
DRAFT REMEDIAL INVESTIGATION WORK PLAN

for

**50-58 Cliff Street
New York, New York**

Prepared for:

**SHF Cliff Street LLC
247 West 37th Street, 4th Floor
New York, New York, 10018**

Prepared by:

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LANGAN

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CERTIFICATION

I, Michael Burke, certify that I am currently a NYS Qualified Environmental Professional (QEP) as defined in Title 6 of the New York Codes, Rules, and Regulations (NYCRR) Part 375 and that this Remedial Investigation Work Plan (RIWP) was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the New York State Department of Environmental Conservation (NYSDEC) Division of Environmental Remediation (DER)-10 Technical Guidance for Site Investigation and Remediation and DER-31 Green Remediation.

DRAFT

Michael Burke, PG, CHMM

1.0 INTRODUCTION

This Remedial Investigation Work Plan (RIWP) was prepared on behalf of SHF Cliff Street LLC (the Requestor) for the property at 50-58 Cliff Street in New York, New York (the site). This RIWP is being submitted in conjunction with the Requestor's application for the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP).

The objective of the RIWP is to further investigate and characterize the nature and extent of environmental impacts at the site, to provide sufficient information to evaluate potential impacts to human health, and to provide sufficient information to evaluate remedial alternatives, as required. This RIWP was developed in accordance with the process and requirements identified in the NYSDEC Division of Environmental Remediation (DER)-10 Technical Guidance for Site Investigation and Remediation (May 2010), DER-31 Green Remediation, Title 6 of the New York Codes, Rules, and Regulations (NYCRR) Part 375, Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances (PFAS) Under NYSDEC's Part 375 Remedial Programs (April 2023) and the New York State Department of Health (NYSDOH) Guidance for Evaluating Soil Vapor Intrusion in the State of New York (October 2006, with subsequent updates).

2.0 SITE BACKGROUND

2.1 Site Description

The site is at 50-58 Cliff Street and is identified as Block 95, Lot 35 on the Manhattan Borough Tax Map. The approximately 6,172-square-foot-site is improved with a garden, including paved walkways and landscaping, that is situated about 4 feet below the surrounding sidewalks. There are no buildings on the site. The site is bound by a pedestrian street (extension of Cliff Street) to the northwest, a pedestrian street (extension of Beekman Street) to the northeast, a one-story building (part of Saint Margaret’s House facility) to the southeast, and a New York City Transit Authority substation to the southwest. According to an October 24, 2025 site survey prepared by Control Point Associates Inc, ground surface elevations within the site vary from about elevation (el) 14 to 16 (North American Vertical Datum of 1988 [NAVD88]). Surrounding sidewalk elevations range from about el 18 in the northeastern adjoining sidewalk to about el 20 in the northwestern adjoining sidewalk. The topography at the site is generally flat and the surrounding area slopes southeast towards the East River (located about 1,000 feet southeast of the site). A site location map is provided as Figure 1.

2.2 Proposed Redevelopment Plan

The proposed redevelopment includes construction of a multi-story affordable housing building with a partial cellar and an exterior garden space fronting the southeast-adjacent Saint Margaret’s House (SMH) building. The contemplated use for purposes of the BCP would be restricted-residential.

2.3 Surrounding Property Land Use

The site is located within an urban area characterized by commercial and residential uses. Adjoining and surrounding property usage is summarized in the following table:

Direction	Block	Lot	Adjoining Properties	Surrounding Properties
Northeast	Pedestrian Walkway (Extension of Beekman Street)			Mixed commercial and residential buildings
	94	1	Southbridge Towers Apartment Complex (80 Gold Street)	
Southeast	95	27	St. Margaret’s House Senior Living Facility (41-53 Fulton Street)	Residential buildings
Northwest	Pedestrian Walkway (Extension of Cliff Street)			Mixed commercial and residential buildings
	94	1	Southbridge Towers Apartment Complex (80 Gold Street)	
Southwest	95	43	Cliff Street Substation (46 Cliff Street)	Mixed commercial and residential buildings

Land use within a half-mile of the site is urbanized and includes mixed-use buildings, subway tunnels, park land, and school facilities. The closest ecological receptor is the East River, which is located approximately 0.19-miles to the southeast of the site.

No schools or day care facilities are located on the site. Sensitive receptors, as defined in DER-10, within a half-mile of the site include those listed below:

