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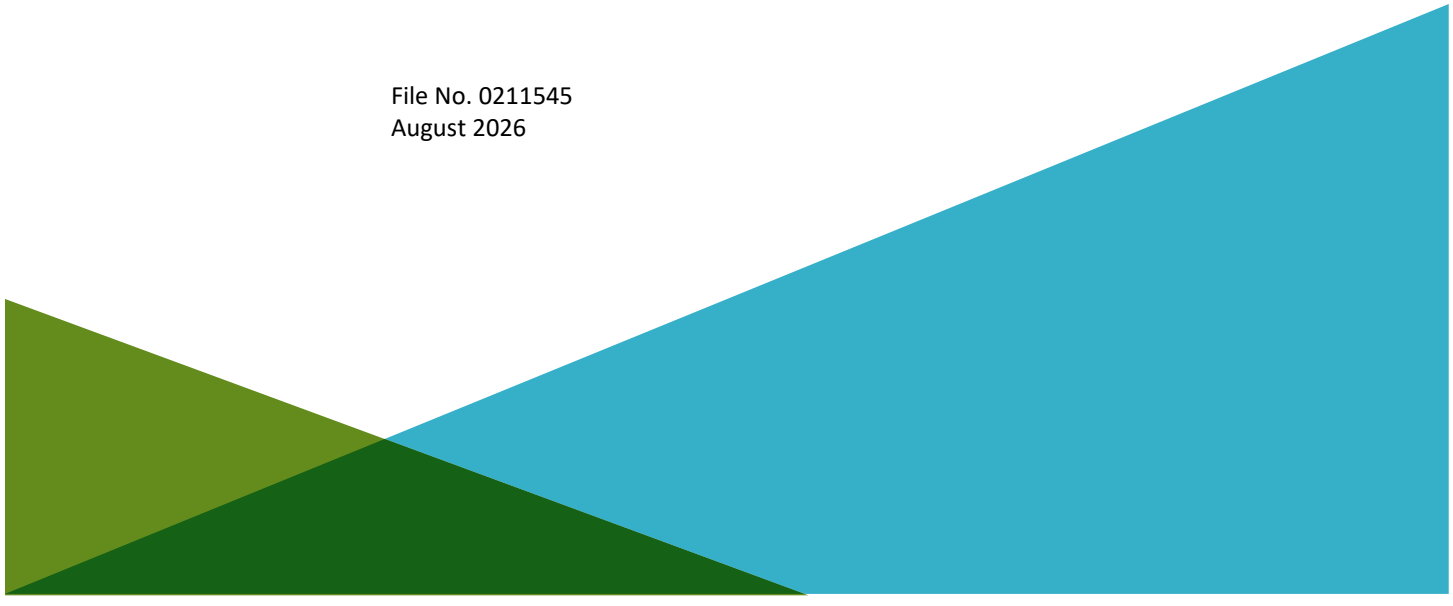
REPORT ON

REMEDIAL INVESTIGATION WORK PLAN
FORMER CORZO MAINTENANCE SITE
NYSDEC BCP SITE NO. C224442
168 BANKER STREET
BROOKLYN, NEW YORK

by
H & A of New York Engineering and Geology LLP
New York, New York

for
Wythe Gem LLC
Brooklyn, New York

File No. 0211545
August 2026



H & A OF NEW YORK ENGINEERING
AND GEOLOGY, LLP
213 West 35th Street
7th Floor
New York, NY 10001
646.518.7735

August 14, 2026
File No. 0211545

New York State Department of Environmental Conservation
Remedial Bureau B, Section E - Division of Environmental Remediation
625 Broadway, 12th Floor
Albany, New York 12233-7017

Attention: Mr. Robert Strang

Subject: Remedial Investigation Work Plan
Former Corzo Maintenance Site
BCP Site No. C224442
168 Banker Street
Brooklyn, New York

Ladies and Gentlemen:

H & A of New York Engineering and Geology, LLP (Haley & Aldrich of New York), on behalf of Wythe Gem LLC, is submitting for the review and approval of the New York State Department of Environmental Conservation (NYSDEC) this Remedial Investigation Work Plan (RIWP) for the Former Corzo Maintenance Site (Brownfield Cleanup Program [BCP] Site C224442) located at 168 Banker Street in Brooklyn, New York (Site). This RIWP has been developed based on the NYSDEC's "Technical Guidance for Site Investigation and Remediation" (Division of Environmental Remediation [DER]-10, dated May 2010).

Please do not hesitate to contact us if there are any questions regarding this submittal or any other aspects of the project.

Sincerely yours,
H & A OF NEW YORK ENGINEERING AND GEOLOGY LLP

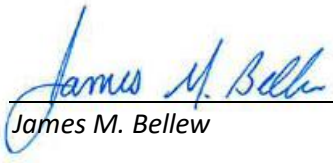
Zachary P. Simmel
Project Manager

James M. Bellew
Principal

cc:
Louis Handler (Wythe Gem LLC) Email: louis.handler@gmail.com
Zelig Weiss (Wythe Gem LLC) Email: zelig@riversideny.com
Jon Schuyler Brooks (Abramson Brooks LLP) Email: jbrooks@abramsonbrooks.com

Certification

I, James M. Bellew, certify that I am currently a Qualified Environmental Professional as defined in 6 NYCRR Part 375 and that this Remedial Investigation Work Plan[1] was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the Division of Environmental Remediation Technical Guidance for Site Investigation and Remediation (DER-10).



August 14, 2026

James M. Bellew *Date*

[1] *Certification applies to remedial investigation activities conducted after execution of a Brownfield Cleanup Agreement (BCA).*

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List of Acronyms and Abbreviations

Acronym/Abbrev.	Definition
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
µg/m^3	micrograms per cubic meter
A	
Applicant	Wythe Gem LLC
AOC	Area of Concern
ASP	Analytical Services Protocol
AWQS	Ambient Water Quality Standards
B	
BCA	Brownfield Cleanup Agreement
BCP	Brownfield Cleanup Program
BER	Business Environmental Risk
bgs	below ground surface
Brussee	Brussee Environmental
BTEX	benzene, toluene, ethylbenzene, and xylenes
C	
CAMP	Community Air Monitoring Plan
CFR	Code of Federal Regulations
Coastal	Coastal Environmental Solutions, Inc.
CREC	Controlled Recognized Environmental Condition
CUSCO	Commercial Use Soil Cleanup Objective
CVOC	chlorinated volatile organic compound
D	
DER-10	Division of Environmental Remediation-10 *(specifically "May 2010 NYSDEC Technical Guidance for Site Investigation and Remediation")*
DPV	DPV Consultants, Inc.
DUSR	Data Usability Summary Report
E	
EA	Exposure Assessment
EDD	Electronic Data Deliverable
ELAP	Environmental Laboratory Approval Program
EPA	U.S. Environmental Protection Agency
ESA	Environmental Site Assessment
F	
FER	Final Engineering Report
FSP	Field Sampling Plan
ft	foot/feet

List of Acronyms and Abbreviations (continued)

Acronym/Abbrev.	Definition
G	
GPR	ground penetrating radar
GPRS	Ground Penetrating Radar Systems, LLC
GV	Guidance Value
H	
Haley & Aldrich of New York	H & A of New York Engineering and Geology, LLP
HASP	Health and Safety Plan
HREC	Historical Recognized Environmental Conditions
L	
L/min	liters per minute
Lakewood	Lakewood Environmental Services Corp.
LSDF	low-sulfur diesel fuel
LUST	Leaking Underground Storage Tank
M	
mg/kg	milligrams per kilogram
N	
ng/L	nanograms per liter
NOVA	NOVA Geophysical Services
NTU	nephelometric turbidity unit
NYCDCP	New York City Department of City Planning
NYCOER	New York City Office of Environmental Remediation
NYCRR	New York Codes, Rules and Regulations
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYSDOT	New York State Department of Transportation
O	
OSHA	Occupational Safety and Health Administration
P	
PACE	Pace Analytical Services
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PCE	perchloroethene/tetrachloroethene
PFAS	per- and polyfluoroalkyl substances
PFOA	perfluorooctanoic acid
PFOS	perfuorooctane sulfonic acid
PID	photoionization detector
ppm	parts per million

List of Acronyms and Abbreviations (continued)

Acronym/Abbrev.	Definition
Q	
QA/QC	Quality Assurance/Quality Control
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QEP	Qualified Environmental Professional
QHHEA	Qualitative Human Health Exposure Assessment
R	
RAWP	Remedial Action Work Plan
REC	Recognized Environmental Condition
RI	Remedial Investigation
RIR	Remedial Investigation Report
RIWP	Remedial Investigation Work Plan
Roux	Roux Environmental Engineering and Geology, D.P.C.
S	
SCO	Soil Cleanup Objective
Site	the property located at 168 Banker Street, Brooklyn, New York
SMP	Site Management Plan
sq ft	square feet
SVOC	semi-volatile organic compound
T	
TAL	Target Analyte List
TCE	trichloroethene
TCL	Target Compound List
TOGS 1.1.1	Technical and Operational Guidance Series 1.1.1 *(Specifically "June 1998 NYSDEC Division of Water Technical and Operational Guidance Series 1.1.1 Ambient Water Quality Standards and Guidance Values, Class GA for the protection of a source of drinking water modified per the April 2000 addendum")*
U	
UUSCOs	Unrestricted Use Soil Cleanup Objectives
V	
VOC	volatile organic compound

1. Introduction

On behalf of the Applicant, Wythe Gem LLC, H & A of New York Engineering and Geology, LLP (Haley & Aldrich of New York) has prepared this *Remedial Investigation Work Plan* (RIWP) for the Former Corzo Maintenance Site, located at 168 Banker Street in the Greenpoint neighborhood of Brooklyn, New York (the "Site"). This RIWP was prepared in accordance with the regulations and guidance applicable to the Brownfield Cleanup Program (BCP).

The Site is identified as Block 2615, Lot 125 on the New York City Tax Map. The Site is approximately 21,730 square feet (sq ft) (0.5 acres) and is currently a vacant, undeveloped lot with an asphalt cover. The Site is bound to the north by a one-story warehouse building, to the south by Wythe Avenue followed by a new multi-story building under construction, to the east by Banker Street followed by a commercial building, and to the west by North 15th Street followed by industrial and manufacturing use buildings. The Site was most recently utilized by Corzo Maintenance, a subsurface utility installation contractor, as a storage yard for construction equipment, vehicles, and materials. The Site location is shown on Figure 1. Existing Site features are shown on Figure 2. A surrounding land use map is provided as Figure 3. The Site is located within a manufacturing use (M1-5) zoning district, with the intended post-development use as a new multi-story commercial building.

1.1 PURPOSE

The objective of the Remedial Investigation (RI) is to characterize the nature and extent of environmental impacts at the Site and to provide sufficient information to evaluate remedial alternatives, as required. Based on the current and former uses of the Site, and previous investigations conducted, semi-volatile organic compounds (SVOCs), including polycyclic aromatic hydrocarbons (PAHs), heavy metals, and volatile organic compounds (VOCs), including chlorinated volatile organic compounds (CVOCs), are the anticipated contaminants of concern. A Limited Subsurface Investigation was performed at the Site by DPV Consultants, Inc. (DPV) in March 2015, and an RI was conducted at the Site by Brussee Environmental (Brussee) in April 2025 to investigate the anticipated contaminants of concern identified based on former uses of the Site. While the Limited Subsurface Investigation and RI sampling event provided preliminary Site characterization data, they did not fully determine the nature and extent of contamination at the Site. A summary of the historical soil, groundwater, and soil vapor analytical data collected at the Site is further detailed in Section 2.5 and displayed in Figures 4 through 6.

Previous investigations did not comprehensively delineate the extent of soil, groundwater, and soil vapor contamination on the Site; therefore, additional targeted soil, groundwater, and soil vapor sampling are proposed. Figure 2 presents the Proposed Sample Location Plan. An RI will be performed upon approval of this RIWP. Results of the additional sample analyses will be used to confirm the results of the previous Site characterization activities, delineate any on-Site source(s), and determine a course for remedial action. In addition, a qualitative exposure assessment will be conducted and will consider the nature and extent of populations currently exposed or that have the potential to be exposed to Site-related contaminants both on and off Site, along with describing the reasonably anticipated future land use of the Site and affected off-Site areas.

2. Site Background

2.1 CURRENT LAND USE

The Site is currently a vacant, undeveloped lot with an asphalt cover.

2.2 SITE HISTORY

Based on a Phase I Environmental Site Assessment (ESA) completed by Roux Environmental Engineering and Geology, D.P.C. (Roux) in March 2022, the Site was historically located in a marsh/wetland area adjoining the East River, located to the west of the Site. This area was filled by the early 1900s. The 1905 Sanborn Fire Insurance Map shows the subject property divided into eight tax lots with no structures. The Site remained relatively unchanged until 1942, when the Site was developed with a small one-story storage structure in the central eastern portion of the Site. By 1951, the former storage structure was no longer present, and two structures indicated as sand blasting and a wash house were present in the northeast and northwest corners of the subject property, respectively. Sanborn Fire Insurance Maps from 1965 to 1996 show the Site as a vacant lot with no structures. The Site was identified as “parking” on Sanborn Fire Insurance Maps from 2001 to 2007. The Phase I ESA indicates that Corzo Contracting, a subsurface utility installation contractor, utilized the Site as a storage yard for materials and vehicles from the mid-1990s through at least 2022. The Site is currently vacant with no structures present. A metal canopy is located near the southwest corner of the Site with no items stored underneath.

2.3 SURROUNDING LAND USE

The Site is located within an urban area of the Greenpoint neighborhood of Brooklyn, New York, characterized by industrial/manufacturing and commercial buildings. There are no sensitive receptors located within a 500-foot (ft) radius of the Site. Properties immediately surrounding the Site are zoned for manufacturing use (M1-5, M1-1, M1-2). Surrounding land uses are shown on Figure 3.

2.4 SURROUNDING LAND USE HISTORY

The area surrounding the Site has been used primarily for industrial and manufacturing uses since the early 1940s. Properties adjoining the Site have historically been used for iron works, paint and varnish manufacturing, manufacturing of steel products, cloth/textile backing and laminating, and a machine shop.

2.5 PREVIOUS INVESTIGATIONS

The following previous investigations and reports were prepared for the Site:

- *Limited Subsurface Investigation*, prepared by DPV, prepared for Park Central Real Estate Co. LLC, March 16, 2015.
- *Phase I Environmental Site Assessment,* prepared by Roux, prepared for Macentico III LLC, March 10, 2022.

