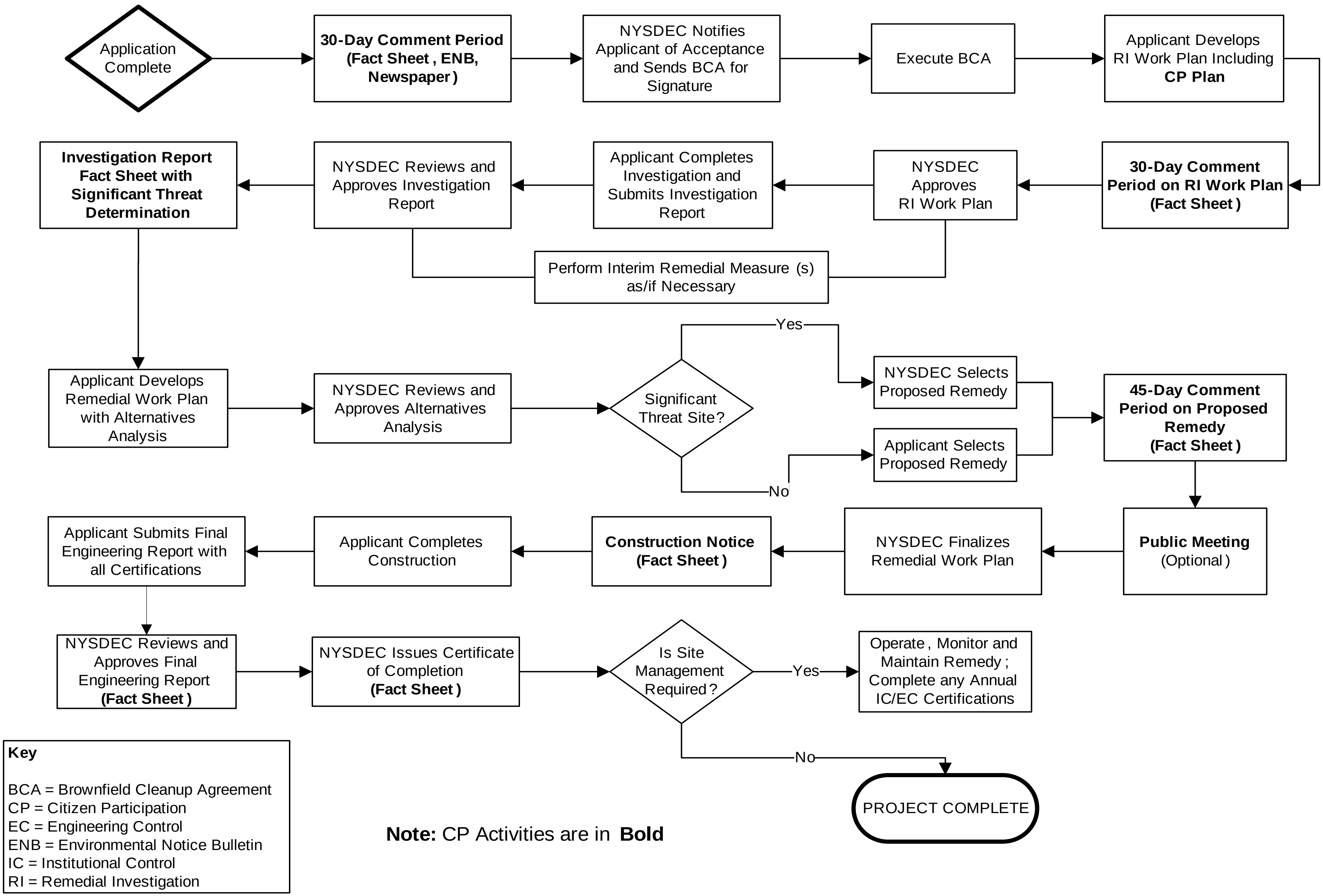
YM YWHA INNOVATIVE SENIOR CENTER
54 NAGLE AVENUE
NEW YORK, NY10040

THE CHILDREN'S AID SOCIETY
93 Nagle Ave
New York, NY 10040

WE ACT
Attn: Peggy Sheppard
1854 Amsterdam Ave 2nd Floor
New York, NY 10031

Appendix C - Site Location Map

Appendix D– Brownfield Cleanup Program Process



APPENDIX G

PROJECT PERSONNEL RESUMES

Jason J. Hayes, PE, LEED AP

Principal
Environmental Engineering

15 years in the industry

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) Brownfield's application, investigation, and remediation; New York City Department of Environmental Protection (NYCDEP) and New York City Office of Environmental Remediation (OER) E-designated site application, investigation, 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, Tall Office Building (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, Tall Residential Building, 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

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

Urban Land Institute (ULI), member

Commercial Real Estate Development Association (NAIOP), member

NYC Brownfield Partnership, member

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Hudson Yards Redevelopment (Phase I ESA and Phase II ESI), New York, NY
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 Two (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 Residential Tower (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

Waterfront Development Technical Course – Presented on Impacted Waterfront Planning Considerations

Michael D. Burke, PG, CHMM, LEED AP

Principal
Environmental Engineering and Remediation

19 years in the industry

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

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

- 42-50 24th Street, NYS Brownfield Cleanup Program Site, Long Island City, NY
- Storage Deluxe (163 6th Street), OER E-Designation Site, New York, NY
- 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