Number	Name (Approximate distance from site)	Address
1	St. Maragret's House Senior Living Facility (southeast-adjoining to the site)	49 Fulton Street, New York, NY 10038
2	Pearl Street Playground (about 0.04-mile south of the site)	49 Fulton Street, New York, NY 10038
3	KinderCare FiDi NYC (about 0.10 mile west of the site)	101 John Street, New York, NY 10038
4	The Peck Slip School (about 0.11-mile northeast of the site)	1 Peck Slip New York, NY 10038
5	Imagination Playground (about 0.15-mile south of the site)	165 John Street, New York, NY 10038
6	Spruce Street School (about 0.19-mile north of the site)	12 Spruce Street, New York, NY 10038
7	Gotham Park (about 0.22-mile northeast of the site)	1 Rose Street, New York, NY 10038
8	AVNA Learning Center (about 0.23-mile northwest of the site)	139 Fulton Street # 605, New York, NY 10028
9	Murry Bergtraum High School for Business Careers (about 0.23-mile north of the site)	411 Pearl Street New York, NY 10038
10	Manhattan Early College School for Marketing and Media Arts (about 0.23-mile north of the site)	411 Pearl Street New York, NY 10038
11	The Urban Assembly Early College High School of Emergency Medicine (about 0.23-mile north of the site)	411 Pearl Street New York, NY 10038
12	Urban Assembly Maker Academy (about 0.24-mile north of the site)	411 Pearl Street New York, NY 10038
13	Success Academy Charter Schools (about 0.27-mile southwest of the site)	95 Pine Street, New York, NY 10005
14	Bright Horizons (about 0.30-mile west of the site)	20 Pine Street, New York, NY 10005
15	Millennium Park (about 0.30-mile northwest of the site)	1 Park Row, New York, NY 10038
16	Pine Street School (about 0.31-mile west of the site)	25 Pine Street, New York, NY 10005
17	Zuccotti Park (about 0.38-mile west of the site)	84 Liberty Street, New York, NY 10006
18	P.S. 126 Jacob August Riis (about 0.41-mile northeast of the site)	80 Catherine Street New York, NY 10038
19	Leman Manhattan Preparatory School (about 0.41-mile southwest of the site)	41 Broad Street, New York, NY 10004
20	Vivvi World Trade Center (about 0.46-mile northwest of the site)	50 Park Place, New York, NY 10007
21	Millennium High School (about 0.47-mile southwest of the site)	75 Broad Street, 13 th Floor, New York, NY 10004

2.4 Site Physical Conditions

2.4.1 Topography

According to a site survey prepared by Control Point Associates Inc, ground surface elevations within the site vary from about el 14 to 16 NAVD88. Ground surface within the site is set below the surrounding

sidewalks, which are at el 18 to 20. The topography at the site is generally flat and the surrounding area slopes southeast towards the East River (located about 0.19-miles southeast of the site).

2.4.2 Site Geology

Based on a Phase II Environmental Site Investigation (ESI) completed by Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C. (Langan) in October 2024, subsurface stratigraphy generally consists of non-native fill consisting of fine- to medium-grained sand with varying amounts of silt, gravel, and anthropogenic materials (brick and wood) extending to a maximum depth of 9.25 feet below grade surface (bgs). The non-native fill layer is underlain by brown, fine- to medium-grained sand with varying amounts of silt, clay, and gravel.

Bedrock was not encountered during the Phase II ESI or in previous borings. The 7 January 2026 Geotechnical Engineering Report, prepared by Langan, states that bedrock was not encountered during the Geotechnical Investigation, and the deepest boring was advanced to about 137 feet bgs. According to the USGS "Bedrock and Engineering Geologic Maps of New York County and Parts of Kings and Queens Counties, New York, and Parts of Bergen and Hudson Counties, New Jersey" (Baskerville, 1994), bedrock beneath the site is part of the Manhattan Schist Formation.

2.4.3 Hydrogeology

Groundwater flow is typically topographically influenced, as shallow groundwater tends to originate in areas of topographic highs and flow toward areas of topographic lows, such as rivers, stream valleys, ponds, and wetlands. A broader, interconnected hydrogeologic network often governs groundwater flow at depth or in the bedrock aquifer. Groundwater depth and flow direction are also subject to hydrogeologic and anthropogenic variables such as precipitation, evaporation, extent of vegetative cover, and coverage by impervious surfaces. Other factors influencing groundwater include depth to bedrock, artificial fill, and variability in local geology and groundwater sources or sinks. Potable water is provided by the City of New York and is derived from surface impoundments in the Croton, Catskill, and Delaware watersheds.

During implementation of the Phase II ESI, groundwater was encountered at about 15.3 feet bgs, between about el. -0.5 and 0 feet NAVD88 in two temporary groundwater monitoring wells. The inferred regional groundwater flow direction, based on regional topography and proximity to water bodies, is to the southeast towards the East River.

2.5 Environmental History and Previous Investigations

The following environmental reports were prepared for the site and are included in Appendix A.

- *Phase I Environmental Site Assessment – 50-58 Cliff Street, prepared by Langan, dated 7 December 2022*
- *Phase II Environmental Site Investigation – 50-58 Cliff Street, prepared by Langan, dated 12 December 2024*

Environmental conditions established in the above reports are summarized in the sections below.