- *Remedial Investigation Report,* prepared by Brussee, prepared for Keren Star Management LLC, May 2025.

A summary of environmental findings of these reports is provided below.

Limited Subsurface Investigation (DPV, March 2015)

A Limited Subsurface Investigation was performed by DPV at the Site on February 11, 2015, to investigate environmental concerns identified in a previous Phase I ESA (report not provided), including the historic use of surrounding properties for industrial purposes and potential presence of fill material at the Site.

The Limited Subsurface Investigation consisted of the installation of eight soil borings (SB-1 through SB-8), the collection of eight soil samples, the installation of two temporary groundwater sampling probes, and the collection of two groundwater samples. Soil and groundwater samples were analyzed for VOCs, SVOCs, polychlorinated biphenyls (PCBs), pesticides, and primary pollutant metals.

Field observations made by DPV and laboratory analytical results are summarized below:

- The stratigraphy of the Site, from the surface down, consisted of fill material ranging from 7 to 10 ft below grade, underlain by dark gray silt and clay with sand and shell intervals. No olfactory or photoionization detector (PID) evidence of contamination was observed.
- Soil results are summarized as follows:
  - Pesticides and PCBs were not detected above laboratory detection limits in any soil samples.
  - VOCs were not detected above the New York State Department of Environmental Conservation (NYSDEC) Part 375 Unrestricted Use Soil Cleanup Objectives (UUSCOs).
  - Several SVOCs, specifically PAHs, were detected above the UUSCOs and the NYSDEC Part 375 Commercial Use Soil Cleanup Objectives (CUSCOs), including benzo(a)anthracene (maximum concentration 69 milligrams per kilogram [mg/kg]), benzo(a)pyrene (maximum concentration 68 mg/kg), benzo(b)fluoranthene (maximum concentration 88 mg/kg), chrysene (maximum concentration 66 mg/kg), dibenzo(a,h)anthracene (maximum concentration 9.6 mg/kg), and indeno(1,2,3-cd)pyrene (maximum concentration 43 mg/kg).
  - Several metals were detected above the UUSCOs and CUSCOs, including arsenic (maximum concentration 25 mg/kg) and mercury (maximum concentration 7 mg/kg).
- Groundwater results are summarized as follows:
  - The VOC naphthalene was detected above the Technical and Operational Guidance Series (TOGS) 1.1.1. Ambient Water Quality Standards (AWQS) at a concentration of 14 micrograms per liter (µg/L) in sample SB-7 GW. No other VOCs were detected above the AWQS.

- Several SVOCs, specifically PAHs, were detected above the AWQS, including benzo(a)anthracene (maximum concentration 0.82 µg/L), benzo(b)fluoranthene (maximum concentration 0.71 µg/L), benzo(k)fluoranthene (maximum concentration 0.3 µg/L), chrysene (maximum concentration 0.86 µg/L), and indeno(1,2,3-cd)pyrene (maximum concentration 0.33 µg/L)
- Several total metals were detected above the AWQS in groundwater samples, including arsenic (maximum concentration 37.74 µg/L), beryllium (maximum concentration 9.86 µg/L), chromium (maximum concentration 1,886 µg/L), copper (maximum concentration 3,013 µg/L), lead (maximum concentration 2,374), mercury (maximum concentration 3.11 µg/L), nickel (maximum concentration 974.3 µg/L), selenium (maximum concentration 14.8 µg/L), and thallium (maximum concentration 5.7 µg/L).

Phase I ESA (Roux, 2022)

A Phase I ESA was conducted for the Site by Roux in March 2022. This Phase I was completed to identify current or past Recognized Environmental Conditions (RECs), Historical Recognized Environmental Conditions (HRECs), Controlled Recognized Environmental Conditions (CRECs), Business Environmental Risks (BERs), and *de minimis* conditions in connection with the Site. Roux did not identify RECs in connection with the Site; however, Roux identified the following BERs in connection with the Site:

- Presence of Fill Material: The Site was historically located in a marsh/wetland area that was historically filled in by New York City to create additional developable land. Fill material typically consists of non-native materials, including bricks, concrete, glass, ceramics, etc. Fill material was confirmed to be present at the Site in the March 2015 Limited Subsurface Investigation conducted by DPV. Roux recommended that any future redevelopment activities should consider the fill material for appropriate disposal in accordance with local, state, and federal regulations.
- Presence of E-Designations: The Site is listed with an E-Designation (E-585) for Hazardous Materials, Noise, and Air applied by the New York City Department of City Planning (NYCDCP) as an instrument to control the development of potentially contaminated properties. The hazardous materials portion of the E-Designation would require any redevelopment to be performed under the oversight of the New York City Mayor's Office of Environmental Remediation (NYCOER) and under an approved Remedial Action Work Plan (RAWP).

Remedial Investigation Report (RIR) (Brussee, 2025)

Brusse performed an RI at the Site in April 2025. The investigation included a Site inspection to identify Areas of Concern (AOCs) and physical obstructions, including completion of a ground penetrating radar (GPR) survey, installation of seven soil borings and collection of 14 soil samples (plus quality assurance/ quality control [QA/QC]), installation of four soil borings and collection of four soil samples to delineate an SVOC hotspot identified in the 2015 Limited Subsurface Investigation conducted by DPV, installation of four temporary groundwater monitoring wells and collection of four groundwater samples (plus QA/QC), and installation of seven soil vapor implants and collection of seven soil vapor samples. Soil samples were analyzed for VOCs, SVOCs, pesticides, PCBs, and Target Analyte List (TAL) metals. Two soil samples were analyzed for the emerging contaminants per- and poly-fluoroalkyl substances (PFAS) and

1,4-dioxane. Groundwater samples were analyzed for VOCs, SVOCs, pesticides, PCBs, total and dissolved metals, 1,4-dioxane, and three of the four samples were analyzed for PFAS. Soil vapor samples were analyzed for VOCs.

Field observations made by Brussee and laboratory analytical results are summarized below:

- The stratigraphy of the Site, from the surface down, consists of fill material to depths up to 7 ft below ground surface (bgs) underlain by gray/black silt and gray clay. Depth to groundwater was approximately 7.5 ft below sidewalk grade, and regional groundwater flow was estimated to be towards the northeast.
- Soil Results are summarized as follows:
  - Three VOCs were detected above the UUSCOs but below CUSCOs, including acetone (maximum concentration 0.31 mg/kg), tetrachloroethene (PCE; maximum concentration 2.7 mg/kg), and trichloroethene (TCE; maximum concentration 14 mg/kg).
  - Six SVOCs were detected above the UUSCOs and CUSCOs at maximum concentrations in soil sample SB5A (0-2'), including benzo(a)anthracene (130 mg/kg), benzo(a)pyrene (150 mg/kg), benzo(b)fluoranthene (150 mg/kg), chrysene (120 mg/kg), dibenzo(a,h)anthracene (15 mg/kg), and indeno(1,2,3-cd)pyrene (62 mg/kg).
  - PCBs were not detected in any of the soil samples collected.
  - Three pesticides, including 4,4-DDD (maximum concentration 0.025 mg/kg), 4,4'-DDE (maximum concentration 0.045 mg/kg), and 4,4-DDT (maximum concentration 0.0048 mg/kg), were detected above the UUSCOs in two of the 14 soil samples.
  - Several metals were detected above the UUSCOs and CUSCOs in multiple soil samples, including arsenic (maximum concentration 118 mg/kg), copper (maximum concentration 487 mg/kg), lead (maximum concentration 2,280 mg/kg), and mercury (maximum concentration 32.4 mg/kg)
  - No PFAS compounds were detected within the two soil samples retained for analysis, with the exception of perfluorooctanoic acid (PFOA) at 0.515 micrograms per kilogram (µg/kg) in sample BEC13 (4-6'). 1,4-dioxane was not detected in either of the two soil samples retained for analysis.
- Groundwater results are summarized as follows:
  - One VOC, naphthalene, was detected above the AWQS in one groundwater sample, MW4, at a concentration of 97 µg/L.
  - Several SVOCs were detected in groundwater samples above the AWQS, including benzo(a)anthracene (maximum concentration 0.87 µg/L), benzo(a)pyrene (maximum concentration 1.4 µg/L), benzo(b)fluoranthene (maximum concentration 0.9 µg/L), benzo(k)fluoranthene (maximum concentration 0.86 µg/L), chrysene (maximum concentration 0.74 µg/L), benzo(k)fluoranthene (maximum concentration 0.86 µg/L), indeno(1,2,3-cd)pyrene (maximum concentration 1 µg/L), naphthalene (maximum concentration 64 µg/L), and phenol (maximum concentration 2.5 µg/L).
  - No pesticides or PCBs were detected in groundwater samples collected for analysis.

  - Two dissolved metals were detected above the AWQS, including manganese (maximum concentration 1,800 µg/L) and sodium (maximum concentration 98,400 µg/L). Several total metals were detected above the AWQS, including iron (maximum concentration 25,700 µg/L), lead (maximum concentration 32 µg/L), manganese (maximum concentration 2,100 µg/L), and sodium (maximum concentration 93,400 µg/L).
  - PFOA (maximum concentration 38.7 nanograms per liter [ng/L]) was detected in groundwater sample MW3 above the NYSDEC Guidance Values (GVs) for emerging contaminants (latest update April 2023). Perfluorooctanesulfonic acid (PFOS) was not detected in groundwater samples above the NYSDEC GV. 1,4-dioxane was not detected in groundwater samples collected for analysis.

- Soil vapor results are summarized as follows:
  - Total benzene, toluene, ethylbenzene, and xylenes (BTEX) concentrations ranged from 0 to 100.84 micrograms per cubic meter (µg/m^3). Total CVOC concentrations ranged from 52.1 µg/m^3 in SV7 to 324,579 µg/m^3 in SV6. Total VOC concentrations ranged from 225.28 µg/m^3 in SV7 to 328,903 µg/m^3 in SV6.
  - Several CVOCs were detected in multiple soil vapor samples above laboratory detection limits, including PCE (maximum concentration 1,550 µg/m^3, TCE (maximum concentration 313,000 µg/m^3), cis-1,2-dichloroethene (maximum concentration 9,870 µg/m^3), 1,1-dichloroethene (maximum concentration 3,550 µg/m^3), trans-1,2-dichloroethene (maximum concentration 361 µg/m^3), and vinyl chloride (maximum concentration 159 µg/m^3).

3. Remedial Investigation

This section describes the field activities to be conducted during the RI and provides the sampling scope, objectives, methods, anticipated number of samples, and sample locations. The following activities will be conducted to fill data gaps, delineate on-Site sources, if present, and determine the nature and extent of contamination at the Site. The NYSDEC and New York State Department of Health (NYSDOH) will be notified at least seven days prior to mobilization to the Site for the RI work.

3.1 SOIL SAMPLING

To further characterize soil conditions, additional on-Site soil samples will be collected to meet NYSDEC Division of Environmental Remediation (DER)-10 requirements for RIs. The sampling and analysis plan is summarized in Table 1. Proposed sample locations are presented in Figure 2.

As part of this RI, a total of 12 soil borings will be installed to 10 ft bgs (or 5 ft into the water table, whichever is deeper, if soil boring is converted to a monitoring well) by a track-mounted direct-push drill rig (Geoprobe®), or other drilling technology as needed, operated by a licensed operator. Soil samples will be collected from dedicated liners using stainless-steel macro-cores, casings, or sampling spoons. Samples will be collected using laboratory-provided clean bottle ware. VOC grab samples will be collected using terra cores or encores.

Soils will be logged continuously by a geologist or engineer using the Modified Burmeister Soil Classification System. The presence of staining, odors, and PID readings will be noted. Sampling methods are described in the Field Sampling Plan (FSP) provided in Appendix A. A Quality Assurance Project Plan (QAPP) is provided in Appendix B. Laboratory data will be reported in Analytical Services Protocols (ASP) Category B deliverable format.

Soil samples representative of Site conditions will be collected at 12 locations widely distributed across the Site, as shown in Figure 2. Up to three grab samples will be collected from each soil boring. One surface sample will be collected from the top 0 to 2 inches immediately beneath the Site cover (i.e., surface soils). A second sample will be collected at an intermediate depth within the last 2 ft of the observed fill layer (estimated at 5 to 7 ft bgs, but subject to field observation). A third sample will be collected at the 2-ft interval above the observed groundwater interface, estimated to be encountered between 7 to 8 ft bgs but subject to field observation. If the last 2 ft of the observed fill layer is the same depth as the observed groundwater interface, only one sample will be collected at that depth. The number of samples collected during the RI may vary based on field conditions.

Soil samples will be analyzed for:

- Target Compound List (TCL) VOCs using U.S. Environmental Protection Agency (EPA) Method 8260B;
- TCL SVOCs using EPA Method 8270C;

- TAL Metals using EPA Method 6010;
- PCBs using EPA Method 8082;
- TCL Pesticides using EPA Method 8081B;
- PFAS using EPA Method 1633; and
- 1,4-dioxane using EPA Method 8270.

Samples to be analyzed for PFAS will be collected and analyzed in accordance with the NYSDEC-issued April 2023 "Sampling, Analysis, and Assessment of PFAS Under NYSDEC's Part 375 Remedial Programs."

3.2 GROUNDWATER SAMPLING

The purpose of the groundwater sampling is to obtain current groundwater data and analyze for additional parameters (i.e., PFAS and 1,4-dioxane) to meet NYSDEC DER-10 requirements for RIs. Groundwater flow is presumed to flow to the west-northwest towards the East River.

A total of eight 2-inch permanent monitoring wells will be installed to approximately 15 ft bgs or to at least 5 ft below the groundwater interface (if encountered at a shallower depth). Monitoring wells will have a 2-inch annular space and be installed using either #0 or #00 certified clean sand fill. Wells will be screened to straddle the groundwater interface, assumed to be encountered between approximately 7 to 8 ft bgs. The groundwater interface depth will be evaluated during initial work on the implementation of this RI to establish the proper range of well screening in the field. Observations will be communicated with NYSDEC daily in field reports, further detailed in Section 9.1.

Monitoring wells will be developed by surging a pump in the well several times to pull fine-grained material from the well. Development will be completed until the water turbidity is 50 nephelometric turbidity units (NTUs) or less, or 10 well volumes are removed, if possible. Groundwater sampling will occur at a minimum of one week after monitoring well development. The well casings will be surveyed by a New York State-licensed surveyor and gauged during a round of synoptic groundwater depth readings to facilitate the preparation of a groundwater contour map and to determine the direction of groundwater flow.