Anthony Moffa, Jr., ASP, CHMM, COSS

Associate/Corporate Health and Safety Manager

20 years in the industry

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

Selected Projects

Verizon - Pennsylvania, Inc. Philadelphia Naval Yard, PA
Confidential Client, Philadelphia, PA
Penn Color, Doylestown, PA
Verizon - Pennsylvania, Inc., Phase I Environmental Assessment, Lansdowne, PA
Verizon - Pennsylvania, Inc. (formerly Bell Atlantic Corporation), Various Locations, PA
Kinder Morgan Bulk Terminals, Inc. Fairless Hills, PA
PP&L – Martins Creek, Bangor, PA
Concord Beverage Company, Concordville, PA
Penn Color, Hatfield, PA
National Starch & Chemical Company, Bloomfield, NJ
Air Products and Chemicals, Inc.., Middlesex, NJ
PSEG Services Corporation, Jersey City, NJ
Sampson Coatings, Richmond, VA
Custom Chemicals Corporation, Elmwood Park, NJ

Education

B.S., Physics
West Chester University

Professional Registration

Associate Safety Professional (ASP)

Certified Hazardous Material Manager (CHMM)

Certified Occupational Safety Specialist (COSS)

Affiliations

Pennsylvania Chamber of Business & Industry

Chemical Council of New Jersey

New Jersey Business & Industry Association

Geoprofessional Business Association

Certifications and Training

Hazardous Waste Operations and Emergency Response Training

OSHA Site Supervisor Training

10 & 30-Hour Construction Safety & Health Training

30-Hour Construction Safety & Health Training

10-Hour Industry Safety & Health Training

Confined Space Awareness & Entry

Competent Person in Excavations

Hazard Communications

Defensive Driving Training

LANGAN

Brian Gochenaur, QEP

Senior Project Manager
Environmental Scientist

15 years in the industry

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

1525 Bedford Avenue, BCP Gas Station Cleanup and Redevelopment, Crown Heights, NY
535 4th Avenue, BCP Auto Repair Cleanup and Redevelopment, Crown Heights, NY
268 West Street, BCP Redevelopment of Former Commercial and Industrial Site, Tribeca, NY
110 125th Street, Soil Excavation and Remediation, Harlem Neighborhood, New York, NY
NY Aquarium, Shark Exhibit, Soil Characterization and Excavation Oversight, Coney Island Neighborhood, Brooklyn, NY
Former Roseland Ballroom Redevelopment, Soil Characterization and Excavation Oversight, New York, NY
60 West Street, Site investigation and Redevelopment, Greenpoint, New York
42 Crosby Street, "E" Designated Site Investigation and Remediation, New York, NY
New York School Construction Authority, Various Locations, In-House Environmental Consulting, New York Metro Area
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
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

Education

B.S., Environmental Science
University of Florida

Professional Registration

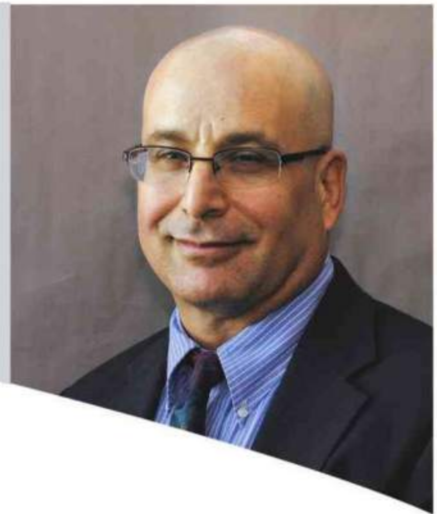
Qualified Environmental Professional (QEP) certified by the Institute of Professional Environmental Practice

40-Hour OSHA (HAZWOPER)

Cingular Wireless Portfolio, Cingular Wireless, Various Locations Phase I and II Locations, WA
Queens Center Mall Expansion, Remedial Oversight, Elmhurst, NY

William Bohrer

Project Geologist
Geologist



39 years in the industry

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

Education

Post Graduate Studies in Geophysics
Cornell University

B.S., Geology
Tufts University

Professional Registration

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

PA Council of Professional Geologists

LAMEES ESMAIL, EIT

SENIOR STAFF ENGINEER

ENVIRONMENTAL ENGINEERING

Ms. Esmail is a civil and environmental engineer with experience in environmental permitting and erosion and sedimentation control primarily for linear overhead transmission line projects. Types of permits include state land disturbance approvals and Army Corps of Engineers Section 10 Pre-Construction Notifications.

Ms. Esmail also has experience aiding with the siting of new substation properties, using ArcGIS and AutoCAD to compile data for potential sites.

SELECTED PROJECTS

- Con Edison Partial Replacement of 345KV Feeders M51 & M52 Feasibility Study, New York, NY
- 50 Hudson Yards, Supertall Office Building, New York, NY
- 215 North 10th Street, Brooklyn, NY
- 320 West 135th Street, New York, NY
- 163 Varick Street, New York, NY
- 39 West 23rd Street, New York, NY
- 1 Huron Street, Brooklyn, NY
- Bedford Armory, Brooklyn, NY
- 1607 Surf Avenue, Brooklyn, NY
- 414 Gerard Avenue, Bronx, NY
- 99 Hudson Boulevard, New York, NY

SELECTED PUBLICATIONS, REPORTS, AND PRESENTATIONS

Esmail, L., "Transmission Line Erosion Control and Construction Specifications", Duke Energy Progress Transmission Erosion and Sedimentation Control Seminar, Raleigh, NC, November 2016.

EDUCATION

B.S., Civil Engineering (Environmental Concentration)
George Washington University

PROFESSIONAL REGISTRATION

Engineer in Training (EIT) in NC

MARLA MILLER, PE, BCEE

SENIOR PROJECT ENGINEER

ENVIRONMENTAL ENGINEERING

Ms. Miller has over 19 years of experience managing site characterization and remediation projects. She is a senior environmental engineer experienced in environmental permitting, industrial pretreatment, compliance monitoring, and water quality evaluation. She has a strong background in data validation, laboratory analyses, and sampling procedures for soil, water, and air matrices. Her expertise in data interpretation includes natural attenuation monitoring, petroleum hydrocarbon chromatography, and aqueous geochemistry.