General Site History

The site was developed with three, four-story structures occupying the entire lot in the early-1890s to mid-1910s. By 1950, two of the structures are denoted as “essential oils” on Sanborn maps, and city directories confirm essential oil operations from 1927 through 1956. City directory listings for 50 Cliff Street from 1920 to 1968 list several occupants at the site including “Stein Henry Plumbers Supply”, “Post E L & Co Metals & Oils”, “Tucker & Fickeisen Inc Wire & Bronze Wk”, and “Ingram Hill Bags & Burlap”. These city directory listings indicated on-site metal works operations from 1934 through 1958. In 1961, the site was clear of all structures and used for vehicle storage. Garden construction and concrete pathways similar to its present day configuration were apparent starting in 1981.

Previous Environmental Sampling

Langan completed a Phase II ESI between 23 and 28 October 2024. A summary of documented soil, groundwater, and soil vapor contamination from the Phase II ESI is provided below.

Geophysical Survey

A geophysical survey was conducted across accessible parts of the site and surrounding sidewalks, to the extent feasible. Anomalous findings, as interpreted by the geophysical survey contractor, are summarized below:

- Subsurface anomalies resembling various utilities (e.g., electric and sewer) were identified on-site.
- An unidentified scattered subsurface anomaly was detected in the southwestern part of the site. While the signature of the anomaly was not necessarily consistent with an underground storage tank (UST), the anomaly is referenced as a suspect UST throughout this work plan.

Soil

The non-native fill layer underlying the site contains semivolatile organic compounds (SVOCs) and metals at concentrations exceeding the 6 NYCRR Part 375 Unrestricted Use (UU), Protection of Groundwater (PGW), and Restricted Use Restricted-Residential (RURR) soil cleanup objectives (SCO). Native soil underlying the fill did not contain contaminants exceeding the UU, PGW, or RURR SCOs.

No visual, olfactory, or photoionization detector (PID) evidence of a chemical or petroleum release was identified in the borings during the Phase II ESI. Nine SVOCs and four metals were detected at concentrations exceeding the UU, PGW, and/or RURR SCOs. The presence of SVOCs and metals are attributed to the non-native fill quality and historical site use.

Groundwater

Groundwater contains six SVOCs and three metals exceeding the NYSDEC Technical and Operational Guidance Series (TOGS) 1.1.1 Ambient Water Quality Standards and Guidance Values for Class GA water (collectively the NYSDEC SGVs). The source of SVOCs in groundwater is likely to be non-native fill. The metals detected above SGVs in groundwater are common earth metals and are naturally occurring or representative of regional groundwater conditions.

Soil Vapor

No regulatory standard currently exists for soil vapor samples in New York State. Petroleum-related compounds were detected at low levels in soil vapor samples across the site. No on-site source of petroleum was identified.

Previous sample locations and analytical results are shown on Figures 2 through 5.

2.6 Areas of Concern

Based on the site history and the findings of previous studies, the areas of concern (AOC) to be further investigated by this remedial investigation (RI) are shown on Figure 6 and are described below.

AOC 1: Suspected Petroleum Bulk Storage

An unidentified subsurface anomaly (suspected to be a UST) was detected in the southwestern part of the site during the geophysical survey conducted as part of the October 2024 Phase II ESI. Petroleum-related compounds were also detected at low levels in soil vapor samples across the site. Observations and impacts related to potential petroleum-bulk storage require further investigation.

AOC 2: Non-Native Fill

Non-native fill at the site extends from surface grade to between 8 and 9.25 feet bgs and consists of fine- to medium-grained sand with varying amounts of silt, gravel, and anthropogenic materials (brick and wood). SVOCs and metals detected in the fill layer at concentrations above the UU, PGW, and/or RURR SCOs are attributed to the fill quality and historical site uses.

3.0 SCOPE OF WORK

The objective of this RIWP is to supplement existing data to investigate and characterize “the nature and extent of the contamination at and/or emanating from a brownfield site”, as required to satisfy New York Environmental Conservation Law (ECL) 27-1411.1.

The field investigation will include the tasks summarized below, which are discussed in more detail in the following sections. The rationale for each sampling location, in relation to the AOCs and analytical parameters for each proposed sample, is provided in Table 1.

Geophysical Survey

- Perform a supplemental geophysical survey to locate USTs, underground structures, geophysical anomalies, and utilities across accessible areas of the site, including in the vicinity of proposed sampling locations.

Soil Borings and Sampling

- Advance five soil borings to at least 14 feet bgs or approximately 4 feet into native soil, whichever is deeper. If impacts are identified during advancement, borings will be extended to a depth at which impacts are no longer observed. Soil borings to be converted to groundwater monitoring wells will be advanced to at least 7 feet below the observed groundwater interface.
- Advance three shallow soil borings to about 6 feet bgs to delineate SVOCs detected in Phase II sample SB-02_4-6.
- Advance four soil borings in the vicinity of the suspected UST to investigate the extent of potential petroleum-related impacts to soil, if any. Borings will be advanced to about 2 feet below the observed groundwater table interface (groundwater is anticipated at about 15 feet bgs). Soil borings to be converted to groundwater monitoring wells will be advanced to at least 7 feet below the observed groundwater interface.
- Collect at least one soil sample from each boring (plus quality assurance/quality control [QA/QC] samples) to further characterize and delineate the nature and extent of soil contamination at the site.
 - At least one soil sample will be collected from soil borings advanced in the vicinity of the suspected UST (with the exception of SB08)
 - One soil sample will be collected from about 4 to 6 feet bgs from shallow soil borings advanced to delineate SVOCs.
 - At least two soil samples will be collected from the remaining borings.