The sampling and analysis plan is summarized in Table 1. Proposed monitoring well locations are provided on Figure 2. Proposed locations will be dependent on field observation and will be communicated with NYSDEC in daily reporting.

The proposed eight monitoring wells will be sampled and analyzed for:

- TCL VOCs using EPA Method 8260B;
- TCL SVOCs using EPA Method 8270C;
- Total Metals using EPA Methods 6010/7471;
- Dissolved Metals using EPA Methods 6010/7471;
- PCBs using EPA Method 8082;

- TCL Pesticides using EPA Method 8081B;
- PFAS using EPA Method 1633; and
- 1,4-dioxane using EPA Method 8270 SIM.

Samples to be analyzed for PFAS will be collected and analyzed in accordance with the NYSDEC-issued April 2023 "Sampling, Analysis and Assessment of PFAS."

Groundwater wells will be sampled using low-flow sampling methods as described in the FSP. Following the low-flow purge, samples will be collected from monitoring wells for analysis of the analytes mentioned above. Groundwater sampling will be conducted at least one week after monitoring well development.

The FSP presented in Appendix A details field procedures and protocols that will be followed during field activities. The QAPP presented in Appendix B details the analytical methods and procedures that will be used to analyze samples collected during field activities. Monitoring wells will be sampled for PFAS analysis following the purge and sampling method detailed in the NYSDEC guidance documents (see Appendix C).

3.3 INVESTIGATION-DERIVED WASTE

Following sample collection, boreholes that are not converted to monitoring wells will be backfilled with soil cuttings and an upper bentonite plug. Boreholes will be restored to grade with the surrounding area. If soil is identified as grossly contaminated, it will be separated and placed into a sealed and labeled New York State Department of Transportation (NYSDOT)-approved 55-gallon drum pending characterization and off-Site disposal. Groundwater purged from the monitoring wells during development and sample collection will be placed into an NYSDOT-approved 55-gallon drum pending off-Site disposal.

3.4 SOIL VAPOR SAMPLING

Samples will be collected in accordance with the NYSDOH Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York (NYSDOH, October 2006). Eight soil vapor points will be installed 1 to 2 ft above the groundwater interface, approximately 5 to 6 ft bgs. The vapor implants will be installed with a direct-push drilling rig (e.g., Geoprobe®) to advance a stainless-steel probe to the desired sample depth. Sampling will occur for the duration of two hours.

Prior to sampling, a helium tracer gas leak test will be performed to evaluate the sample point integrity at each soil gas sampling location. To perform the leak test, an enclosure or shroud will be placed over the sealed soil gas sampling location. The sampling tubing will be run through a hole in the enclosure, and a silicone gasket will be used to seal the interface between the tubing and the enclosure. The enclosure will then be sealed at the ground surface with a rubber gasket and/or bentonite. Helium will be released into the enclosure from the side port using a tank of high-purity helium. Following the application of the tracer gas, each sample location will be purged using a personal sample pump (i.e., GilAir Plus) at a flow rate of approximately 0.2 liters per minute (L/min). The purge air will then be

monitored using a portable helium detector to check the integrity of each soil gas point prior to sampling.

Soil gas samples will be collected in appropriately sized Summa® canisters that have been certified clean by the laboratory, and samples will be analyzed for VOCs using EPA Method TO-15. Flow rates for both purging and sampling will not exceed 0.2 L/min. Sampling methods are described in the FSP provided in Appendix A.

3.5 PROPOSED SAMPLING RATIONALE

Haley & Aldrich of New York has proposed the sampling plan described herein, and as shown on Figure 2, in consideration of observations and findings reported during the March 2015 Limited Subsurface Investigation conducted at the Site by DPV and the April 2025 RI conducted by Brussee as described in Section 2.5.

During the previous investigations conducted at the Site, soil, groundwater, and soil vapor samples were collected. However, the sample map from the previous investigations shows data gaps. Data gaps include the lack of a full suite analysis of soil and groundwater at the Site. Further investigation is also recommended to determine the extent of CVOC impacts to soil, groundwater, and soil vapor, mainly on the eastern portion of the Site, where elevated concentrations of CVOCs were detected in soil vapor during the April 2025 RI.

Sampling locations have been proposed to investigate areas of the Site with identified data gaps. Proposed sampling locations will include groundwater, soil, and soil vapor sampling to address data gaps and confirm if there is an on-Site source of contamination or a potential off-Site source migrating onto the Site.

The Proposed Sample Location Map (included as Figure 2) is designed to generate sufficient data to identify the source of contamination and classify subsurface conditions throughout the Site as a whole, with a particular focus on sample locations in areas of the Site that have historically indicated evidence of contamination.

4. Green and Sustainable Remediation and Climate Resiliency

The work completed as part of this work plan will comply with all NYSDEC guidance documents, including DER-31: Green Remediation (NYSDEC, 2011). To ensure compliance with DER-31, the work will be completed using the best practices and techniques described below. Specific reporting methods relative to DER-31 are further described below.

4.1 BEST PRACTICES AND TECHNIQUES

DER-31 provides examples of best practices and techniques that could be applied during all phases of remediation (Attachment 1 of the DER-31 policy). In addition, the techniques identified below will be implemented at sites unless a site-specific evaluation demonstrates impracticability or favors an alternative green approach:

Practice/Technique	Potential Benefits[1]	Applicable to this Work Plan
Use renewable energy where possible or purchase Renewable Energy Credits	Reduce/supplement purchased energy use	
Use of remediation technologies with an intermittent energy supply (i.e., energy use during peak energy generation only)	Reduce energy use	X
Incorporate green building design	Reduce future use impacts	
Reuse existing buildings and infrastructure to reduce waste	Reduce waste and material use	
Reuse and recycle construction and demolition debris and other materials (i.e., grind waste wood and other organics for on-Site use)	Reduce waste and material use	
Design cover systems to be usable (i.e., habitat or recreation)	Reduce construction impacts of future development	
Reduce vehicle idling	Reduce air emissions and fuel use	X
Use of Low-Sulfur Diesel Fuel (LSDF) or alternate fuels (i.e., biodiesel or E85) when possible	Reduce air emissions	
Sequence work to minimize double-handling of materials	Reduce construction impacts	X
Use energy-efficient systems and office equipment in the job trailer	Reduce energy use	X

Note:
[1] Potential benefits listed are not comprehensive and will vary depending upon the site and implementation of the practice or technique.

In order to comply with the requirements of DER-31, the following actions will be taken:

1. All vehicles and fuel-consuming equipment on the Site will be shut off if not in use for more than three minutes;
2. Work will be sequenced, to the extent practicable, to allow the direct loading of waste containers for off-Site disposal;
3. Work will be sequenced, to the extent practicable, to limit unnecessary mobilizations to and throughout the Site; and
4. To the extent practicable, energy-efficient systems and office equipment will be utilized.

4.2 REPORTING

All green and sustainable practices and techniques employed will be discussed in the forthcoming RIR.

4.3 CLIMATE RESILIENCY EVALUATION

The Site is located within a 100-year flood zone and is within Zone AE, which is a Special Flood Hazard Area. The development plan is still under design but will incorporate consideration for resiliency to climate change, including the design of a cover system that will mimic, rather than alter, the current setting in the vicinity of the Site and will provide pathways for surface runoff and resiliency against future flooding events. A Climate Screening Checklist is provided in Appendix D.

4.4 ENVIRONMENTAL FOOTPRINT ANALYSIS

An environmental footprint analysis has been completed using SiteWise™ for the scope of work included in this RIWP. Results of the analysis, available in Appendix E, indicate that the majority of greenhouse gas emissions, potentially exceeding 2,000 metric tons, are the product of consumables and transportation associated with the RI.

5. Quality Assurance and Quality Control

QA/QC procedures will be used to provide performance information with regard to the accuracy, precision, sensitivity, representation, completeness, and comparability associated with the sampling and analysis for this investigation. Field QA/QC procedures will be used: (1) to document that samples are representative of actual conditions at the Site; and (2) to identify possible cross-contamination from field activities or sample transit. Laboratory QA/QC procedures and analyses will be used to demonstrate whether analytical results have been biased, either by interfering compounds in the sample matrix or by laboratory techniques that may have introduced systematic or random errors to the analytical process.

QA/QC procedures are defined in the QAPP included in Appendix B.

6. Data Use

6.1 DATA SUBMITTAL

Analytical data will be supplied in ASP Category B Data Packages. If more stringent than those suggested by the EPA, the laboratory's in-house QA/QC limits will be utilized. Validated data will be submitted to the NYSDEC EQuIS database in an Electronic Data Deliverable (EDD) package.

6.2 DATA VALIDATION

Data packages will be sent to a qualified data validation specialist to evaluate the accuracy and precision of the analytical results. A Data Usability Summary Report (DUSR) will be created to confirm the compliance of methods with the protocols described in the NYSDEC ASP. DUSRs will summarize and confirm the usability of the data for project-related decisions. Data validation will be completed in accordance with the DUSR guidelines from the NYSDEC DER. DUSRs will be included with the submittal of an RIR, further discussed in Section 9.2. Additional details on the DUSRs are provided in the QAPP in Appendix B.

7. Project Organization

A project team for the Site has been created, based on qualifications and experience, with personnel suited for the successful completion of the project.

The NYSDEC-designated Case Manager, Robert Strang, will be responsible for overseeing the successful completion of the project work and adherence to the work plan on behalf of NYSDEC.

The NYSDOH-designated Case Manager, Megan Rivera, will be responsible for overseeing the successful completion of the project work and adherence to the work plan on behalf of NYSDOH.

James Bellew will be the Qualified Environmental Professional (QEP) and Principal-in-Charge for this work. In this role, Mr. Bellew will be responsible for the overall completion of each task per the requirements outlined in this work plan and in accordance with the DER-10 guidance.

Zachary Simmel will be the Project Manager for this work. In this role, Mr. Simmel will manage the day-to-day tasks, including coordination and supervision of field engineers and scientists, adherence to the work plan, and oversight of the project schedule. As the Project Manager, Mr. Simmel will also be responsible for communications with the NYSDEC Case Manager regarding project status, schedule, issues, and updates for project work.

Ali Reach will be the field team leader for this work and will also act as the Quality Assurance Officer (QAO). The QAO will ensure the application and effectiveness of the QAPP by the analytical laboratory and the project staff, provide input to the field team as to corrective actions that may be required as a result of the above-mentioned evaluations, and prepare and/or review data validation and audit reports.

Calvin Jackson will be the field scientist responsible for implementing the field effort for this work. Mr. Jackson's responsibilities will include implementing the work plan activities and directing the subcontractors to ensure the successful completion of all field activities.

The drilling subcontractor will be Coastal Environmental Solutions, Inc. (Coastal) or Lakewood Environmental Services Corp. (Lakewood). Coastal or Lakewood will provide environmental drilling to implement the scope of work outlined in this RIWP.

The geophysical survey contractor will be NOVA Geophysical Services (NOVA) or Ground Penetrating Radar Systems, LLC (GPRS). In this role, NOVA or GPRS will conduct a geophysical survey throughout all accessible regions of the Site prior to the performance of ground-intrusive work.

The analytical laboratory will be Pace Analytical (Pace) of Westborough, Massachusetts, a New York Environmental Laboratory Approval Program (ELAP)-certified laboratory (No. 11148). Pace will be responsible for analyzing samples as per the analyses and methods identified in Section 3.

8. Health and Safety

8.1 HEALTH AND SAFETY PLAN

A Site-specific Health and Safety Plan (HASP) has been prepared in accordance with NYSDEC and NYSDOH guidelines and is provided as Appendix F of this work plan. The HASP includes a description of health and safety protocols to be followed by Haley & Aldrich of New York field staff during implementation of the RIWP, including monitoring within the work area, along with response actions, should impacts be observed. The HASP has been developed in accordance with the Occupational Safety and Health Administration (OSHA), Title 40 Code of Federal Regulations (CFR) Part 1910.120 regulatory requirements for use by Haley & Aldrich of New York field staff who will work at the Site during planned activities. Contractors or other personnel who perform work at the Site are required to develop their own HASP and procedures of comparable or higher content for their respective personnel in accordance with relevant OSHA regulatory requirements for work at hazardous waste sites, as well as the general industry requirements as applicable based on the nature of work being performed.

8.2 COMMUNITY AIR MONITORING PLAN

The proposed investigation work will be completed outdoors at the Site. Where intrusive drilling operations with the potential to disturb the subsurface are planned, community air monitoring will be implemented to protect the downwind receptors. A Haley & Aldrich of New York representative will continually monitor the breathing air in the vicinity of the immediate work area using a hand-held PID to measure total VOCs in air at concentrations as low as 1 part per million (ppm). The air in the work zone will also be monitored for visible dust generation.

If VOC measurements above 5 ppm are sustained for 15 minutes or visible dust generation is observed, the ground-intrusive work will be temporarily halted, and a more rigorous monitoring of VOCs and dust using recordable meters will be implemented in accordance with the NYSDOH Generic Community Air Monitoring Plan (CAMP). During activities not disturbing the subsurface, personnel on the Site will monitor for visual dust and odors only. CAMP data will be provided to the NYSDEC in the daily reports, further detailed in Section 9. The NYSDOH CAMP guidance document is included in Appendix G.

8.3 QUALITATIVE HUMAN HEALTH EXPOSURE ASSESSMENT (QHHEA)

A comprehensive Qualitative Human Health Exposure Assessment (QHHEA) will be performed following the collection of all RI data. The Exposure Assessment (EA) will be performed in accordance with Section 3.3(c)4 of DER-10 and the NYSDOH guidance for performing a qualitative EA (DER-10; Appendix 3B). The results of the QHHEA will be provided in the RIR. According to Section 3.10 of DER-10 and the Fish and Wildlife Resources Impact Analysis Decision Key in DER-10, Appendix 3C, a Fish and Wildlife Exposure Assessment will be performed (if needed) based on the RI results.

9. Reporting

9.1 DAILY REPORTING

Daily reports will be submitted to the NYSDEC and NYSDOH summarizing the Site activities completed during the RI. Daily reports will include a Site figure, a description of Site activities, a photo log, and a summary of community air monitoring performed. Daily reports will be submitted the following calendar day after Site work is completed.