SELECTED PROJECTS

Data Validation

- St. Joseph's Parish Redevelopment Data Quality Assessment (DQA) and Data Usability (DUE) preparation, New York, NY
- 175 – 225 3rd Street Data Usability Summary Report (DUSR), Brooklyn, NY
- 805 – 825 Atlantic Ave DUSR, Brooklyn, NY
- John Evans Superfund Site DUSR, Lansdale, PA
- 50 North Road (Nokia Chester), DQA and DUE preparation, Chester, NJ
- Data Validation/Data Management for Brownfields Site Assessment, Port St. Joe, FL*

Industrial Wastewater Pretreatment

- Industrial Wastewater Discharge Limit Development, Inland Empire Utilities Agency (IEUA), CA*
- Local Limits Study, Hopewell, VA*
- Local Limits Study, Mesa, AZ*
- Local Limits Development and Sewer Use Ordinance Development, Prescott, AZ*
- Implementation of Industrial Pretreatment Program, Prescott, AZ*
- Industrial Pretreatment Development, Queen Creek, AZ*
- Selenium Wastewater Treatment Options for Meat Packing Facility, Tolleson, AZ*
- Arizona Pollutant Discharge Elimination System (AZPDES) Permit Application Preparation, Phoenix, AZ
- Preparation of Sampling and Analysis Plan for Sub-Regional Operating Group (SROG) Local Limits Development, Phoenix and Surrounding Cities, AZ

EDUCATION

M.S., Environmental Engineering
University of California, Berkeley

B.S., Biology
Loyola Marymount University

PROFESSIONAL REGISTRATION

Professional Engineer (PE) in AZ

Board Certified Environmental Engineer (BCEE) – Hazardous Waste Management (09-10019)

CERTIFICATIONS

The Wastewater Treatment, Wastewater Collection, and Water Distribution Operator Certification

Grade 2
Water Treatment Operator Certification Grade 1

Backflow Tester Certification (AABP)

*Denotes projects performed prior to employment at Langan

Site Investigation/Remediation/Compliance

- Arizona Electric Power Cooperative (AEPCO) Apache Generating Station Arizona Protection Permit (APP), Wilcox, AZ
- Arizona Department of Environmental Quality (ADEQ) Water Quality Assurance Revolving Fund (WQARF) Projects, Phoenix and Gilbert, AZ
- Long-Term Monitoring Program and 5-Year CERCLA Review, Luke Air Force Base (AFB), Glendale, AZ*
- Development of Stormwater Prevention Pollution Plan (SWPPP) and Stormwater Flow Modeling, Luke AFB, Glendale, AZ*
- Site Investigation and Clean Closure for Confidential Industrial Client, Tempe, AZ*
- RCRA Facility Investigation/Corrective Measures Assessment, San Jose, CA*
- Technical Resource for X-Ray Fluorescence (XRF) Field Screening Program for Former Small Arms Firing Range, Nogales, AZ*
- Designed and Implemented Sampling Procedures for Volatile Emissions from Tailings Impoundment Using Flux Chambers, Henderson, CO*
- Conceptual Site Model and Statistical Evaluation for Water Treatment Plant, Denver, CO*

Mining Project

- Third-Party Construction Quality Assurance (CQA) for Geotextile-Lined Tailings Repository, Casa Grande, AZ*
- CQA For Reclamation at Smelter, Miami, AZ*
- XRF Field Screening for Excavation at Former Smelter Site, El Paso, TX*
- CQA for Reclamation Projects at Active Smelter, Miami, AZ

FARIELLE BRAZIER

STAFF ENGINEER

ENVIRONMENTAL ENGINEERING

Ms. Brazier is a staff engineer with experience in construction oversight, air quality screening, soil logging and characterization, ground water sampling, and sub-slab/soil vapor sampling. She also has experience assisting with the preparation of technical reports and specifications.

SELECTED PROJECTS

- 145 Wolcott Street, Brooklyn, NY
- 80 Flatbush Avenue, Brooklyn, NY
- 1525 Bedford Avenue, Brooklyn, NY
- 126 Nassau Street, New York, NY
- Astoria Steel, Astoria, NY
- 156-162 Perry Street, New York, NY
- Design of Southpoint Seawalls, Roosevelt Island, NY
- 64 Norfolk Street, New York, NY

EDUCATION

M.S., Bio-Environmental Engineering
Rutgers University

B.S., Bio-Environmental Engineering
Rutgers University

PROFESSIONAL REGISTRATIONS

OSHA 40-Hour HAZWOPER

OSHA 10-Hour Construction

APPENDIX H

QUALITY ASSURANCE PROJECT PLAN

QUALITY ASSURANCE PROJECT PLAN

for

4650 Broadway
New York, New York

Block 2175, Lot 1
BCP Site No. C231123

Prepared For:

AQOZFI Inwood, LLC
1600 Market Street, Suite 2600
Philadelphia, PA

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 2021
Langan Project No. 170505501

LANGAN

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1.0 PROJECT DESCRIPTION

1.1 INTRODUCTION

This Quality Assurance Project Plan (QAPP) was prepared on behalf of AQOZFI Inwood, LLC (the Volunteer), for the 4650 Broadway Site at 4650 Broadway in the New York, New York (the site). The site entered the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP) under BCP Site No. C231123 on December 18, 2018. 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 Health and Safety Plan (HASP) and Community Air Monitoring Plan (CAMP) for the protection of on-site workers, the community, and the environment has been developed and will be implemented during 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

In preparation for site remediation and in accordance with the approved Interim Remedial Measures Work Plan (IRMWP), the existing building will undergo abatement of hazardous materials, including asbestos-containing materials (ACM), lead based paint (LBP), polychlorinated biphenyl (PCB)-containing building materials, and any other identified universal and miscellaneous hazardous waste articles. Following abatement of hazardous materials, the building will be demolished to facilitate site remediation.