Monitoring Well Installation and Sampling

- Install and develop at least three new permanent monitoring wells (MW08, MW14, and MW16).
- Collect one groundwater sample from each new monitoring well (plus QA/QC samples) for laboratory analysis to further evaluate groundwater quality across the site.

- Survey and gauge newly-installed monitoring wells to evaluate groundwater elevations, flow direction, and the potential presence of non-aqueous phase liquids (NAPL).

Soil Vapor Installation and Sampling

- Install four soil vapor points to about 5 feet bgs or 2 feet above the observed groundwater table (whichever is shallower).
- Collect one soil vapor sample from each soil vapor point for laboratory analysis to further evaluate the nature and extent of soil vapor contamination across the site.

At the completion of the above scope of work, the NYSDEC and NYSDOH Project Managers will be consulted, as reasonable, to determine if additional samples are needed based on field observations and/or analytical data. If any modifications to the RIWP are made, they will be discussed in the Remedial Investigation Report (RIR).

The field investigation will be completed in accordance with the procedures specified in the Quality Assurance Project Plan (QAPP), Health and Safety Plan (HASP), and Community Air Monitoring Program (CAMP) included as Appendices B, C, and D, respectively.

The names, contact information and roles of the principal personnel who will participate in the investigation are listed below. Résumés for Langan employees involved in the project are included in the QAPP (Appendix B).

Personnel	Investigation Role	Contact Information
Paul McMahon, PE Langan Engineering	Project Engineer	Phone – 212-479-5451 Email – pmcmahon@langan.com
Elizabeth Adkins, PE Langan Engineering	Project Manager	Phone – 212-479-5445 Email – eadkins@langan.com
Seyena Simpson Langan Engineering	Field Team Leader	Phone – 212-479-5499 x 5789 Email – ssimpson@langan.com
Tony Moffa, CHMM Langan Engineering	Langan Health & Safety Officer	Phone – 215-491-6500 Email – tmoffa@langan.com
William Bohrer, PG Langan Engineering	Field Safety Officer	Phone – 212-479-5533 Email – wbohrer@langan.com
Michael Burke, PG, CHMM Langan Engineering	Quality Assurance Officer	Phone – 212-479-5413 Email – mburke@Langan.com
Ben Rao Pace Analytical Services, LLC	Laboratory Contractor	Phone – 508-898-9220 Email – brao@alphalab.com
Joe Conboy Langan Engineering	Program Quality Assurance Monitor/ Data Validator	Phone – 609-282-8055 Email – jconboy@langan.com

3.1 Geophysical Survey

A geophysical contractor will perform a geophysical survey to locate USTs, underground structures, geophysical anomalies, identify utilities across accessible areas of the site, and clear subsurface boring locations of potential subsurface obstructions. The geophysical survey will be completed using a collection of geophysical instruments, including electromagnetic and utility line locator instruments and

ground-penetrating radar (GPR). The results of the survey may require relocating subsurface boring locations.

3.2 Soil Investigation

3.2.1 Soil Boring Installation

The drilling subcontractor will advance at least twelve soil borings using a limited-access drill rig to further investigate the AOCs identified in Section 2.7 and supplement the 12 December 2024 Phase II ESI. A plan showing the proposed sample locations is included as Figure 6, and a summary of the proposed laboratory analyses for each sample is included as Table 1. The following table associates borings and/or monitoring wells with AOCs and describes the rationale for each.

AOC	Associated Soil Borings	Rationale
AOC 1	SB05 through SB08	Investigate potential petroleum-bulk storage impacts around the suspected UST identified in the southwestern part of the site
AOC 2	SB08 through SB16	Further evaluate the nature and extent of non-native fill across the site

The soil borings will be advanced using a hand auger (or equivalent) and/or direct-push drilling technology. The direct-push drill rig will be equipped with a closed-point Macro-Core sampler to prevent the collapse of sidewall material as borings are advanced. Langan personnel will document the work, screen soil samples for environmental impacts, and collect representative environmental soil samples for laboratory analyses. Soil will be screened continuously to the boring termination depth for organic vapors with a PID equipped with a 10.6 electron volt (eV) bulb and for visual and olfactory evidence of environmental impacts (e.g., NAPL, staining, odor). Soil will be visually classified for color, grain size, texture, and moisture content, and will be recorded in a field log. Site operations will comply with the safety guidelines outlined in the HASP in Appendix C. Non-disposable, down-hole drilling equipment and sampling apparatus will be decontaminated between locations with Alconox and water. Water used for decontamination and rinsate will be containerized into United Nations/Department of Transportation (UN/DOT)-approved 55-gallon drums, labeled, and staged for off-site disposal.