9.2 REMEDIAL INVESTIGATION REPORT

Following completion of the work, a summary of the RI will be provided to the NYSDEC in an RIR to support the implementation of the proposed remedial action. The report will include:

- A summary of the RI activities;
- A figure showing sampling locations;
- Tables summarizing laboratory analytical results;
- Laboratory analytical data reports;
- Field sampling data sheets;
- Community air monitoring data;
- Findings regarding the nature and extent of contamination at the Site;
- Qualitative EA of any contamination from an on-Site source that has migrated off the Site; and,
- Conclusions and recommendations.

The RIR will include all data collected during the RI and adhere to the technical requirements of DER-10.

10. Schedule

The Site owner plans to implement this RIWP promptly upon execution of a Brownfield Cleanup Agreement (BCA) and after approval of the RIWP. The below anticipated schedule highlights BCP milestones anticipated for the Site.

Anticipated RI/BCP Schedule	
BCP Application, RIWP, and 30-Day Public Comment Period (Concurrent with BCP Application)	August 2025 to June 2026
Execute BCA	June 2026
NYSDEC Approval of RIWP and Citizen Participation Plan	June 2026 to September 2026
RI Implementation	September 2026 to October 2026
RIR/RAWP Submittal and 45-Day Public Comment Period	October 2026 to January 2027
NYSDEC Approval of RIR/RAWP and Issuance of Decision Document	January 2027 to March 2027
Preparation/Submission of Draft Final Engineering Report (FER)/Site Management Plan (SMP)	March 2027 to June 2027
NYSDEC & NYSDOH Review of FER/SMP	July 2027 to November 2027
Issuance of Certificate of Completion	December 2027

References

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2. DPV Consultants, Inc. 2015. *Limited Subsurface Investigation, 18 Wythe Avenue, Brooklyn, New York.* Prepared for Park Central Real Estate Co. LLC, c/o Doug Arnaudin Mitchell Holdings LLC. March 16.

3. Haley & Aldrich of New York Engineering and Geology, LLP. 2025. *Brownfield Cleanup Program Application, Proposed Former Corzo Maintenance Site, 168 Banker Street, Brooklyn, New York.* Prepared for Wythe Gem LLC and submitted to the New York State Department of Environmental Conservation. July.

4. New York State Department of Environmental Conservation. 1998. *Division of Water Technical and Operational Guidance Series 1.1.1: Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations.* June. Addendum issued April 2000.

5. New York State Department of Environmental Conservation. 2006. *6 New York Codes, Rules and Regulations Part 375: Environmental Remediation Programs.* Effective December 14.

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8. New York State Department of Environmental Conservation. 2023. *Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances under NYSDEC's Part 375 Remedial Programs.* Revised April.

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10. Roux Environmental Engineering and Geology, D.P.C. 2022. *Phase I Environmental Assessment, 14 Wythe Avenue, Brooklyn, New York.* Prepared for Macentico III LLC. March 10.

11. U.S. Environmental Protection Agency. 2017. *Low-Flow Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Wells.* EQASOP-GW 001. September.

TABLE

TABLE 1
SAMPLING AND ANALYSIS PLAN
168 BANKER STREET
BROOKLYN, NEW YORK

Boring Number	Sample Depth	Target Compound List VOCs (8260D/5035)	Target Compound List SVOCs (8270E)/(8270)	Total Analyte List Metals (6010D)/(6010)	PCBs (8082A)	Pesticides (8081B)	PFAS (1633)	1,4-Dioxane (8270)/(8270E-SIM)	Dissolved Target Analyte List Metals (6020)	VOCs (TO-15)
SOIL										
SB-01	0-2 inches	X	X	X	X	X	X	X		
	Bottom 2 ft of fill material	X	X	X	X	X	X	X		
	Groundwater interface (6-8 ft)	X	X	X	X	X	X	X		
SB-02	0-2 inches	X	X	X	X	X	X	X		
	Bottom 2 ft of fill material	X	X	X	X	X	X	X		
	Groundwater interface (6-8 ft)	X	X	X	X	X	X	X		
SB-03	0-2 inches	X	X	X	X	X	X	X		
	Bottom 2 ft of fill material	X	X	X	X	X	X	X		
	Groundwater interface (6-8 ft)	X	X	X	X	X	X	X		
SB-04	0-2 inches	X	X	X	X	X	X	X		
	Bottom 2 ft of fill material	X	X	X	X	X	X	X		
	Groundwater interface (6-8 ft)	X	X	X	X	X	X	X		
SB-05	0-2 inches	X	X	X	X	X	X	X		
	Bottom 2 ft of fill material	X	X	X	X	X	X	X		
	Groundwater interface (6-8 ft)	X	X	X	X	X	X	X		
SB-06	0-2 inches	X	X	X	X	X	X	X		
	Bottom 2 ft of fill material	X	X	X	X	X	X	X		
	Groundwater interface (6-8 ft)	X	X	X	X	X	X	X		
SB-07	0-2 inches	X	X	X	X	X	X	X		
	Bottom 2 ft of fill material	X	X	X	X	X	X	X		
	Groundwater interface (6-8 ft)	X	X	X	X	X	X	X		
SB-08	0-2 inches	X	X	X	X	X	X	X		
	Bottom 2 ft of fill material	X	X	X	X	X	X	X		
	Groundwater interface (6-8 ft)	X	X	X	X	X	X	X		
SB-09	0-2 inches	X	X	X	X	X	X	X		
	Bottom 2 ft of fill material	X	X	X	X	X	X	X		
	Groundwater interface (6-8 ft)	X	X	X	X	X	X	X		
SB-10	0-2 inches	X	X	X	X	X	X	X		
	Bottom 2 ft of fill material	X	X	X	X	X	X	X		
	Groundwater interface (6-8 ft)	X	X	X	X	X	X	X		
SB-11	0-2 inches	X	X	X	X	X	X	X		
	Bottom 2 ft of fill material	X	X	X	X	X	X	X		
	Groundwater interface (6-8 ft)	X	X	X	X	X	X	X		
SB-12	0-2 inches	X	X	X	X	X	X	X		
	Bottom 2 ft of fill material	X	X	X	X	X	X	X		
	Groundwater interface (6-8 ft)	X	X	X	X	X	X	X		
GROUNDWATER										
MW-01	Straddle water table	X	X	X	X	X	X	X	X	
MW-02	Straddle water table	X	X	X	X	X	X	X	X	
MW-03	Straddle water table	X	X	X	X	X	X	X	X	
MW-04	Straddle water table	X	X	X	X	X	X	X	X	
MW-05	Straddle water table	X	X	X	X	X	X	X	X	
MW-06	Straddle water table	X	X	X	X	X	X	X	X	
MW-07	Straddle water table	X	X	X	X	X	X	X	X	
MW-08	Straddle water table	X	X	X	X	X	X	X	X	

TABLE 1
SAMPLING AND ANALYSIS PLAN
168 BANKER STREET
BROOKLYN, NEW YORK

Boring Number	Sample Depth	Target Compound List VOCs (8260D/5035)	Target Compound List SVOCs (8270E)/(8270)	Total Analyte List Metals (6010D)/(6010)	PCBs (8082A)	Pesticides (8081B)	PFAS (1633)	1,4-Dioxane (8270)/(8270E-SIM)	Dissolved Target Analyte List Metals (6020)	VOCs (TO-15)
SOIL VAPOR										
SV-01	1-2 ft above groundwater interface									X
SV-02	1-2 ft above groundwater interface									X
SV-03	1-2 ft above groundwater interface									X
SV-04	1-2 ft above groundwater interface									X
SV-05	1-2 ft above groundwater interface									X
SV-06	1-2 ft above groundwater interface									X
SV-07	1-2 ft above groundwater interface									X
SV-08	1-2 ft above groundwater interface									X
SV-09	1-2 ft above groundwater interface									X

Notes:

VOCs - Volatile Organic Compounds
SVOCs - Semi-volatile Organic Compounds
PCBs - Polychlorinated biphenyls
PFAS - Per- and Polyfluoroalkyl Substances
Samples to be collected in the intermediate range will be determined in the field and collected at base of fill layer as determined by visual logging
Sample depths may be adjusted based on visual, olfactory, and PID field screening
bgs - below grade surface

QA/QC samples include:

MS/MSD - 1 for every 20 samples
Trip Blanks - 1 per cooler per day of samples to be analyzed for VOCs
Field Blanks - 1 for every 20 samples
Duplicates - 1 for every 20 samples

FIGURES



NY

N

MAP SOURCE: USGS
SITE COORDINATES: 40°43'28"N, 73°57'20"W

HALEY ALDRICH

168 BANKER STREET
BROOKLYN, NEW YORK

PROJECT LOCUS

APPROXIMATE SCALE: 1 IN = 2000 FT
AUGUST 2026

FIGURE 1

GIS: \\haleyaldrich.com\share\CF\Projects\0211545\GIS\211545_000_168 BANKER STREET.aprx - khensen - 5/29/2026 11:00 AM



LEGEND

- SITE BOUNDARY
- PARCEL BOUNDARY
- SOIL BORING LOCATION
- SOIL BORING/ PERMANENT GROUNDWATER MONITORING WELL LOCATION
- SOIL VAPOR PROBE

NOTES

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. ASSESSOR PARCEL DATA SOURCE: NYC DEPARTMENT OF CITY PLANNING, INFORMATION TECHNOLOGY DIVISION
3. AERIAL IMAGERY SOURCE: NEARMAP, MARCH 11, 2025

N

0 30 60

SCALE IN FEET

HALEY ALDRICH

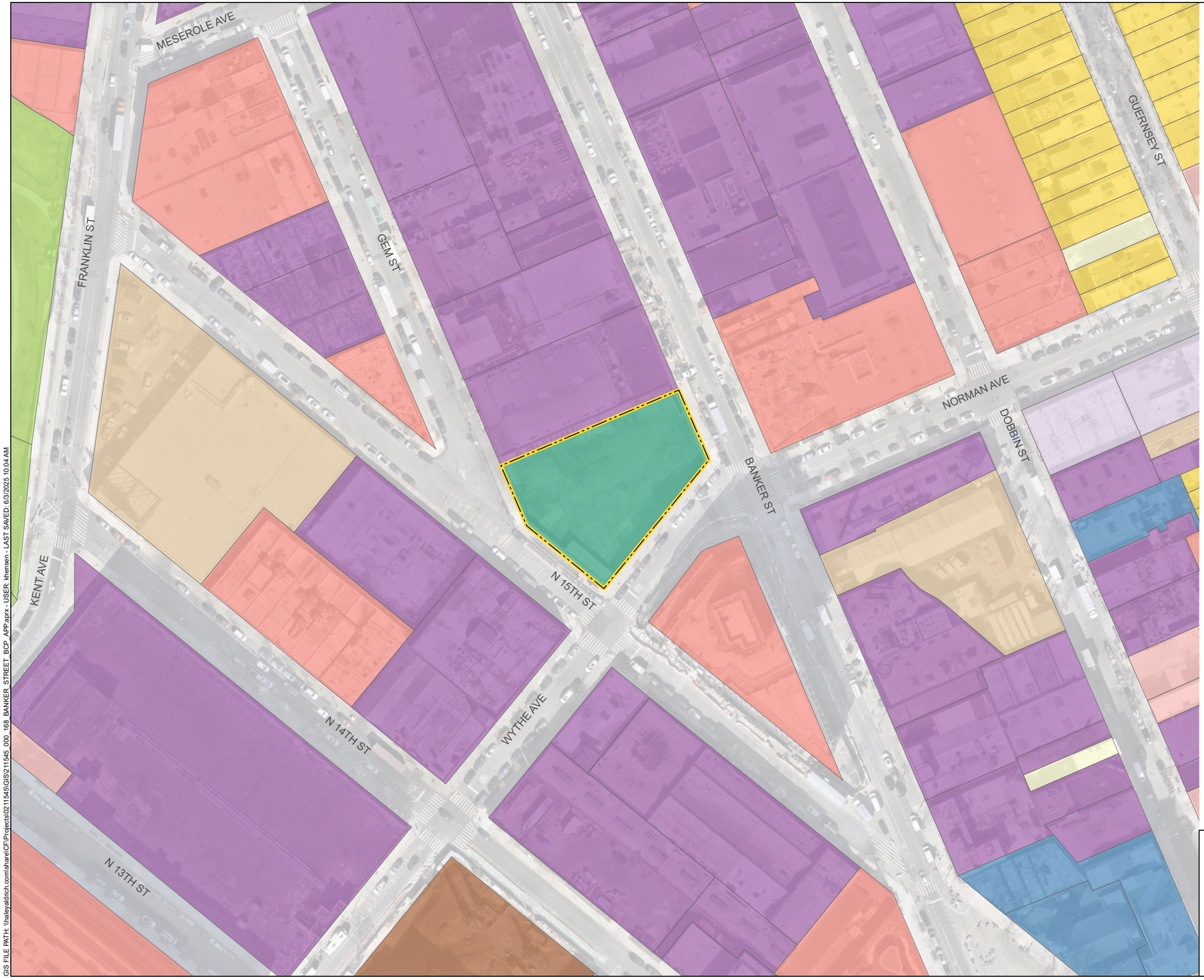
168 BANKER STREET
BROOKLYN, NEW YORK

PROPOSED SAMPLE LOCATION PLAN

AUGUST 2026

FIGURE 2

GIS FILE PATH: \\haleyaldrich.com\share\CF\Projects\0211545\GIS\211545_000_168_BANKER_STREET.aprx - USER: khensen - LAST SAVED: 5/29/2025 10:57 AM



LEGEND

ZONING AND LAND USE

- ONE AND TWO FAMILY BUILDINGS
- MULTI-FAMILY WALK-UP BUILDINGS
- MIXED RESIDENTIAL AND COMMERCIAL BUILDINGS
- COMMERCIAL AND OFFICE BUILDINGS
- INDUSTRIAL AND MANUFACTURING BUILDINGS
- TRANSPORTATION AND UTILITY
- PUBLIC FACILITIES AND INSTITUTIONS
- OPEN SPACE AND OUTDOOR RECREATION
- PARKING FACILITIES
- VACANT LAND
- NOT CATEGORIZED
- SITE BOUNDARY
- PARCEL BOUNDARY

NOTES

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.