Implementation of the RAWP consists of remediation of the site to Track 4 cleanup standards. The proposed Track 4 remedy consists of the following tasks:

- Development and implementation of a HASP and CAMP for the protection of on-site workers, the community, and the environment during the remediation phase of development

- Excavation of the top 2 feet below cellar grade, or about 3,500 cubic yards, to facilitate installation of an engineered composite cover system. The site will be further excavated to about 5 feet below cellar grade as part of site development.
- Removal of 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 NYSDEC Division of Environmental Remediation (DER) Program Policy: Technical Guidance for Site Investigation and Remediation (DER-10), Title 6 New York Codes, Rules, and Regulations (NYCRR) Part 613.9, NYSDEC Commissioner's Policy (CP)-51, and other applicable NYSDEC UST closure requirements
- Collection and analysis of documentation soil samples at the excavation bottom (about 5 feet below cellar grade)
- Installation of an engineered composite cover system (i.e., reinforced concrete building foundation) underlain by a minimum 20-mil vapor barrier/waterproofing membrane of a building foundation
- Establishment of use restrictions (institutional controls [IC]) including prohibitions on the use of groundwater from the site and prohibitions on sensitive site uses, such as farming or vegetable gardening, to eliminate future exposure pathways
- Establishment of an approved Site Management Plan to ensure long-term management of engineering controls (ECs) and ICs, including the performance of periodic inspections and certification that the controls are performing as they were intended
- Recording of an Environmental Easement (EE) to memorialize the remedial action and the ECs and ICs to ensure that future owners of the site continue to maintain these controls as required

2.0 DATA QUALITY OBJECTIVES AND PROCESS

Data Quality Objectives (DQOs) are qualitative and quantitative statements to help ensure that data of known and appropriate quality are obtained during the project. The overall objective is to prevent additional environmental impacts to site media (soil and groundwater) by removal of hazardous lead-impacted fill hot-spots. DQOs for sampling activities are determined by evaluating five factors:

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

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

- **Precision** – an expression of the reproducibility of measurements of the same parameter under a given set of conditions. Field sampling precision will be determined by analyzing coded duplicate samples and analytical precision will be determined by analyzing internal QC duplicates and/or matrix spike duplicates.
- **Accuracy** – a measure of the degree of agreement of a measured value with the true or expected value of the quantity of concern. For soil and groundwater samples, accuracy will be determined through the assessment of the analytical results of field blanks and trip blanks for each sample set. Analytical accuracy will be assessed by examining the percent recoveries of surrogate compounds that are added to each sample (organic analyses only), internal standards, laboratory method blanks, instrument calibration, and the percent recoveries of matrix spike compounds added to selected samples and laboratory blanks. For soil vapor or air samples, analytical accuracy will be assessed by examining the percent recoveries that are added to each sample, internal standards, laboratory method blanks, and instrument calibration.

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

3.0 PROJECT ORGANIZATION

Excavation activities will be overseen by Langan on behalf of the Volunteer. 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 Mahwah, New Jersey (NYSDOH ELAP certification number 11148).

Key contacts for this project are as follows:

AQOZFI Inwood, LLC:	Mr. Josh Strelzik Telephone: (215) 735-1313
Remediation Engineer:	Mr. Jason Hayes, P.E. Telephone: (212) 479-5427
Langan Project Director:	Mr. Michael Burke, P.G, CHMM Telephone: (212) 479-5582
Langan Project Manager:	Mr. Brian Gochenaur Telephone: (212) 479-5479
Langan Field Team Leader:	Ms. Julia Leung Telephone: (212) 479-5429
Langan Quality Assurance Officer (QAO):	Mr. Michael D. Burke, P.G, CHMM Telephone: (212) 479-5617
Langan Health and Safety Manager:	Mr. Tony Moffa, CHMM Telephone: (215) 491-6500
Langan Health and Safety Officer:	Mr. William Bohrer Telephone: (410) 984-3068
Data Validator:	Mr. Joseph Conboy, Langan Telephone: (212) 845-8985
Laboratory Representative:	Mr. Ben Rao (Alpha) Telephone: (201) 847-2951
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 5x 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.

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 blanks and through compliance to all sample handling, preservation, and holding time requirements. All field blanks should be non-detect when analyzed by the laboratory. Any contaminant detected in an associated field blank will be evaluated against laboratory blanks (preparation or method) and evaluated against field samples collected on the same day to determine potential for bias. Trip blanks are not required for non-aqueous matrices but are planned for non-aqueous matrices where high concentrations of VOCs are anticipated.

Laboratory accuracy is assessed by evaluating the percent recoveries of matrix spike/matrix spike duplicate (MS/MSD) samples, laboratory control samples (LCS), surrogate compound recoveries, and the results of method preparation blanks. MS/MSD, LCS, 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 EPA 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 director 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 and duplicate samples will be based on the recommendations listed in DER-10, and as described in Section 5.3.