3.2.2 Soil Sampling and Analysis

AOC 1

Borings SB05 through SB08 will be advanced in the vicinity of the suspected UST identified in the southwestern part of the site to investigate potential petroleum impacts. Samples from borings SB05 through SB08 will be collected from the following intervals:

- One sample will be collected from the interval exhibiting the greatest degree of impacts (based on the presence of staining, odor, and/or PID readings above background), if encountered.

- One sample will be collected from the 2-foot interval below the vertical extent of identified impacts, if encountered.
- If no impacts are observed, one sample will be collected from the groundwater interface.
- SB08 will be sampled to investigate potential petroleum impacts and to further investigate potential impacts from historical uses and fill quality across the site, as noted in AOC 2 below.

AOC 2

At least one grab soil sample will be collected for laboratory analysis from borings SB08 through SB16 to further investigate potential impacts from historical uses and fill quality across the site. Samples from borings SB08 through SB16, with the exception of borings SB10, SB11, and SB15, will be collected as follows:

- One representative fill sample will be collected above the groundwater table. Fill samples will target select intervals where SVOCs, metals, pesticides, or polychlorinated biphenyls (PCB) were detected in nearby Phase II ESI borings.
- One sample will be collected from the 2-foot interval at the top of the native soil layer.
- An additional sample will be collected from the 2-foot interval below the top of the native soil layer and placed on hold with the laboratory pending receipt of the preliminary results.

Samples from borings SB10, SB11, and SB15 will be collected as follows:

- One sample will be collected from the 4- to 6-foot interval for SVOCs only.

Depending on the site conditions (e.g., fill depth, presence/absence of impacts) and recovery, the number of samples collected at each boring may vary.

Soil samples will be collected in laboratory-supplied containers and will be sealed, labeled, and placed in a chilled cooler (to attempt to maintain a temperature of <math><4^{\circ}\text{C}</math>) for delivery to a NYSDOH Environmental Laboratory Approval Program (ELAP)-certified laboratory. Soil samples will be analyzed for one or more of the following using the latest United States Environmental Protection Agency (USEPA) methods:

- Target Compound List (TCL) VOCs by USEPA Methods 8260C/5035
- TCL SVOCs (including 1,4-dioxane) by USEPA Method 8270D
- PCBs by USEPA Method 8082A
- Target Analyte List (TAL) metals (including cyanide and hexavalent and trivalent chromium) by USEPA Methods 6010C/7471B/9010C/7196A
- Pesticides and herbicides by USEPA Methods 8081B and 8151A, respectively
- PFAS (40-compound list) by USEPA Method 1633

The proposed RI soil samples are summarized in Table 1. QA/QC procedures to be followed and sampling frequency are described in the QAPP in Appendix B.

3.3 Groundwater Investigation

3.3.1 Monitoring Well Installation

Three soil borings will be converted into permanent groundwater monitoring wells (MW08, MW14, and MW16). The proposed wells are included on Figure 6. As indicated in Table 1, groundwater samples from the three new monitoring wells will be used to investigate and characterize the nature and extent of contamination associated with the AOCs.

Monitoring well locations will be numbered in conjunction with their respective soil boring numbers and prefixed with "MW". Soil conditions will be screened and logged as described in Section 3.2. The wells will be constructed using 2-inch-diameter, threaded, flush-joint, polyvinyl chloride (PVC) casing, and 10-foot-long, pre-packed well screens that will terminate about 7 feet below the observed groundwater table. Due to access restrictions (the site is located about 4 feet below the surrounding sidewalk grade down a set of stairs), a limited-access rig will install all monitoring wells. The well annulus around the slotted screen in each well will be a minimum of 1 inch (minimum 4-inch-diameter boreholes). Clean sand (e.g., Morie No. 2) will be used to fill the annulus around the pre-packed screen up to about 2 feet above the top of the screened interval. A minimum 2-foot-thick bentonite seal will be installed above the sand, and the remaining borehole annulus will be backfilled with clean sand or drill cuttings with no evidence of chemical or petroleum impacts (i.e., staining, odors, or PID readings above background conditions) to within 12 inches of the surface and/or grouted to the surface with a bentonite and cement slurry. Monitoring wells will be finished at the surface with flush-mounted access covers. A well construction table detailing each monitoring well is provided in Table 2.

After installation, the wells will be developed by surging using either a weighted bailer or surge block across the well screen and casing to agitate and remove fines. After surging, the well will be purged via pumping until the water becomes visually clear. The well will then be allowed to stabilize for a minimum of one week prior to sampling.

3.3.2 Groundwater Sampling and Analysis

Before sampling, the headspace of each well will be measured with a PID. Because groundwater samples will be analyzed for PFAS, wells will be gauged with an interface probe to determine the depth to groundwater and thickness of any NAPL during well construction and again after groundwater samples are collected and the water table elevation stabilizes, to avoid potential cross contamination. If NAPL is encountered, representative samples of the product will be collected for laboratory fingerprint analysis. Groundwater samples will not be collected from monitoring wells that contain NAPL.