2. ASSESSOR PARCEL DATA SOURCE: NYC DEPARTMENT OF CITY PLANNING, INFORMATION TECHNOLOGY DIVISION

3. LAND USE DATA SOURCE: NYC DEPARTMENT OF CITY PLANNING

4. AERIAL IMAGERY SOURCE: NEARMAP, MARCH 11, 2025

N

0 100 200

SCALE IN FEET

HALEY ALDRICH

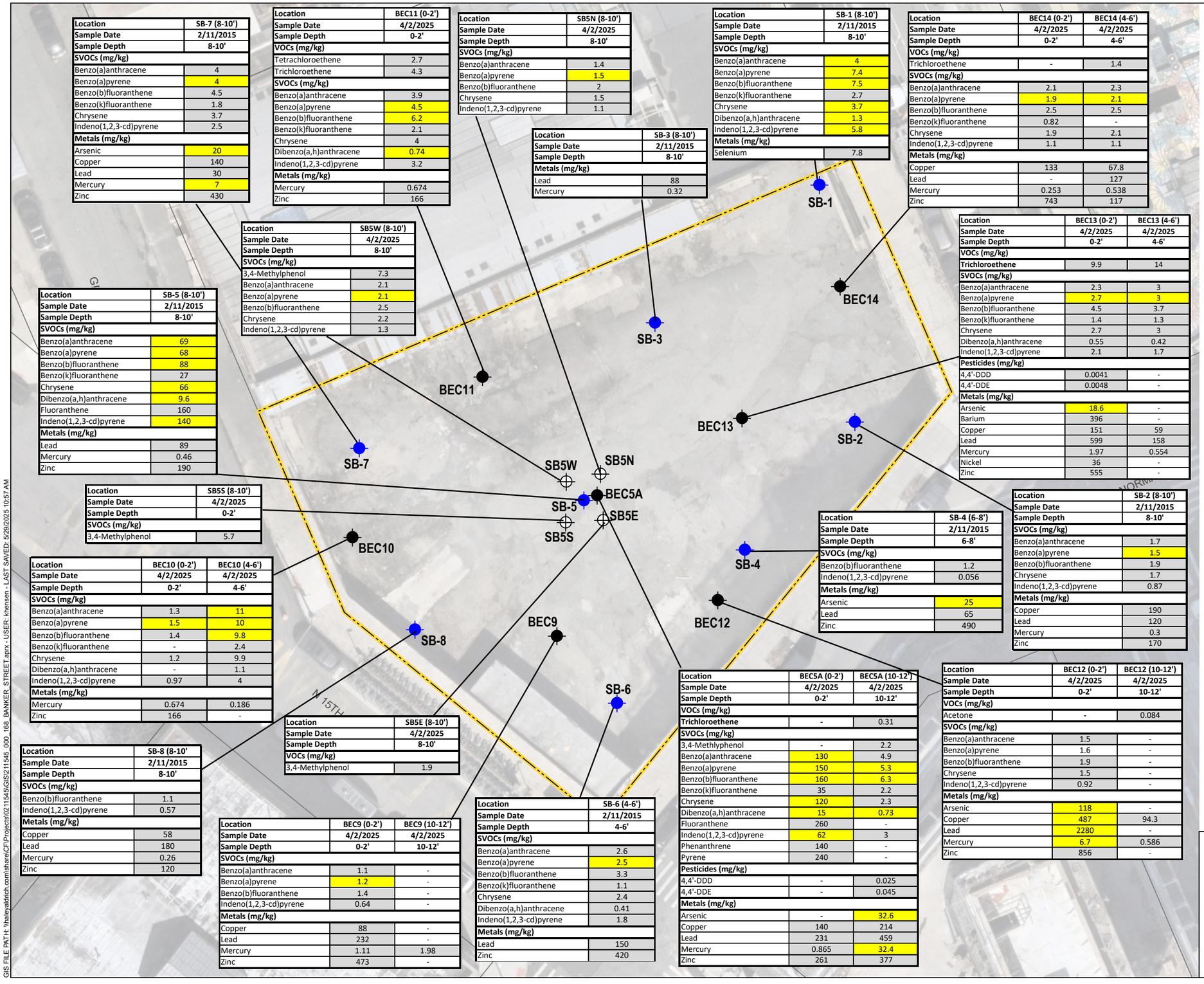
168 BANKER STREET
BROOKLYN, NEW YORK

SURROUNDING LAND USE

AUGUST 2026

FIGURE 3

GIS FILE PATH: \\haleyaldrich.com\share\CF\Projects\0211545\GIS\211545_000_168_BANKER_STREET_BCP_APP.aprx - USER: khensen - LAST SAVED: 6/3/2025 10:04 AM



Location	SB-7 (8-10')
Sample Date	2/11/2015
Sample Depth	8-10'
SVOCs (mg/kg)	
Benzo(a)anthracene	4
Benzo(a)pyrene	4
Benzo(b)fluoranthene	4.5
Benzo(k)fluoranthene	1.8
Chrysene	3.7
Indeno(1,2,3-cd)pyrene	2.5
Metals (mg/kg)	
Arsenic	20
Copper	140
Lead	30
Mercury	7
Zinc	430

Location	BEC11 (0-2')
Sample Date	4/2/2025
Sample Depth	0-2'
VOCs (mg/kg)	
Tetrachloroethene	2.7
Trichloroethene	4.3
SVOCs (mg/kg)	
Benzo(a)anthracene	3.9
Benzo(a)pyrene	4.5
Benzo(b)fluoranthene	6.2
Benzo(k)fluoranthene	2.1
Chrysene	4
Dibenzo(a,h)anthracene	0.74
Indeno(1,2,3-cd)pyrene	3.2
Metals (mg/kg)	
Mercury	0.674
Zinc	166

Location	SB5N (8-10')
Sample Date	4/2/2025
Sample Depth	8-10'
SVOCs (mg/kg)	
Benzo(a)anthracene	1.4
Benzo(a)pyrene	1.5
Benzo(b)fluoranthene	2
Chrysene	1.5
Indeno(1,2,3-cd)pyrene	1.1

Location	SB-3 (8-10')
Sample Date	2/11/2015
Sample Depth	8-10'
Metals (mg/kg)	
Lead	88
Mercury	0.32

Location	SB-1 (8-10')
Sample Date	2/11/2015
Sample Depth	8-10'
SVOCs (mg/kg)	
Benzo(a)anthracene	4
Benzo(a)pyrene	7.4
Benzo(b)fluoranthene	7.5
Benzo(k)fluoranthene	2.7
Chrysene	3.7
Dibenzo(a,h)anthracene	1.3
Indeno(1,2,3-cd)pyrene	5.8
Metals (mg/kg)	
Selenium	7.8

Location	BEC14 (0-2')	BEC14 (4-6')
Sample Date	4/2/2025	4/2/2025
Sample Depth	0-2'	4-6'
VOCs (mg/kg)		
Trichloroethene	-	1.4
SVOCs (mg/kg)		
Benzo(a)anthracene	2.1	2.3
Benzo(a)pyrene	1.9	2.1
Benzo(b)fluoranthene	2.5	2.5
Benzo(k)fluoranthene	0.82	-
Chrysene	1.9	2.1
Indeno(1,2,3-cd)pyrene	1.1	1.1
Metals (mg/kg)		
Copper	133	67.8
Lead	-	127
Mercury	0.253	0.538
Zinc	743	117

Location	SB5W (8-10')
Sample Date	4/2/2025
Sample Depth	8-10'
SVOCs (mg/kg)	
3,4-Methylphenol	7.3
Benzo(a)anthracene	2.1
Benzo(a)pyrene	2.1
Benzo(b)fluoranthene	2.5
Chrysene	2.2
Indeno(1,2,3-cd)pyrene	1.3

Location	BEC13 (0-2')	BEC13 (4-6')
Sample Date	4/2/2025	4/2/2025
Sample Depth	0-2'	4-6'
VOCs (mg/kg)		
Trichloroethene	9.9	14
SVOCs (mg/kg)		
Benzo(a)anthracene	2.3	3
Benzo(a)pyrene	2.7	3
Benzo(b)fluoranthene	4.5	3.7
Benzo(k)fluoranthene	1.4	1.3
Chrysene	2.7	3
Dibenzo(a,h)anthracene	0.55	0.42
Indeno(1,2,3-cd)pyrene	2.1	1.7
Pesticides (mg/kg)		
4,4'-DDD	0.0041	-
4,4'-DDE	0.0048	-
Metals (mg/kg)		
Arsenic	18.6	-
Barium	396	-
Copper	151	59
Lead	599	158
Mercury	1.97	0.554
Nickel	36	-
Zinc	555	-

Location	SB-5 (8-10')
Sample Date	2/11/2015
Sample Depth	8-10'
SVOCs (mg/kg)	
Benzo(a)anthracene	69
Benzo(a)pyrene	68
Benzo(b)fluoranthene	88
Benzo(k)fluoranthene	27
Chrysene	66
Dibenzo(a,h)anthracene	9.6
Fluoranthene	160
Indeno(1,2,3-cd)pyrene	140
Metals (mg/kg)	
Lead	89
Mercury	0.46
Zinc	190

Location	SB5S (8-10')
Sample Date	4/2/2025
Sample Depth	0-2'
SVOCs (mg/kg)	
3,4-Methylphenol	5.7

Location	SB-4 (6-8')
Sample Date	2/11/2015
Sample Depth	6-8'
SVOCs (mg/kg)	
Benzo(b)fluoranthene	1.2
Indeno(1,2,3-cd)pyrene	0.056
Metals (mg/kg)	
Arsenic	25
Lead	65
Zinc	490

Location	SB-2 (8-10')
Sample Date	2/11/2015
Sample Depth	8-10'
SVOCs (mg/kg)	
Benzo(a)anthracene	1.7
Benzo(a)pyrene	1.5
Benzo(b)fluoranthene	1.9
Chrysene	1.7
Indeno(1,2,3-cd)pyrene	0.87
Metals (mg/kg)	
Copper	190
Lead	120
Mercury	0.3
Zinc	170

Location	BEC10 (0-2')	BEC10 (4-6')
Sample Date	4/2/2025	4/2/2025
Sample Depth	0-2'	4-6'
SVOCs (mg/kg)		
Benzo(a)anthracene	1.3	11
Benzo(a)pyrene	1.5	10
Benzo(b)fluoranthene	1.4	9.8
Benzo(k)fluoranthene	-	2.4
Chrysene	1.2	9.9
Dibenzo(a,h)anthracene	-	1.1
Indeno(1,2,3-cd)pyrene	0.97	4
Metals (mg/kg)		
Mercury	0.674	0.186
Zinc	166	-

Location	SB5E (8-10')
Sample Date	4/2/2025
Sample Depth	8-10'
VOCs (mg/kg)	
3,4-Methylphenol	1.9

Location	SB-8 (8-10'
Sample Date	2/11/2015
Sample Depth	8-10'
SVOCs (mg/kg)	
Benzo(b)fluoranthene	1.1
Indeno(1,2,3-cd)pyrene	0.57
Metals (mg/kg)	
Copper	58
Lead	180
Mercury	0.26
Zinc	120

Location	BEC9 (0-2')	BEC9 (10-12')
Sample Date	4/2/2025	4/2/2025
Sample Depth	0-2'	10-12'
SVOCs (mg/kg)		
Benzo(a)anthracene	1.1	-
Benzo(a)pyrene	1.2	-
Benzo(b)fluoranthene	1.4	-
Indeno(1,2,3-cd)pyrene	0.64	-
Metals (mg/kg)		
Copper	88	-
Lead	232	-
Mercury	1.11	1.98
Zinc	473	-

Location	SB-6 (4-6')
Sample Date	2/11/2015
Sample Depth	4-6'
SVOCs (mg/kg)	
Benzo(a)anthracene	2.6
Benzo(a)pyrene	2.5
Benzo(b)fluoranthene	3.3
Benzo(k)fluoranthene	1.1
Chrysene	2.4
Dibenzo(a,h)anthracene	0.41
Indeno(1,2,3-cd)pyrene	1.8
Metals (mg/kg)	
Lead	150
Zinc	420

Location	BEC5A (0-2')	BEC5A (10-12')
Sample Date	4/2/2025	4/2/2025
Sample Depth	0-2'	10-12'
VOCs (mg/kg)		
Trichloroethene	-	0.31
SVOCs (mg/kg)		
3,4-Methlyphenol	-	2.2
Benzo(a)anthracene	130	4.9
Benzo(a)pyrene	150	5.3
Benzo(b)fluoranthene	160	6.3
Benzo(k)fluoranthene	35	2.2
Chrysene	120	2.3
Dibenzo(a,h)anthracene	15	0.73
Fluoranthene	260	-
Indeno(1,2,3-cd)pyrene	62	3
Phenanthrene	140	-
Pyrene	240	-
Pesticides (mg/kg)		
4,4'-DDD	-	0.025
4,4'-DDE	-	0.045
Metals (mg/kg)		
Arsenic	-	32.6
Copper	140	214
Lead	231	459
Mercury	0.865	32.4
Zinc	261	377

Location	BEC12 (0-2')	BEC12 (10-12')
Sample Date	4/2/2025	4/2/2025
Sample Depth	0-2'	10-12'
VOCs (mg/kg)		
Acetone	-	0.084
SVOCs (mg/kg)		
Benzo(a)anthracene	1.5	-
Benzo(a)pyrene	1.6	-
Benzo(b)fluoranthene	1.9	-
Chrysene	1.5	-
Indeno(1,2,3-cd)pyrene	0.92	-
Metals (mg/kg)		
Arsenic	118	-
Copper	487	94.3
Lead	2280	-
Mercury	6.7	0.586
Zinc	856	-

LEGEND

- SITE BOUNDARY
- PARCEL BOUNDARY
- 2015 LIMITED PHASE II SOIL BORING LOCATION
- 2025 REMEDIAL INVESTIGATION SOIL BORING LOCATION
- 2025 REMEDIAL INVESTIGATION DELINEATION SOIL BORING LOCATION

Part 375 SCOs		
Analyte	UUSCO	CUSCO
VOCs (mg/kg)		
Tetrachloroethene	1.3	150
Trichloroethene	0.47	200
SVOCs (mg/kg)		
3,4-Methlyphenol	0.33	500
Benzo(a)anthracene	1	5.6
Benzo(a)pyrene	1	1
Benzo(b)fluoranthene	1	5.6
Benzo(k)fluoranthene	0.8	56
Chrysene	1	56
Dibenzo(a,h)anthracene	0.33	0.56
Fluoranthene	100	500
Indeno(1,2,3-cd)pyrene	0.5	5.6
Phenanthrene	100	500
Pyrene	100	500
Pesticides (mg/kg)		
4,4-DDD	0.0033	92
4,4-DDE	0.0033	62
Metals (mg/kg)		
Barium	350	400
Arsenic	13	16
Copper	50	270
Lead	63	1000
Mercury	0.18	2.8
Selenium	3.9	1500
Zinc	109	10000