5.0 SAMPLE COLLECTION AND FIELD DATA ACQUISITION PROCEDURES

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 HSO, and will be accomplished by following the procedures outlined in the operating manual for the instrument. At a minimum, field calibration and/or field equipment checking will be performed once daily, prior to use. Field calibration will be documented in the field notebook. Entries made into the logbook regarding the status of field equipment will include the following information:

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

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. 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. Purging shall be considered complete after three well volumes are purged and groundwater quality parameters have reached stabilization within a reasonable time frame. 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. 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. Trip blanks will be collected at a rate of one per day if soil samples are analyzed for VOCs during that day.

Duplicate soil samples will be collected and analyzed for quality assurance purposes. Duplicate samples will be collected at a frequency of 1 per 20 investigative 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. Blue ice will not be used to cool per- and polyfluoroalkyl substances (PFAS) samples. 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 HASP 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 PPE) will be collected in plastic garbage bags and disposed of as non-hazardous industrial waste. Debris is expected to be transported to a local municipal landfill for disposal. If applicable, residual solids (e.g., leftover soil cuttings) will be placed back in the borehole from which it was sampled. If gross contamination is observed, soil will be collected and stored in Department of Transportation (DOT)-approved 55-gallon drums in a designated storage area at the Site. The residual materials stored in a designated storage area at the site for further characterization, treatment or disposal.

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 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)

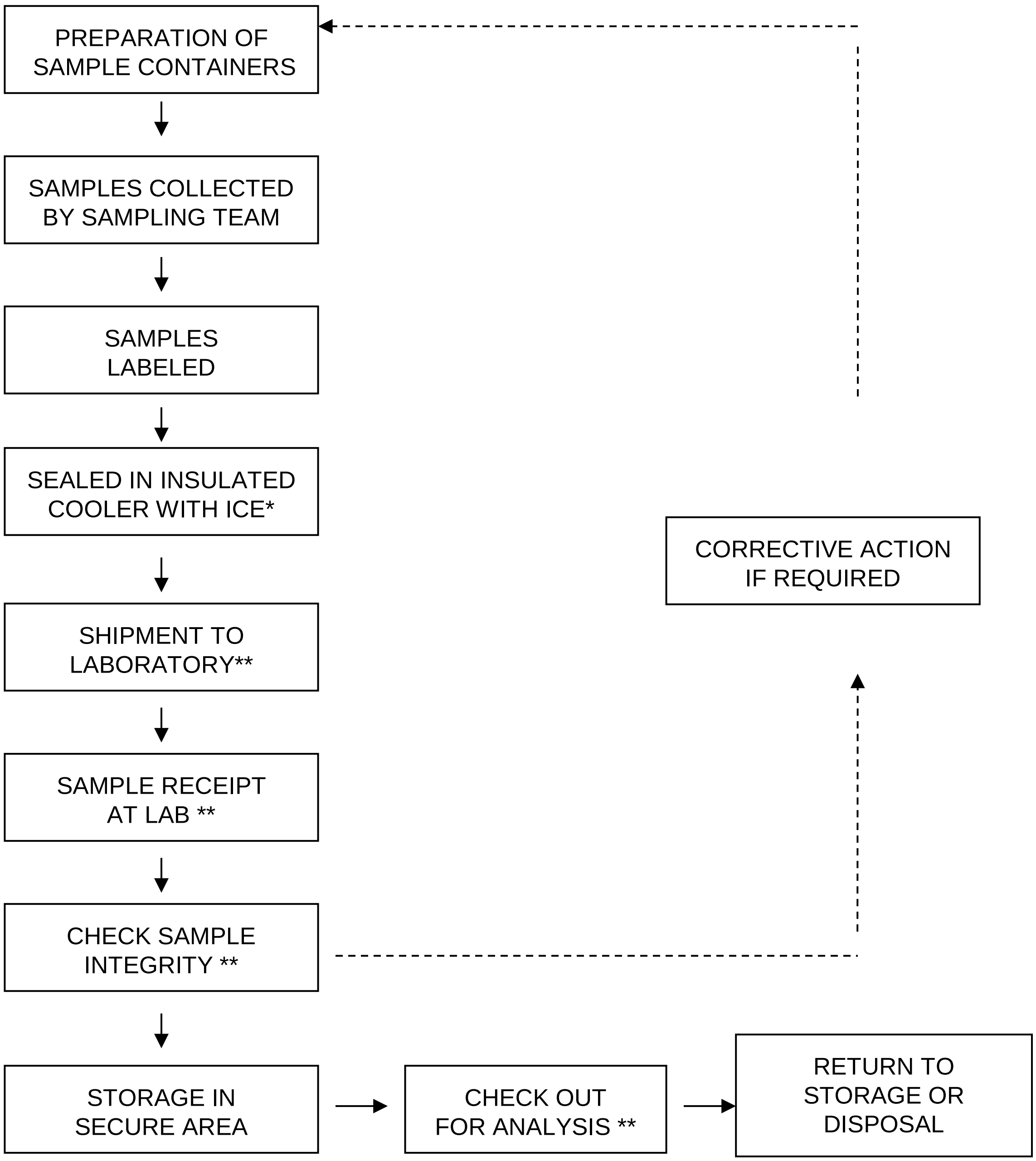
will be recorded on the form. All entries will be made in waterproof, permanent blue or black ink.

- 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.