One groundwater sample will be collected from each newly installed well in general accordance with NYSDEC DER-10 and USEPA's Low Flow Purging and Sampling Procedures for the Collection of Groundwater Samples from Monitoring Wells (EQASOP-GW4 Revised Sep. 2017) and the NYSDEC guidance for Sampling, Analysis, and Assessment of PFAS under NYSDEC's Part 375 Remedial Programs (April 2023).

Before the groundwater samples are collected, wells will be continuously purged until groundwater quality parameters (pH, conductivity, turbidity, dissolved oxygen, temperature, and oxidation-reduction potential) stabilize or the wells have been purged for one hour, whichever is sooner, in accordance with the USEPA low-flow guidance. The groundwater samples will be collected once purged water is clear of sediment and turbidity is below 5 Nephelometric Turbidity Units (NTU). A multi-parameter water quality system will be used to monitor the groundwater quality parameters during sampling. Samples will be collected with a peristaltic pump or equivalent and dedicated polyethylene tubing. Groundwater samples will be collected at a maximum flow rate of 0.5 liters per minute. Development and purge water will be containerized into UN/DOT-approved 55-gallon drums, labeled, and staged for off-site disposal.

The groundwater samples will be collected in laboratory-supplied containers and will be sealed, labeled, and placed in a chilled cooler (to attempt to maintain a temperature of <4°C) for delivery to the laboratory. Groundwater samples will be analyzed using the latest USEPA methods as follows:

- TCL VOCs by USEPA Method 8260C
- TCL SVOCs by USEPA Method 8270D (1,4-dioxane by 8270 SIM isotope dilution)
- PCBs by USEPA Method 8082A
- TAL Metals (field-filtered and unfiltered) (including hexavalent and trivalent chromium) by USEPA Method 6010C/7470
- Cyanide by USEPA Method 9012B
- Pesticides and herbicides by USEPA Methods 8081B and 8151A, respectively
- PFAS (40-compound list) by USEPA Method 1633

The proposed groundwater samples are summarized in Table 1. QA/QC sample collection procedures and sampling frequency are described in the QAPP in Appendix B.

3.3.3 Monitoring Well Survey and Synoptic Gauging

Langan will survey the vertical elevation of the monitoring wells, including ground surface elevation and the top of well casing, to the nearest 0.01 foot. The horizontal location will be measured off of a surveyed site feature. Vertical control will be established by surveying performed relative to NAVD88 by a New York State-licensed land surveyor. A synoptic gauging event will be performed after the new wells are installed to document static water levels across the site. This data will be used to prepare a groundwater contour map depicting the elevation of the water table across the site.

3.4 Soil Vapor Investigation

3.4.1 Soil Vapor Point Installation

Four soil vapor points (SV08, SV12, SV14, and SV16) will be installed using direct-push technology in accordance with the NYSDOH's Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York (October 2006, with updates). A plan showing the proposed soil vapor point locations is included as Figure

6. As indicated in Table 1, soil vapor samples from each sampling location will be used to investigate and characterize the nature and extent of contamination associated with AOC 1 and AOC 2.

Soil vapor points will be installed by advancing a probe implant to about 2 feet above the groundwater table or 5 feet bgs, whichever is shallower. The soil vapor collection points will consist of a 1.875-inch polyethylene implant with inert sample tubing (e.g., Teflon or Teflon-lined polyethylene). The annulus (i.e., the sampling zone) around the soil vapor implant and tubing will be filled with a clean, coarse sand pack followed by a hydrated bentonite seal to surface grade. Hydrated bentonite will also be used to create a seal around the tubing at the surface of the soil vapor points.

3.4.2 Soil Vapor Sampling and Analysis

Samples will be collected in accordance with the NYSDOH's Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York (October 2006, with updates). Before collecting vapor samples, a maximum of three vapor point volumes (i.e., the volume of the sample implant and tubing) will be purged from each sample location at a rate of less than 0.2 liters per minute using a RAE Systems MultiRAE meter set at a low flow setting. The purged vapor will be monitored for VOCs with the MultiRAE during purging.

A helium tracer gas will be used to serve as a QA/QC technique to document the integrity of each vapor point seal before and after sampling. The tracer gas will be introduced into a container, which will shroud the vapor point and seal. Helium will be measured from the sampling tube and inside the container. If the sample tubing contains more than 10% of the tracer gas concentration that was introduced into the container, then the seal will be considered compromised and will be enhanced or reconstructed to prevent outdoor air infiltration.

A log sheet for each vapor sample will be completed to record sample identification; date and time of sample collection; sampling depth; name of the field personnel responsible for sampling; sampling methods and equipment; vapor purge volumes; volume of vapor extracted; flow rate; and vacuum of canisters before and after sample collection.