NOTES

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. ASSESSOR PARCEL DATA SOURCE: NYC DEPARTMENT OF CITY PLANNING, INFORMATION TECHNOLOGY DIVISION
3. AERIAL IMAGERY SOURCE: NEARMAP, MARCH 11, 2025
4. 2015 SOIL ANALYTICAL RESULTS FROM THE LIMITED SUBSURFACE INVESTIGATION REPORT BY DPV CONSULTANTS, INC.
5. 2025 SOIL ANALYTICAL RESULTS FROM THE REMEDIAL INVESTIGATION REPORT BY BRUSSEE ENVIROMENTAL.
6. EXCEEDANCES OF THE NYSDEC PART 375 COMMERCIAL USE SOIL CLEANUP OJECTIVES (CUSCOS) IN YELLOW
7. EXCEEDANCES OF THE NYSDEC PART 375 UNRESTRICTED USE SOIL CLEANUP OBJECTIVES (UUSCOs) IN GRAY
8. - INDICATES AN EXCEEDANCE OF THE UUSCO OR CUSCO WAS NOT OBSERVED

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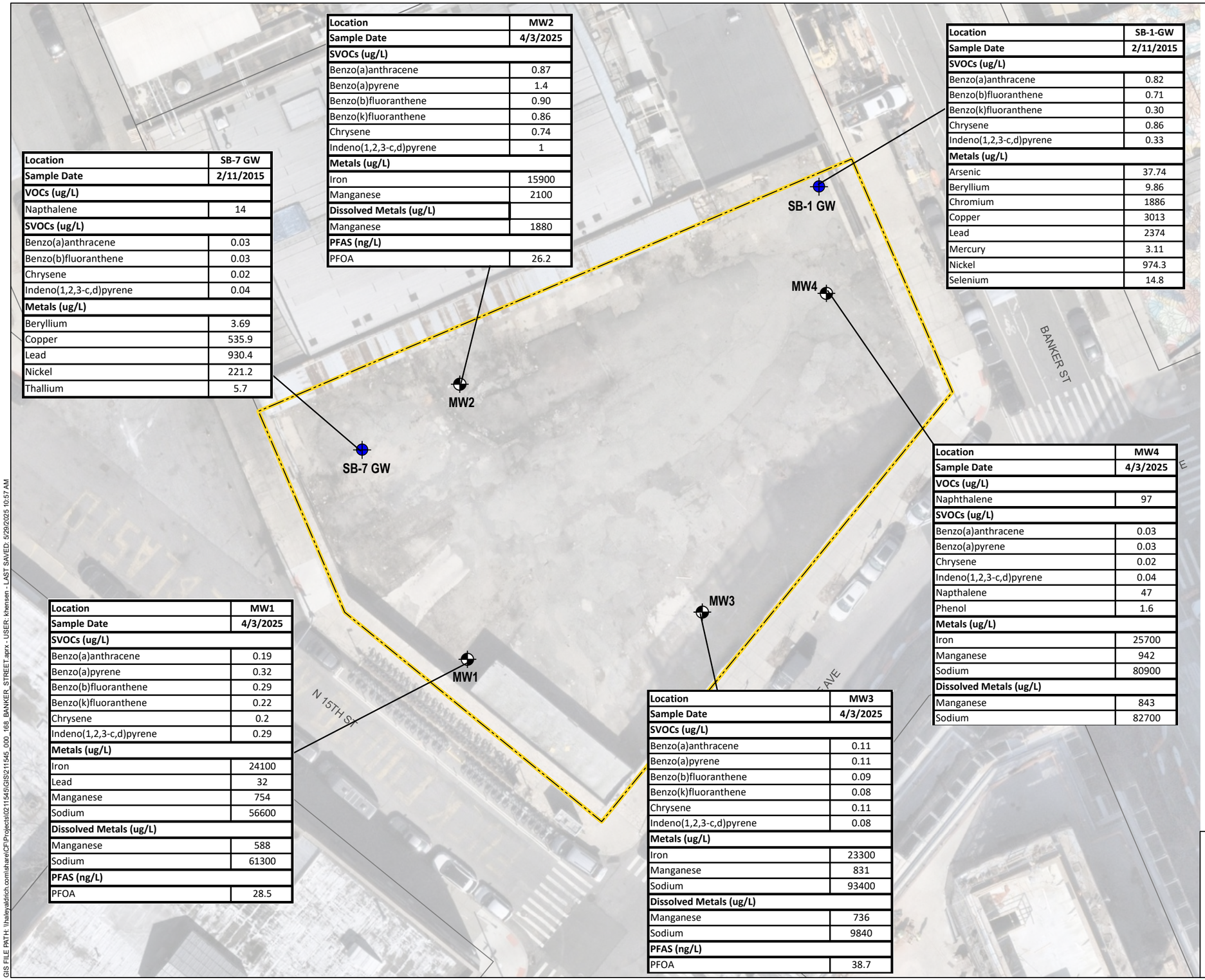
168 BANKER STREET
BROOKLYN, NEW YORK

SOIL RESULTS EXCEEDANCES MAP

AUGUST 2026

FIGURE 4

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Location	SB-7 GW
Sample Date	2/11/2015
VOCs (ug/L)	
Napthalene	14
SVOCs (ug/L)	
Benzo(a)anthracene	0.03
Benzo(b)fluoranthene	0.03
Chrysene	0.02
Indeno(1,2,3-c,d)pyrene	0.04
Metals (ug/L)	
Beryllium	3.69
Copper	535.9
Lead	930.4
Nickel	221.2
Thallium	5.7

Location	MW2
Sample Date	4/3/2025
SVOCs (ug/L)	
Benzo(a)anthracene	0.87
Benzo(a)pyrene	1.4
Benzo(b)fluoranthene	0.90
Benzo(k)fluoranthene	0.86
Chrysene	0.74
Indeno(1,2,3-c,d)pyrene	1
Metals (ug/L)	
Iron	15900
Manganese	2100
Dissolved Metals (ug/L)	
Manganese	1880
PFAS (ng/L)	
PFOA	26.2

Location	SB-1-GW
Sample Date	2/11/2015
SVOCs (ug/L)	
Benzo(a)anthracene	0.82
Benzo(b)fluoranthene	0.71
Benzo(k)fluoranthene	0.30
Chrysene	0.86
Indeno(1,2,3-c,d)pyrene	0.33
Metals (ug/L)	
Arsenic	37.74
Beryllium	9.86
Chromium	1886
Copper	3013
Lead	2374
Mercury	3.11
Nickel	974.3
Selenium	14.8

Location	MW4
Sample Date	4/3/2025
VOCs (ug/L)	
Naphthalene	97
SVOCs (ug/L)	
Benzo(a)anthracene	0.03
Benzo(a)pyrene	0.03
Chrysene	0.02
Indeno(1,2,3-c,d)pyrene	0.04
Napthalene	47
Phenol	1.6
Metals (ug/L)	
Iron	25700
Manganese	942
Sodium	80900
Dissolved Metals (ug/L)	
Manganese	843
Sodium	82700

Location	MW1
Sample Date	4/3/2025
SVOCs (ug/L)	
Benzo(a)anthracene	0.19
Benzo(a)pyrene	0.32
Benzo(b)fluoranthene	0.29
Benzo(k)fluoranthene	0.22
Chrysene	0.2
Indeno(1,2,3-c,d)pyrene	0.29
Metals (ug/L)	
Iron	24100
Lead	32
Manganese	754
Sodium	56600
Dissolved Metals (ug/L)	
Manganese	588
Sodium	61300
PFAS (ng/L)	
PFOA	28.5

Location	MW3
Sample Date	4/3/2025
SVOCs (ug/L)	
Benzo(a)anthracene	0.11
Benzo(a)pyrene	0.11
Benzo(b)fluoranthene	0.09
Benzo(k)fluoranthene	0.08
Chrysene	0.11
Indeno(1,2,3-c,d)pyrene	0.08
Metals (ug/L)	
Iron	23300
Manganese	831
Sodium	93400
Dissolved Metals (ug/L)	
Manganese	736
Sodium	9840
PFAS (ng/L)	
PFOA	38.7

LEGEND

- SITE BOUNDARY
- PARCEL BOUNDARY
- 2025 REMEDIAL INVESTIGATION GROUNDWATER MONITORING WELL LOCATION
- 2015 LIMITED SUBSURFACE INVESTIGATION GROUNDWATER MONITORING WELL LOCATION

TOGS 1.1.1. Ambient Water Quality Standards	
Analyte	**AWQS**
VOCs (ug/L)	
Naphthalene	10
SVOCs (ug/L)	
Benzo(a)anthracene	0.002
Benzo(a)pyrene	0.002
Benzo(b)fluoranthene	0.002
Benzo(k)fluoranthene	0.002
Chrysene	0.002
Napthalene	10
Phenol	1
Indeno(1,2,3-c,d)Pyrene	0.002
Metals (Dissolved (ug/L)	
Manganese (Dissolved)	300
Sodium (Dissolved)	20000
Metals (ug/L)	
Arsenic	25
Beryllium	3
Chromium	50
Copper	200
Iron	300
Lead	25
Manganese	300
Mercury	0.7
Nickel	100
Selenium	10
Sodium	20000
Thallium	0.5
PFAS (ng/L)	
PFOA	6.7

NOTES

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. ASSESSOR PARCEL DATA SOURCE: NYC DEPARTMENT OF CITY PLANNING, INFORMATION TECHNOLOGY DIVISION
3. AERIAL IMAGERY SOURCE: NEARMAP, MARCH 11, 2025
4. ALL ANALYTES SHOWN INDICATE AN EXCEEDANCE OF THE NYSDEC TOGS 1.1.1. AMBIENT WATER QUALITY STANDARDS (AWQS) OR THE NYSDEC FEBRUARY 2023 GUIDANCE VALUES (GVs) FOR PFOA, PFOS, AND 1,4-DIOXANE

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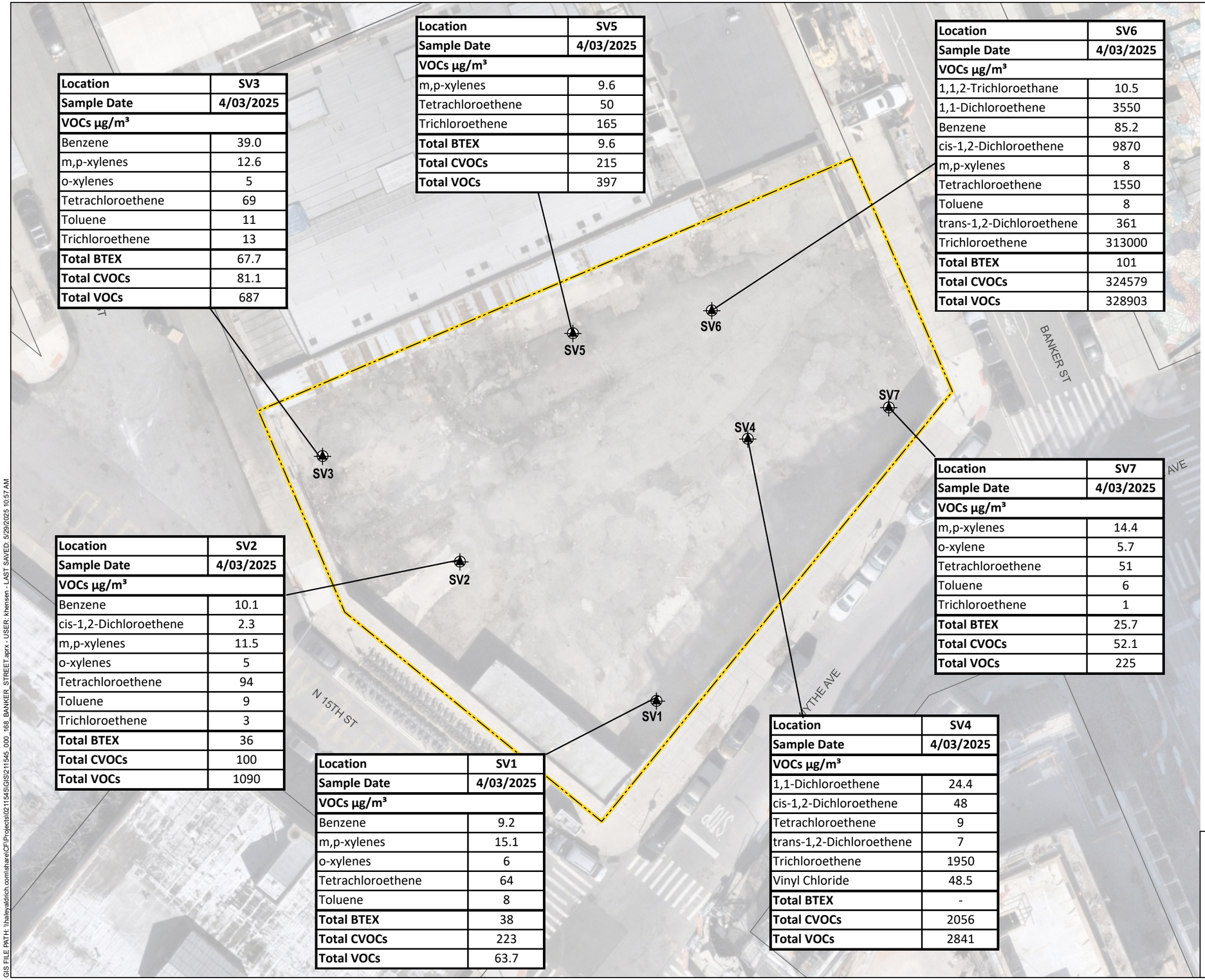
168 BANKER STREET
BROOKLYN, NEW YORK

GROUNDWATER RESULTS EXCEEDANCES MAP

AUGUST 2026

FIGURE 5

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Location	SV3
Sample Date	4/03/2025
VOCs µg/m³	
Benzene	39.0
m,p-xylenes	12.6
o-xylenes	5
Tetrachloroethene	69
Toluene	11
Trichloroethene	13
Total BTEX	67.7
Total CVOCs	81.1
Total VOCs	687