If 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 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 Sample

ALPHA ANALYTICAL

AIR ANALYSIS

CHAIN OF CUSTODY

PAGE____ OF____

320 Forbes Blvd, Mansfield, MA 02048
TEL: 508-822-9300 FAX: 508-822-3288

Date Rec'd in Lab:

ALPHA Job #:

Client Information

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:

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	ANALYSIS: 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

NEW YORK CHAIN OF CUSTODY

Westborough, MA 01581
8 Walkup Dr.
TEL: 508-898-9220
FAX: 508-898-9193

Mansfield, MA 02048
320 Forbes Blvd
TEL: 508-822-9300
FAX: 508-822-3288

Service Centers
Mahwah, NJ 07430: 35 Whitney Rd, Suite 5
Albany, NY 12205: 14 Walker Way
Tonawanda, NY 14150: 275 Cooper Ave, Suite 105

Page ___ of ___

Date Rec'd in Lab

ALPHA Job #

Client Information
Client:
Address:
Phone:
Fax:
Email:

Project Information
Project Name:
Project Location:
Project #
(Use Project name as Project #) ☐
Project Manager:
ALPHAQuote #:

Turn-Around Time
Standard ☐ Due Date:
Rush (only if pre approved) ☐ # of Days:

Deliverables
☐ ASP-A ☐ ASP-B
☐ EQuIS (1 File) ☐ EQuIS (4 File)
☐ Other

Regulatory Requirement
☐ NY TOGS ☐ NY Part 375
☐ AWQ Standards ☐ NY CP-51
☐ NY Restricted Use ☐ Other
☐ NY Unrestricted Use
☐ NYC Sewer Discharge

Billing Information
☐ Same as Client Info
PO #

Disposal Site Information
Please identify below location of applicable disposal facilities.
Disposal Facility:
☐ NJ ☐ NY
☐ Other:

These samples have been previously analyzed by Alpha ☐
Other project specific requirements/comments:

Please specify Metals or TAL.

ANALYSIS

Sample Filtration
☐ Done
☐ Lab to do
Preservation
☐ Lab to do
(Please Specify below)

Total Bottles

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler's Initials	Analysis								Sample Specific Comments	Total Bottles

Preservative Code:
A = None
B = HCl
C = HNO_3
D = H_2SO_4
E = NaOH
F = MeOH
G = $NaHSO_4$
H = $Na_2S_2O_3$
K/E = Zn Ac/NaOH
O = Other

Container Code
P = Plastic
A = Amber Glass
V = Vial
G = Glass
B = Bacteria Cup
C = Cube
O = Other
E = Encore
D = BOD Bottle

Westboro: Certification No: MA935
Mansfield: Certification No: MA015

Container Type								
Preservative								

Relinquished By:	Date/Time	Received By:	Date/Time

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. BY EXECUTING THIS COC, THE CLIENT HAS READ AND AGREES TO BE BOUND BY ALPHA'S TERMS & CONDITIONS. (See reverse side.)

Form No: 01-25 HC (rev. 30-Sept-2013)

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 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 appropriate for the analyses to be performed, and be reported in standard format.

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

6.2 DATA REDUCTION

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

Each EDD deliverable must be formatted using a Microsoft Windows operating system and the NYSDEC data deliverable format for EQuIS. To avoid transcription errors, data will be loaded directly into the ASCII format from the laboratory information management system (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), and
- Preparation of Data Usability Summary Reports (DUSR).

A DUSR will be prepared and reviewed by the QAO before issuance. The DUSR will present the results of data validation, including a summary assessment of laboratory data packages, sample preservation and COC procedures, and a summary assessment of precision, accuracy, representativeness, comparability, and completeness for each analytical method. A detailed assessment of each SDG will follow. For each of the organic analytical methods, the following will be assessed:

- Holding times;
- Instrument tuning;
- Instrument calibrations;
- Blank results;
- System monitoring compounds or surrogate recovery compounds (as applicable);
- Internal standard recovery results;
- MS and MSD results;
- Target compound identification;
- Chromatogram quality;
- Pesticide cleanup (if applicable);
- Compound quantitation and reported detection limits;
- System performance; and
- Results verification.

For each of the inorganic compounds, the following will be assessed:

- Holding times;
- Calibrations;
- Blank results;
- Interference check sample;
- Laboratory check samples;
- Duplicates;
- Matrix Spike;
- Furnace atomic absorption analysis QC;
- ICP serial dilutions; and
- Results verification and reported detection limits.

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

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

7.0 QUALITY ASSURANCE PERFORMANCE AUDITS AND SYSTEM AUDITS

7.1 INTRODUCTION

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

7.2 SYSTEM AUDITS

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

7.3 PERFORMANCE AUDITS

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

7.4 FORMAL AUDITS

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

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

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

8.0 CORRECTIVE ACTION

8.1 INTRODUCTION

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

8.2 PROCEDURE DESCRIPTION

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

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

- When predetermined acceptance standards are not attained;

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

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

Personnel assigned to quality assurance functions will have the responsibility to issue and control Corrective Action Request (CAR) Forms (Figure 12.1 or similar). The CAR identifies the out-of-compliance condition, reference document(s), and recommended corrective action(s) to be administered. The CAR is issued to the personnel responsible for the affected item or activity. A copy is also submitted to the Project Manager. The individual to whom the CAR is addressed returns the requested response promptly to the QA personnel, affixing his/her signature and date to the corrective action block, after stating the cause of the conditions and corrective action to be taken. The QA personnel maintain the log for status of CARs, confirms the adequacy of the intended corrective action, and verifies its implementation. CARs will be retained in the project file for the records.