After the integrity of each seal is confirmed, vapor samples will be collected into laboratory-supplied batch-certified clean 2.7- or 6-liter Summa canisters with calibrated flow controllers. Vapor samples will be collected over a 2-hour sampling period and analyzed for VOCs by USEPA Method TO-15.

The proposed vapor samples are summarized in Table 1. QA/QC sample collection procedures and sampling frequency are described in the QAPP in Appendix B.

3.5 Sampling Contingency

Additional soil, groundwater, or vapor sampling locations may be completed, as needed, to evaluate unanticipated contamination and to horizontally and vertically delineate identified contamination (e.g., NAPL, VOCs, SVOCs, metals, or other analytes) based on field observations and preliminary analytical results. The objective of a sampling contingency is to provide adequate delineation of AOCs during a single mobilization event, if possible. The decision to complete additional sampling and delineation (including step-out distances and target-depth intervals) based on field observations and/or preliminary

(non-validated) laboratory data will be made by Langan, potentially in consultation with NYSDEC and/or NYSDOH Project Managers. The location of any step-out soil borings and additional monitoring wells will be based on field observations and analytical data from adjacent borings and wells, site access, and drilling considerations. Sampling depths and analyses will be contingent on observations/findings.

3.6 Data Management and Validation

Laboratory analyses of soil, groundwater, and vapor samples will be conducted by a NYSDOH ELAP-approved laboratory in accordance with USEPA SW-846 methods and the data collected will be reported in NYSDEC analytical services protocol (ASP) Category B deliverable format. Environmental data will be reported electronically using the database software application EQUIS as part of NYSDEC's Environmental Information Management System (EIMS) and via email.

QA/QC procedures required by the NYSDEC ASP and SW-846 methods, including initial and continuing instrument calibrations, standard compound spikes, surrogate compound spikes, and analysis of other samples (blanks and laboratory control samples), will be followed during the RI. The laboratory will provide sample bottles for the RI, which will be pre-cleaned and preserved in accordance with the SW-846 methods. Where there are differences in the SW-846 and NYSDEC ASP requirements, the NYSDEC ASP will take precedence.

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 QC sample results (qualitative and quantitative)
- Verification of sample results (positive hits and non-detects)
- Recalculation of 10 percent of all investigative sample results
- Preparation of data usability summary reports (DUSRs)

The DUSRs will be prepared and reviewed by the Program Quality Assurance Monitor (PQAM). The DUSRs will provide a detailed assessment of each sample delivery group (SDG) and present the results of data validation, including a summary assessment of laboratory data packages, sample preservation and Chain of Custody procedures, and a summary assessment of precision, accuracy, representativeness, comparability, and completeness for each analytical method. Additional details on the DUSRs are provided in the QAPP in Appendix B.

The results from the RI will be reported in NYSDEC ASP Category B deliverable format and validated by the Data Validator identified in the QAPP. The DUSRs from the RI and the Phase II ESI will be prepared and included as an appendix in the RIR.

3.7 Management of Investigation-Derived Waste

Grossly-contaminated or excess soil cuttings and purge water will be containerized and staged on-site, pending proper disposal at an off-site waste management facility. Soil cuttings with no apparent staining, odors, or PID readings above background conditions will be used to backfill boreholes. Soil, purged groundwater, and decontamination fluids to be disposed of off-site will be placed in 55-gallon, UN/DOT-

approved drums with closed tops. Drums will be properly labeled, sealed, and characterized. Drums will be labeled as nonhazardous waste pending analysis and stored in a manner to prevent contents from discharging to the environment. Investigative derived waste (IDW) will be disposed of off-site at one or more selected disposal facilities within 90 days of generation. If RI analytical data is insufficient to gain disposal facility acceptance, additional waste characterization samples will be collected. Additional sampling and analyses may be required based on the selected disposal facility. Waste characterization samples will be submitted to a NYSDOH ELAP-approved laboratory for analysis in accordance with the QAPP provided in Appendix B. Management of IDW will comply with NYSDEC DER-10 3.3(e) and DER-31 (Section 3.11).

3.8 Air Monitoring

Air monitoring will be conducted for site personnel (HASP) and the community (CAMP) (Appendix D). Fugitive particulate (dust) generation that could affect site personnel or the public is not expected because intrusive work is limited to boring, monitoring well, and vapor point installation, which does not disturb large volumes of soil.

Dust emissions will be monitored using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10). Organic vapors will be monitored with a PID. Odors will be periodically monitored by site personnel at and beyond the site perimeter. Dust and odor suppression measures (e.g., water misting, odor suppressant) will be implemented as needed. All PIDs used will be equipped with a 10.6 eV bulb.

3.8.1 Personnel Air Monitoring

Langan will conduct air monitoring of the breathing zone periodically during drilling and sampling activities to evaluate health and safety protection for the Langan field personnel. Initially, ambient air monitoring will be performed within the work area. Langan will monitor VOCs with a PID (MultiRAE 3000 or similar) in accordance with the HASP (Appendix C). If air monitoring during intrusive operations identifies the presence of VOCs, on-site personnel will follow the guidelines outlined in the HASP regarding action levels, permissible exposure, engineering controls, and personal protective equipment. If the VOC action level is exceeded, work will cease and the work location will be evacuated. Monitoring will continue until the levels drop to safe limits. At that time, work can resume with continued monitoring. If high levels persist, field activities will be halted and the work relocated to another area. If dust emissions are observed, work will stop and dust suppression measures will be used.