Location	SV5
Sample Date	4/03/2025
VOCs µg/m³	
m,p-xylenes	9.6
Tetrachloroethene	50
Trichloroethene	165
Total BTEX	9.6
Total CVOCs	215
Total VOCs	397

Location	SV6
Sample Date	4/03/2025
VOCs µg/m³	
1,1,2-Trichloroethane	10.5
1,1-Dichloroethene	3550
Benzene	85.2
cis-1,2-Dichloroethene	9870
m,p-xylenes	8
Tetrachloroethene	1550
Toluene	8
trans-1,2-Dichloroethene	361
Trichloroethene	313000
Total BTEX	101
Total CVOCs	324579
Total VOCs	328903

Location	SV7
Sample Date	4/03/2025
VOCs µg/m³	
m,p-xylenes	14.4
o-xylene	5.7
Tetrachloroethene	51
Toluene	6
Trichloroethene	1
Total BTEX	25.7
Total CVOCs	52.1
Total VOCs	225

Location	SV2
Sample Date	4/03/2025
VOCs µg/m³	
Benzene	10.1
cis-1,2-Dichloroethene	2.3
m,p-xylenes	11.5
o-xylenes	5
Tetrachloroethene	94
Toluene	9
Trichloroethene	3
Total BTEX	36
Total CVOCs	100
Total VOCs	1090

Location	SV1
Sample Date	4/03/2025
VOCs µg/m³	
Benzene	9.2
m,p-xylenes	15.1
o-xylenes	6
Tetrachloroethene	64
Toluene	8
Total BTEX	38
Total CVOCs	223
Total VOCs	63.7

Location	SV4
Sample Date	4/03/2025
VOCs µg/m³	
1,1-Dichloroethene	24.4
cis-1,2-Dichloroethene	48
Tetrachloroethene	9
trans-1,2-Dichloroethene	7
Trichloroethene	1950
Vinyl Chloride	48.5
Total BTEX	-
Total CVOCs	2056
Total VOCs	2841

LEGEND

- SITE BOUNDARY
- PARCEL BOUNDARY
- 2025 REMEDIAL INVESTIGATION SOIL VAPOR PROBE LOCATION

NOTES

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. ASSESSOR PARCEL DATA SOURCE: NYC DEPARTMENT OF CITY PLANNING, INFORMATION TECHNOLOGY DIVISION
3. AERIAL IMAGERY SOURCE: NEARMAP, MARCH 11, 2025
4. SOIL VAPOR ANALYTICAL DATA FROM THE 2025 REMEDIAL INVESTIGATION REPORT BY BRUSSEE ENVIRONMENTAL

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168 BANKER STREET
BROOKLYN, NEW YORK

SOIL VAPOR RESULTS SUMMARY MAP

AUGUST 2026

FIGURE 6

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APPENDIX A
Field Sampling Plan

HALEY ALDRICH

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FIELD SAMPLING PLAN
168 BANKER STREET
BROOKLYN, NEW YORK

by
H & A of New York Engineering and Geology LLP
New York, New York

for
Wythe Gem LLC
Brooklyn, New York

File No. 0211545
August 2026



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1. Introduction

This Field Sampling Plan (FSP) has been prepared as a component of the Remedial Investigation Work Plan (RIWP) for the subject site located at 168 Banker Street in Brooklyn, New York (the "Site"). This document was prepared to establish field procedures for field data collection to be performed in support of the RIWP for the Site.

The RIWP includes this FSP, a Quality Assurance Project Plan (QAPP), a Health and Safety Plan (HASP), and a Community Air Monitoring Plan (CAMP), which are included as part of this plan by reference.

The standard operating procedures (SOPs) included as components of this plan will provide the procedures necessary to meet the project objectives. The SOPs will be used as reference for the methods to be employed for field sample collection and handling and the management of field data collected in the execution of the approved RIWP. The SOPs include numerous methods to execute the tasks of the RIWP. The Project Manager will select the appropriate method as required by field conditions and/or the objective of the respective project task at the time of sample collection. Field procedures will be conducted in general accordance with the New York State Department of Conservation (NYSDEC) Technical Guidance for Site Investigation and Remediation (Division of Environmental Remediation [DER]-10) and the Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances (PFAS) under the NYSDEC Part 375 Remedial Program when applicable.

2. Field Program

This FSP provides the general purpose of sampling as well as procedural information. The RIWP contains the details on sampling and analysis (locations, depths, frequency, analyte lists, etc.).

The field program has been designed to acquire the necessary data to comply with the RIWP, and includes the following tasks:

- Soil sampling;
- Groundwater sampling;
- Soil vapor sampling; and,
- Sampling of investigation-derived waste (IDW) as needed for disposal.

A Remedial Investigation (RI) was performed at the Site in April 2025 to investigate the anticipated contaminants of concern identified based on the Site's current and former uses. While the sampling events provided preliminary Site characterization data, they did not fully determine the nature and extent of soil, groundwater, and soil vapor contamination at the Site. The Site characterization did not identify a source of contamination on the Site; therefore, additional targeted soil, groundwater, and soil vapor sampling are proposed.

The SOPs presented herein may be changed as required, dependent on Site conditions or equipment limitations, at the time of sample collection. If the procedures employed differ from the SOP, the deviations will be documented in the associated sampling report.

3. Utility Clearance

Invasive remedial activities, such as excavation or remedial construction activities, require the location of underground utilities prior to initiating work. Such clearance is sound practice in that it minimizes the potential for damage to underground facilities, and more importantly, is protective of the health and safety of personnel. Under no circumstances will invasive activities be allowed to proceed without obtaining proper utility clearance from the appropriate public agencies and/or private entities. This clearance requirement applies to all work on both public and private properties, whether located in a dense urban area or a seemingly out-of-the-way rural location.

The drilling contractor performing the work will be responsible for obtaining utility clearance.

Utility clearance is required by law, and obtaining clearance includes contacting a public or private central clearance agency via a "One-Call" telephone service and providing the proposed exploration location information. It is important to note that public utility agencies may not, and usually do not, have information regarding utility locations on private property.

Before beginning subsurface work at any proposed exploration locations, it is critical that all readily available information on underground utilities and structures be obtained. This includes publicly available information as well as information in the possession of private landowners. Any drawings obtained must be reviewed in detail for information pertaining to underground utilities.

Using the information obtained, the Site should be viewed in detail for physical evidence of buried lines or structures, including pavement cuts and patches, variation in or lack of vegetation, variations in grading, etc. Care must also be taken to avoid overhead utilities as well. The presence of surface elements of buried utilities should be documented, such as manholes, gas or water service valves, catch basins, monuments, or other evidence.

Overhead utility lines must be considered when choosing exploration and excavation locations. Most states require a minimum of 10 feet (ft) of clearance between equipment and energized wires. Such separation requirements may also be voltage-based and may vary depending on state or municipality regulations. In evaluating clearance from overhead lines, the same restrictions may apply to "drops," or wires on a utility pole connecting overhead and underground lines.

Using the information obtained and observations made, proposed exploration or construction locations should be marked in the field. Marking locations can be accomplished using spray paint on the ground, stakes, or other means. All markings of proposed locations should be made in white, in accordance with the generally accepted universal color code for facilities identification (American Public Works Association [APWA] 4/99):

- White: Proposed Excavation or Drilling Location
- Pink: Temporary Survey Markings
- Red: Electrical Power Lines, Cables, Conduit, and Lighting Cables
- Yellow: Gas, Oil, Steam, Petroleum, or Gaseous Materials
- Orange: Communication, Alarm or Signal Lines, Cables or Conduits

- Blue: Potable Water
- Purple: Reclaimed Water, Irrigation and Slurry Lines
- Green: Sewers and Drain Lines

In order to effectively evaluate the proposed locations with these entities, detailed, accurate measurements between the proposed locations and existing surface features should be obtained. Such features can be buildings, street intersections, utility poles, guardrails, etc.

Obtaining the utility clearance generally involves the designated "One-Call" underground facilities protection organization for the area, the landowner, and one or both following entities and/or procedures:

- A third-party utility locator company to locate underground utilities outside of the public right-of-way; and/or
- "Soft dig" excavation techniques to confirm or deny the presence of underground utilities in the area.

The proposed locations should be evaluated in consideration of information available for existing underground facilities. The detailed measurement information described above will be required by the "One-Call" agency. The owners of the applicable, participating underground utilities are obligated to mark their respective facilities at the Site in the colors described above. Utility stake-out activities will typically not commence for approximately 72 hours after the initial request is made.

The public and private utility entities generally only mark the locations of their respective underground facilities within public rights-of-way. Determination of the locations of these facilities on private property will be the responsibility of the property owner or Contractor. If available information does not contain sufficient detail to locate underground facilities with a reasonable amount of confidence, alternate measures may be appropriate, as described below. In some cases, the memory of a long-time employee of a facility on private property may be the best or only source of information. It is incumbent on the Consultant or Contractor to exercise caution and use good judgement when faced with uncertainty.

Note: It is important to note that not all utilities are participants in the "One-Call" agency or process. As such, inquiries must be made with the "One-Call" agency to determine which entities do not participate, so they can be contacted independently.

Most utility stakeouts have a limited time period for which they remain valid, typically two to three weeks. It is critical that this time period be considered to prevent expiration of clearance prior to completion of the invasive activities and the need to repeat the stake-out process.

Care must be exercised to document the receipt of notice from the involved agencies of the presence or absence of utilities in the vicinity of the proposed locations.

Most agencies will generally provide a telephone or fax communication indicating the lack of facilities in the project area. If contact is not made by all of the agencies identified by the "One-Call" process, do not assume that such utilities are not present. Re-contact the "One-Call" agency to determine the status.

For complicated sites with multiple proposed locations and multiple utilities, it is advisable to arrange an on-Site meeting with utility representatives. This will minimize the potential for miscommunication amongst the involved parties.

Completion of the utility stake-out process is not a guarantee that underground facilities will not be encountered in excavations or boreholes; in fact, most “One-Call” agencies and individual utilities do not offer guarantees, nor do they accept liability for damage that might occur. In areas outside the public right-of-way, a utility locating service may be utilized to locate underground utilities. It is advisable that any invasive activities proceed with extreme caution in the upper 4 to 5 ft in the event that the clearance has failed to identify an existing facility. This may necessitate hand excavation or probing to confirm the potential presence of shallow utilities. If uncertainty exists for any given utility, extra activities can be initiated to solve utility clearance concerns. These options include:

- Screening the proposed work areas with utility locating devices, and/or hiring a utility locating service to perform this task.
- Hand digging, augering, or probing to expose or reveal shallow utilities and confirm presence and location. In northern climates, this may require advancing to below the frost line, typically at least 4 ft.
- Using “soft dig” techniques that utilize specialized tools and compressed air to excavate soils and locate utilities. This technique is effective in locating utilities to a depth of 4 to 5 ft.

Equipment/Materials:

- White Spray paint;
- Wooden stakes, painted white or containing white flagging;
- Color-code key; and,
- Available drawings.

4. Field Data Recording

This procedure describes the protocol for documenting the investigation activities in the field. Field data serves as the cornerstone for an environmental project, not only for site characterization but for additional phases of investigation or remedial design. Producing defensible data includes proper and appropriate recording of field data as it is obtained in a manner that preserves the information for future use. This procedure provides guidelines for accurate, thorough collection and preservation of written and electronic field data.

Field data to be recorded during the project generally includes, but is not limited to, the following:

- general field observations;
- numeric field measurements and instrument readings;
- quantity estimates;
- sample locations and corresponding sample numbers;
- relevant comments and details pertaining to the samples collected;
- documentation of activities, procedures, and progress achieved;
- contractor pay item quantities;
- weather conditions;
- a listing of personnel involved in Site-related activities;
- a log of conversations, Site meetings, and other communications; and,
- field decisions and pertinent information associated with the decisions.

4.1 Written Field Data

Written field data will be collected using a standardized, pre-printed field log form. In general, the use of a field log form is preferable as it prompts field personnel to make appropriate observations and record data in a standardized format. This promotes completeness and consistency from one person to the next. Otherwise, electronic data collection using a handheld device produces equal completeness and consistency using a preformatted log form.

In the absence of an appropriate pre-printed form, the data should be recorded in an organized and structured manner in a dedicated project field log book. Log books must be hardcover, bound so that pages cannot be added or removed, and should be made from high-grade 50 percent rag paper with a water-resistant surface.

The following are guidelines for the use of field log forms and log books:

1. Information must be factual and complete.
2. All entries will be made in black indelible ink with a ballpoint pen and will be written legibly. Do not use “rollerball” or felt-tip-style pens, since the water-soluble ink can run or smear in the presence of moisture.

3. Field log forms should be consecutively numbered.
4. Each day's work must start a new form/page.
5. At the end of each day, the current log book page or forms must be signed and dated by the field personnel making the entries.
6. Make data entries immediately upon obtaining the data. Do not make temporary notes in other locations for later transfer; this only increases the potential for error or loss of data.
7. Entry errors are to be crossed out with a single line and initialed by the person making the correction.
8. Do not leave blanks on log forms; if no entry is applicable for a given data field, indicate so with "NA" or a dash ("--").
9. At the earliest practical time, photocopies or typed versions of log forms and log book pages should be made and placed in the project file as a backup in the event the book or forms are lost or damaged.
10. Log books should be dedicated to one project only, i.e., do not record data from multiple projects in one log book.

4.2 Electronic Data

Electronic data recording involves electronic measurement of field information through the use of monitoring instruments, sensors, gauges, and equipment controls. The following is a list of guidelines for proper recording and management of electronic field data:

1. Field data management should follow requirements of a project-specific data management plan (DMP), if applicable.
2. Use only instruments that have been calibrated in accordance with manufacturer's recommendations.
3. Usage of instruments, controls, and computers for the purpose of obtaining field data should only be performed by personnel properly trained and experienced in the use of the equipment and software.
4. Use only fully licensed software on personal computers and laptops.
5. Loss of electronic files may mean loss of irreplaceable data. Every effort should be made to back up electronic files obtained in the field as soon as practical. A backup file placed on the file server will minimize the potential for loss.
6. Electronic files, once transferred from field instruments or laptops to office computers, should be protected, if possible, to prevent unwanted or inadvertent manipulation or modification of data. Several levels of protection are usually available for spreadsheets, including making a file "read-only" or assigning a password to access the file.
7. Protect CDs from exposure to moisture, excessive heat or cold, magnetic fields, or other potentially damaging conditions.
8. Remote monitoring is often used to obtain stored electronic data from site environmental systems. A thorough discussion of this type of electronic field data recording is beyond the scope of this Section. Such on-site systems are generally capable of storing a limited amount of

data as a comma-delimited or spreadsheet file. Users must remotely access the monitoring equipment files via modem or other access and download the data. In order to minimize the potential for loss of data, access and downloading of data should be performed frequently enough to ensure the data storage capacity of the remote equipment is not exceeded.