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

FIGURE 8.1

CORRECTIVE ACTION REQUEST

Number: ________________________ Date: ___________

TO: ______________________________________

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

CONDITION:

REFERENCE DOCUMENTS:

RECOMMENDED CORRECTIVE ACTIONS:

_________ _____ _________ _______ __________ _______

Originator Date Approval Date Approval Date

RESPONSE

CAUSE OF CONDITION

CORRECTIVE ACTION

(A) RESOLUTION

(B) PREVENTION

(C) AFFECTED DOCUMENTS

C.A. FOLLOWUP:

CORRECTIVE ACTION VERIFIED BY: __________________________ DATE:____________

9.0 REFERENCES

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

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

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

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

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

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

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

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

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

ATTACHMENT A

SOIL SAMPLES
LABORATORY REPORTING LIMITS AND METHOD DETECTION LIMITS

Method	Matrix	Analyte	RL	MDL	Units
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

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					
		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	Two 250 mL high density polyethylene (HDPE) bottles	14 days	1 per 20 samples (minimum 1)	1 per 20 samples (minimum 1)	N/A	N/A	1 per 20 samples (minimum 1)

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
Soil	Total VOCs via PID	Part 375 + TCL VOCs	EPA 8260C	Cool to 4°C	Two 40-ml VOC vials with 5ml H_2O, one with MeOH (separate container for % solids)	48 hours after sampling if samples are not frozen to -7° C, 14 days after extraction to analysis	1 per 20 samples (minimum 1)	1 per 20 samples (minimum 1)	1 per shipment of VOC samples	NA	1 per 20 samples
		Part 375 + TCL SVOCs	EPA 8270D	Cool to 4°C	4 oz. amber glass jar	14 days extract, 40 days after extraction to analysis					
		Part 375 + TAL Metals	EPA 6010D, EPA 7471B, EPA 7196A, EPA 9010C/9012B	Cool to 4°C	2 oz. amber glass jar	6 months, except mercury 28 days					
		Part 375 + TCL Pesticides	EPA 8081B	Cool to 4°C	4 oz. amber glass jar	14 days extract, 40 days after extraction to analysis					
		Part 375 + TCL Herbicides	EPA 8151A	Cool to 4°C	4 oz. amber glass jar	14 days extract					
		Part 375 + TCL PCBs	EPA 8082A	Cool to 4°C	4 oz. amber glass jar	14 days extract, 40 days after extraction to analysis					
Product	N/A	Petrleum Hydrocarbon Identification (PHI)	EPA 8015D(M)	Cool to 4°C	4 oz. amber glass jar	14 days extract, 40 days after extraction to analysis	N/A	N/A	N/A	N/A	N/A
		Density	ASTM D1475	Cool to 4°C	4 oz. amber glass jar	N/A	N/A	N/A	N/A	N/A	N/A
		Viscosity	ASTM D445	Cool to 4°C	4 oz. amber glass jar	N/A	N/A	N/A	N/A	N/A	N/A
Soil Vapor	Total VOCs and Methane with MultiGas Meter	TO-15 Listed VOCs	TO-15	Ambient Temperature	6-Liter Summa Canister	Analyze within 30 days of collection	1 per 20 samples (minimum 1)	NA	NA	1 per 10 samples (minimum 1)	NA
Ambient Air	Total VOCs via PID	TO-15 Listed VOCs	TO-15	Ambient Temperature	6-Liter Summa Canister	Analyze within 30 days of collection	1 per 20 samples (minimum 1)	NA	NA	1 per 10 samples (minimum 1)	NA

Notes:
1. PID - Photoionization Detector
2. VOC - Volatile organic compound
3. EPA - Environmental Protection Agency
4. TCL - Target compound list
5. TAL - Target analyte list

ATTACHMENT C

SAMPLE NOMENCLATURE

SAMPLE NOMENCLATURE

The sample nomenclature outlined below provides consistency between sample events and projects but, most importantly, establish unique sample IDs that will avoid confusion months or years after the sample has been collected. Furthermore, unique sample IDs are required for any data submitted to the NYSDEC in EDD format or being uploaded to an EQuIS database.

1.0 INVESTIGATION LOCATION CODES

SB	Soil Boring	SV	Soil Vapor Point
WC	Waste Characterization Boring	IA	Indoor Air
TP	Test Pit	AA	Ambient Air
EPSW	Endpoint Location (Sidewall)	SVE	Vapor Extraction Well
EPB	Endpoint Location (Bottom)	DS	Drum
MW	Monitoring Well	IDW	Investigation Derived Waste
TMW	Temporary Monitoring Well	SL	Sludge
SW	Surface Water	FP	Free Product

2.0 SAMPLE NOMENCLATURE

Each sample at a site must have a unique value.

- **<u>Soil/Sediment Samples:</u>**

SBxx_y-y

Sample Location Code + Number (two digits minimum)

Sampling Interval (y-y)

Sample Type	Sample Location Code	Sampling Depth or Interval (feet bgs or approx. elevation)	Sample Name
Phase II/Remedial Investigation			
Grab Soil Sample	SB01	2 to 4	SB01_2-4
	SB02	4	SB02_4
Waste Characterization			
Grab Soil Sample	WC01	2 to 4	WC01_2-4
	WC02	4	WC02_4
Composite Soil Sample from one or more locations	COMP01 or COMP02 + COMP03	0 to 10 (Fill)	COMP01_0-10

Sample Type	Sample Location Code	Sampling Depth or Interval (feet bgs or approx. elevation)	Sample Name
Endpoint Sampling			
Grab Soil Sample	EPSW01_N	5	EPSW01_N_5
	EPSW01_S	5	EPSW01_S_5
	EPSW01_E	5	EPSW01_E_5
	EPSW01_W	5	EPSW01_W_5
	EPB01	6	EPB01_6

- **Groundwater/Surface Water Samples:**

MWxx_MMDDYY

Sample Location Code + Number (two digits minimum)

Sampling Date (MMDDYY)

Sample Type	Sample Location Code	Sampling Date	Sample Name
Groundwater Sample	MW01	02/21/2013	MW01_022113

- **Air/Soil Vapor Samples:**

IAxx_MMDDYY

Sample Location Code + Number (two digits minimum)