3.8.2 Community Air Monitoring Plan

In addition to air monitoring in the worker breathing zone, Langan will conduct community air monitoring in compliance with the NYSDOH Generic CAMP. CAMP deployment will comply with NYSDEC DER-10 Appendix 1A and Appendix 1B.

Langan will conduct periodic monitoring for VOCs during non-intrusive work such as the collection of groundwater samples. Periodic monitoring may include obtaining measurements upon arrival at a

location, when opening a monitoring well cap, when bailing/purging a well, and upon departure from a location.

Langan will also conduct continuous monitoring for VOCs and dust during ground-intrusive work (e.g., soil boring advancement and monitoring well installation). During ground-intrusive work, Langan will measure upwind concentrations at the start of each workday to establish background concentrations. Langan will monitor VOCs and dust at the downwind perimeter of the work zone, which will be established at a point on the site where measurements are taken between the work zone and public right-of-way. Monitoring for VOCs will be conducted with a PID. Dust emissions will be monitored using real-time monitoring equipment capable of measuring PM-10 (e.g., DustTrak). If dust emissions are observed, work will stop and dust suppression measures will be used. Odors will be periodically monitored by site personnel at and beyond the site perimeter.

3.9 Qualitative Human Health Exposure Assessment

A Qualitative Human Health Exposure Assessment (QHHEA) will be conducted in accordance with Appendix 3B of the NYSDEC DER-10, Technical Guidance for Site Investigation and Remediation. The assessment will be included in the RIR.

3.10 Fish and Wildlife Resources Impact Analysis

A Fish and Wildlife Resources Impact Analysis (FWRIA) screening-level review will be conducted in accordance with Section 3.10 and Appendix 3C of the NYSDEC DER-10, Technical Guidance for Site Investigation and Remediation. If necessary based on the results of the screening-level review, a full FWRIA will be performed. The assessment will be included in the RIR.

3.11 Green and Sustainable Remediation

The NYSDEC DER-31 Green and Sustainable Remediation Initiative requires that green remediation concepts and techniques be considered during all stages of the remedial program, including investigation, with the goal of improving the sustainability of the cleanup and summarizing the net environmental benefit of any implemented green technology. The following measures will be implemented during the RI:

1. Limit use of generators, drilling equipment, and vehicles to reduce emissions to the atmosphere
2. Minimize IDW generated by reusing soil/fill that does not exhibit visual, olfactory, or PID evidence of contamination to backfill boreholes after sampling
3. Minimize truck travel for disposal of IDW by selecting local disposal facilities for IDW
4. Request that the environmental drillers use clean diesel equipment to reduce emissions to the atmosphere
5. Use public transportation to access the site during implementation of the RI, to the extent practicable

4.0 REMEDIAL INVESTIGATION REPORT

Following completion of the RI and receipt of analytical data, an RIR will be prepared in accordance with the applicable requirements of DER-10 Section 3.14. The report will include:

- (1) A summary of the site history and previous investigations
- (2) A description of site conditions and the remedial investigation
- (3) Sampling methodology and field observations
- (4) Evaluation of the results and findings
- (5) Conclusions
- (6) Recommendations for any further assessment, if warranted

The report will summarize the nature and extent of contamination for each AOC and identify complete and potentially complete exposure pathways (as determined through the QHHEA). DUSRs will be included in the RIR and electronic data deliverables will be submitted to the NYSDEC EQulS database prior to submission of the draft RIR.

The report will include soil boring and well construction logs, sampling logs, tabulated analytical results, figures, and laboratory data packages. The analytical results will be organized in table format and include sample location; media sampled; sample depth; field/laboratory identification numbers; analytical results; and applicable Standards, Criteria, and Guidance (SCG) pertaining to the site and contaminants of concern for comparison. The report will include scaled figures showing the locations of soil borings, monitoring wells, and vapor points; sample concentrations above SCGs for each media; groundwater elevation contours and flow direction; and, if appropriate, groundwater contaminant concentration contours.

Soil analytical results will be compared to the UU SCOs, PGW SCOs, RURR SCOs, and the guidance values set forth in the NYSDEC Part 375 Remedial Programs guidance for Sampling, Analysis, and Assessment of PFAS (April 2023). Groundwater analytical results will be compared to the NYSDEC SGVs for Class GA water. Soil vapor results will be tabulated. The RIR will be provided in an electronic format to the NYSDEC.

5.0 SCHEDULE

A preliminary BCP schedule through Remedial Action Work Plan (RAWP) approval is provided as Appendix E. If the schedule changes, it will be updated and submitted to the NYSDEC.