Sampling Date (MMDDYY)

Sample Type	Sample Location Code	Date	Sample Name
Air Sample	IA01	02/21/2013	IA01_022113
Soil Vapor Sample	SV01	02/21/2013	SV01_022113
Vapor Extraction Well Sample	SVE01 (INLET/MIDPOINT/OUTLET)	02/21/2013	SVE01_IN_022113 SVE01_ MID_022113 SVE01_ OUT_022113

- **QA/QC Samples:**

Sample Matrix Codes

SO	Soil	AS	Air
SE	Sediment	SV	Soil Vapor
GW	Groundwater	SL	Sludge
SW	Surface Water	FP	Free Product

- o Duplicates Samples

SODUPxx_MMDDYY

Sample Matrix Code → SO; Sample Type + Number (two digits minimum) → DUPxx; Sampling Date (MMDDYY) → MMDDYY

Sample Type	Parent Sample Code	Date	Sample Name
Groundwater Duplicate Sample (DUP)	MW01_022113	02/21/2013	GWDUP01_022113
Soil boring Duplicate Sample (DUP)	SBP01_022113	02/21/2013	SODUP01_022113
Grab Waste Characterization	WC01	02/21/2013	WCDUP01_022113
Composite Waste Characterization	COMP01	02/21/2013	COMPDUP01_022113

- o Field Blanks and Trip Blanks

SBFBxx_MMDDYY

Sample Matrix Code → SB; Sample Type + Number (two digits minimum) → FBxx; Sampling Date (MMDDYY) → MMDDYY

Sample Type	Date	Sample Name
Groundwater Field Blank (FB)	02/21/2013	GWFB01_022113
Groundwater Trip Blank (TB)	02/21/2013	GWTB01_022113
Soil Field Blank	02/21/2013	SOFB01_022113
Soil Trip Blank	02/21/2013	SOTB01_022113

- o Matrix Spike/Matrix Spike Duplicate (MS/MSD)

Parent Sample Name_MS or MSD

Sample Type	Sample Location	Parent Sample Name	Sample Name
Matrix Spike Soil (MS)	SB01	SB01_2-4	SB01_2-4_MS
Matrix Spike Soil Duplicate (MSD)	SB01	SB01_2-4	SB01_2-4_MSD
Matrix Spike GW (MS)	MW01	MW01	MW01_MS
Matrix Spike GW Duplicate (MSD)	MW01	MW01	MW01_MSD

3.0 NOTES

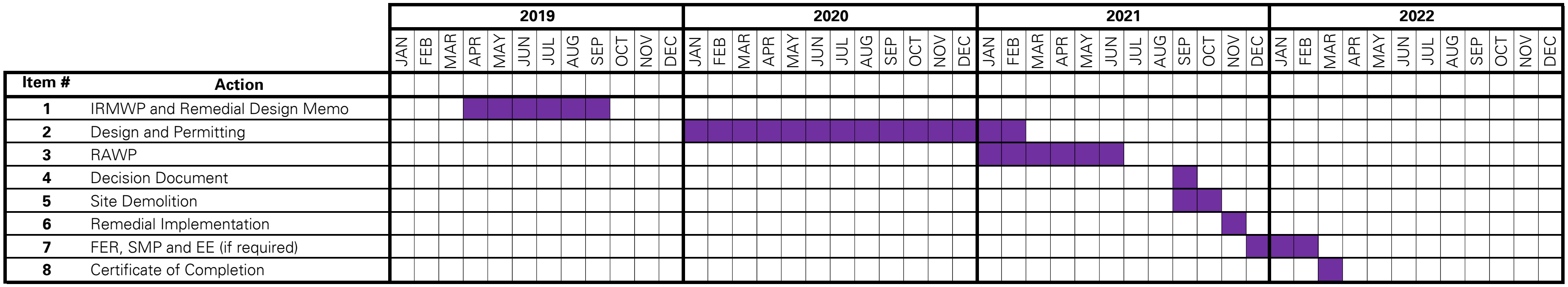
1. The sample location code should not exceed 20 characters and the sample name should not exceed 40 characters.
2. Sample location code (**SB01, MW01, etc.)** is a sequential number (starting with 01) and should be a minimum of two digits.
3. Sample Interval (SB01_**0-5**) is separated from the sample location code with an underscore, and the top and bottom interval with a dash. Soil and sediment sample intervals should always be in

feet. Soil and sediment sample intervals should contain no "/" or "()" or unit.

4. Sample date (MW01_**022113**) is separated from the sample location code with an underscore and should be provided in MMDDYY format [the date should contain no "/" or "-"].
5. If groundwater samples are collected from multiple intervals within one well, you may assign a letter designation (in lower case) to the well ID to differentiate between intervals (i.e., MW01a_022113, MW01b_022113, and MW01c_022113). The letter "a" would indicate the shallowest interval and "c" the deepest. The actual depth intervals should be documented in the project field book or field sheets and the letter designations should be used consistently between sampling events.
6. According to USEPA's Contract Laboratory Program (CLP) Guidance for Field Samplers (January 2011), field duplicate samples should remain "blind" to the laboratory (i.e., they should have separate CLP Sample numbers). Assign two separate (unique) CLP sample numbers (i.e., one number to the field sample and one to the duplicate). Submit blind to the laboratory. (http://www.epa.gov/superfund/programs/clp/download/sampler/CLPSamp-01-2011.pdf)

APPENDIX I

REMEDIATION SCHEDULE



Notes:

1. IRMWP = Interim Remedial Measure Work Plan
2. RAWP = Remedial Action Work Plan
3. FER = Final Engineering Report
4. SMP = Site Management Plan
5. EE = Environmental Easement