Equipment/Materials:

- Appropriate field log forms, or iPad® or equivalent, with preformatted log forms;
- Indelible ballpoint pen (do not use “rollerball” or felt-tip style pens);
- Straight edge;
- Pocket calculator; and,
- Laptop computer (if required).

5. Aquifer Characterization

This procedure describes the measurement of water levels in groundwater monitoring. A synoptic gauging round will be completed to obtain water levels in monitoring wells. Water levels will be acquired in a manner that provides accurate data that can be used to calculate vertical and horizontal hydraulic gradients and other hydrogeologic parameters. Accuracy in obtaining the measurements is critical to ensure the usability of the data.

5.1 Procedure

In order to provide reliable data, water level monitoring events should be collected over as short a period of time as practical. Barometric pressure can affect groundwater levels, and therefore, observation of significant weather changes during the period of water level measurements must be noted. Rainfall events and groundwater pumping can also affect groundwater level measurements. Personnel collecting water level data must note if any of these controls are in effect during the groundwater level collection period. Due to possible changes during the groundwater level collection period, it is imperative that the time of data collection at each station be accurately recorded. Water levels will also be collected prior to any sample collection that day.

The depth to groundwater will be measured with an electronic depth-indicating probe. Prior to obtaining a measurement, a fixed reference point on the well casing will be established for each well to be measured. Unless otherwise established, the reference point is typically established and marked on the north side of the well casing. Do not use protective casings or flush-mounted road boxes as a reference, due to the potential for damage or settlement. The elevation of the reference point shall be obtained by accepted surveying methods, to the nearest 0.01 ft.

The water level probe will be lowered into the well until the meter indicates (via indicator light or tone) that the water has been reached. The probe will be raised above the water level and slowly lowered again until water is indicated. The cable will be held against the side of the inner protective casing at the point designated for water level measurements, and a depth reading will be taken. This procedure will be followed three times or until a consistent value is obtained. The value will be recorded to the nearest 0.01 ft on the Groundwater Level Monitoring Report form.

Upon completion, the probe will be raised to the surface and, together with the amount of cable that entered the well casing, will be decontaminated in accordance with the methods described in the Equipment Decontamination Procedure.

Equipment/Materials:

- Battery-operated, non-stretch electronic water level probe with permanent markings at 0.01-ft increments, such as the Solinst Model 101 or equivalent.
- The calibrated cable on the depth indicator will be checked against a surveyor's steel tape once per quarter year. A new cable will be installed if the cable has changed by more than 0.01 percent (0.01 ft for a 100 ft cable). See also the Field Instruments – Use and Calibration Procedure.
- Groundwater Level Monitoring Report form.

6. Sample Collection for Laboratory Analysis

6.1 SOIL SAMPLE COLLECTION FOR LABORATORY ANALYSIS

The following procedure is an introduction to soil sampling techniques and an outline of field staff responsibilities. All samples will be collected with dedicated sampling equipment.

6.1.1 Preparatory Requirements

Prior to the beginning of any remedial investigation or remedial measures activities, staff must attend a project briefing for the purpose of reviewing the project work plan, Site and utility plans, drawings, applicable regulations, sampling location, depth, and criteria, Site contacts, and other related documents. Health and safety concerns will be documented in a Site-specific HASP.

A file folder for the field activities should be created and maintained such that all relevant documents and log forms likely to be useful for the completion of field activities by others are readily available in the event of personnel changes.

6.1.2 Soil Classification

The stratigraphic log is a factual description of the soil at the borehole location and is relied upon to interpret the soil characteristics and their influence and significance in the subsurface environment. The accuracy of the stratigraphic log is to be verified by the person responsible for interpreting subsurface conditions. An accurate description of the soil stratigraphy is essential for a reasonable understanding of the subsurface conditions. Confirmation of the field description by examination of representative soil samples by the project geologist, hydrogeologist, or geotechnical engineer (whenever practicable) is recommended.

The ability to describe and classify soil correctly is a skill that is learned from a person with experience and by systematic training and comparison of laboratory results to field descriptions.

6.1.2.1 Data Recording

Several methods for classifying and describing soils or unconsolidated sediments are in relatively widespread use. The Unified Soil Classification System (USCS) is the most common. With the USCS, a soil is first classified according to whether it is predominantly coarse-grained or fine-grained.

The description of fill soil is similar to that of natural undisturbed soil except that it is identified as fill and not classified by USCS group, relative density, or consistency. Those logging soils must attempt to distinguish between soils that have been placed (i.e., fill) and not naturally present, or soils that have been naturally present but disturbed (i.e., disturbed native).

It is necessary to identify and group soil samples consistently to determine the subsurface pattern or changes and non-conformities in soil stratigraphy in the field at the time of drilling. The stratigraphy in each borehole during drilling is to be compared to the stratigraphy found at the previously completed

boreholes to ensure that patterns or changes in soil stratigraphy are noted and that consistent terminology is used.

Visual examination, physical observations, and manual tests (adapted from ASTM International [ASTM] D2488, visual-manual procedures) are used to classify and group soil samples in the field and are summarized in this subsection. ASTM D2488 should be reviewed for detailed explanations of the procedures. Visual-manual procedures used for soil identification and classification include:

- visual determination of grain size, soil gradation, and percentage fines;
- dry strength, dilatancy, toughness, and plasticity (thread or ribbon test) tests for identification of inorganic fine-grained soil (e.g., CL, CH, ML, or MH); and,
- soil compressive strength and consistency estimates based on thumb indent and pocket penetrometer (preferred) methods.

Soil characteristics like plasticity, strength, and dilatancy should be determined using the H & A of New York Engineering and Geology, LLP (Haley & Aldrich of New York) Soil Identification Field Form.

6.1.2.2 Field Sample Screening

Upon the collection of soil samples, the soil is screened with a photoionization detector (PID) for the presence of organic vapor. This is accomplished by running the PID across the soil sample. The highest reading and sustained readings are recorded.

Note: The PID measurement must be done upwind of the excavating equipment or any running engines so that exhaust fumes will not affect the measurements.

Another method of field screening is headspace measurements. This consists of placing a portion of the soil sample in a sealable glass jar, placing aluminum foil over the jar top, and tightening the lid. Alternatively, plastic sealable bags may be utilized for field screening in lieu of glass containers. The jar should only be partially filled. Shake the jar and set aside for at least 30 minutes. After the sample has equilibrated, the lid of the jar can be opened; the foil is punctured with the PID probe, and the air (headspace) above the soil sample is monitored. This headspace reading on the field form or in the field book is recorded. All headspace measurements must be completed under similar conditions to allow comparability of results. Soil classification and PID readings will be recorded in the daily field report.

Equipment/Materials:

- Pocket knife or small spatula;
- Small handheld lens;
- Stratigraphic Log (Overburden) (Form 2001);
- Tape measure; and,
- When sampling for PFAS, acceptable materials for sampling include stainless steel, high-density polyethylene (HDPE), polyvinyl chloride (PVC), silicone, acetate, and polypropylene.

6.1.3 Soil Sampling

Soil samples will be collected from acetate liners installed by a track-mounted direct-push drill rig (Geoprobe®) or sonic drill rig (as necessary) operated by a licensed operator. Soil samples will be collected using a stainless-steel trowel or sampling spoon into laboratory-provided sample containers. If it is necessary to relocate any proposed sampling location due to terrain, utilities, access, etc., the Project Manager must be notified, and an alternate location will be selected.

Prior to use and between each sampling location at an environmental site, the sampling equipment must be decontaminated. All decontamination must be conducted in accordance with the project-specific plans or the methods presented in SOP 7.0.

6.1.4 Sampling Techniques

The following procedure describes typical soil sample collection methods for submission of samples to a laboratory for chemical analysis. The primary goal of soil sampling is to collect representative samples for examination and chemical analysis (if required).

Environmental soil samples obtained for chemical analyses are collected with special attention given to the rationale behind determining the precise zone to sample, the specifics of the method of soil extraction, and the requisite decontamination procedures. Preservation, handling, and glassware for environmental soil samples vary considerably depending upon several factors, including the analytical method to be conducted and the analytical laboratory being used.

Soil sampling for PFAS will be performed in accordance with NYSDEC, DER, Sampling, Analysis, and Assessment of PFAS under NYSDEC Part 375 Remedial Program (April 2023).

6.1.4.1 Grab Versus Composite Samples

A grab sample is collected to identify and quantify conditions at a specific location or interval. The sample is comprised of the minimum amount of soil necessary to make up the volume of the sample dictated by the required sample analyses. Composite samples may be obtained from several locations or along a linear trend (in a test pit or excavation). Sampling may occur within or across stratification.

6.2 GROUNDWATER SAMPLE COLLECTION FOR LABORATORY ANALYSIS

The following section describes two techniques for groundwater sampling: “Low-Stress/Low-Flow Methods” and “Typical Sampling Methods.”

“Low-Stress/Low-Flow” methods will be employed when collecting groundwater samples for the evaluation of volatile constituents (i.e., dissolved oxygen [DO]) or in fine-grained formations where sediment/colloid transport is possible. Analyses typically sensitive to colloidal transport issues include polychlorinated biphenyls (PCBs), polyaromatic hydrocarbons (PAHs), and metals.

The “Typical Sampling Methods” will be employed where parameters less sensitive to turbidity/sediment issues are being collected (general chemistry, pesticides, and other semi-volatile organic compounds [SVOCs]).

NOTE: If non-aqueous phase liquids (NAPL) (light or dense) are detected in a monitoring well, groundwater sample collection will not be conducted, and the Project Manager must be contacted to determine a course of action.

6.2.1 Preparatory Requirements

- Verify well identification and location using borehole log details and location layout figures. Note the condition of the well and record any necessary repair work required.
- Prior to opening the well cap, measure the breathing space above the well casing with a handheld organic vapor analyzer to establish baseline breathing space volatile organic compound (VOC) levels. Repeat this measurement once the well cap is opened. If either of these measurements exceeds the air quality criteria in the HASP, field personnel should adjust their personal protective equipment (PPE) accordingly.
- Prior to commencing the groundwater purging/sampling, a water level must be obtained to determine the well volume for hydraulic purposes. In some settings, it may be necessary to allow the water level time to equilibrate. This condition exists if a watertight seal exists at the well cap and the water level has fluctuated above the top of screen, creating a vacuum or pressurized area in this air space. Three water level checks will verify that static water level conditions have been achieved.
- Calculate the volume of water in the well. Typically, overburden well volumes consider only the quantity of water standing in the well screen and riser; bedrock well volumes are calculated on the quantity of water within the open core hole and within the overburden casing.

6.2.2 Well Development

Well development is completed to remove fine-grained materials from the well but in such a manner as to not introduce fines from the formation into the sand pack. Well development continues until the well responds to water level changes in the formation (i.e., a good hydraulic connection is established between the well and formation) and the well produces clear, sediment-free water to the extent practical.

- Attach appropriate pump and lower tubing into well.
- Gauge well and calculate one well volume. Turn on pump. If well runs dry, shut off pump and allow to recover.
- Surging will be performed by raising and lowering the pump several times to pull fine-grained material from the well. Periodically measure turbidity level using a La Motte turbidity reader.
- The second and third steps will be repeated until turbidity is less than 50 nephelometric turbidity units (NTU) or when 10 well volumes have been removed.
- All water generated during cleaning and development procedures will be collected and contained on the Site in 55-gallon drums for future analysis and appropriate disposal.

Equipment:

- Appropriate health and safety equipment;
- Knife;

- Power source (generator);
- Field book ;
- Well Development Form (Form 3006);
- Well keys;
- Graduated pails;
- Pump and tubing;
- Cleaning supplies (including non-phosphate soap, buckets, brushes, laboratory-supplied distilled/deionized water, tap water, cleaning solvent, aluminum foil, plastic sheeting, etc.); and,
- Water level meter.

6.2.3 Well Purging and Stabilization Monitoring (Low-Stress/Low-Flow Method)

The preferred method for groundwater sampling will be the low-stress/low-flow method described below.

- Slowly lower the pump, safety cable, tubing, and electrical lines into the well to the depth specified by the project requirements. The pump intake must be at the midpoint of the well screen to prevent disturbance and resuspension of any sediment in the screen base.
- Before starting the pump, measure the water level again with the pump in the well, leaving the water level measuring device in the well when completed.
- Purge the well at 100 to a maximum of 500 milliliters per minute (mL/min). During purging, the water level should be monitored approximately every five minutes, or as appropriate. A steady flow rate should be maintained that results in drawdown of 0.3 ft or less. The rate of pumping should not exceed the natural flow rate conditions of the well. Care should be taken to maintain pump suction and to avoid entrainment of air in the tubing. Record adjustments made to the pumping rates and water levels immediately after each adjustment.
- During the purging of the well, monitor and record the field indicator parameters (pH, temperature, conductivity, oxidation-reduction [redox] reaction potential [ORP], DO, and turbidity) approximately every five minutes. Stabilization is considered to be achieved when the final groundwater flow rate is achieved, and three consecutive readings for each parameter are within the following limits:
  - pH: 0.1 pH units of the average value of the three readings;
  - Temperature: 3 percent of the average value of the three readings;
  - Conductivity: 0.005 milliSiemen per centimeter (mS/cm) of the average value of the three readings for conductivity less than 1 mS/cm and 0.01 mS/cm of the average value of the three readings for conductivity greater than 1 mS/cm;
  - ORP: 10 millivolts (mV) of the average value of the three readings;
  - DO: 10 percent of the average value of the three readings; and
  - Turbidity: 10 percent of the average value of the three readings, or a final value of less than 50 NTU.
- The pump must not be removed from the well between purging and sampling.

6.2.4 Sampling Techniques

- If an alternate pump is utilized, the first pump discharge volumes should be discarded to allow the equipment a period of acclimation to the groundwater.
- Samples are collected directly from the pump, with the groundwater being discharged directly into the appropriate sample container. Avoid handling the interior of the bottle or bottle cap, and don new gloves for each well sampled to avoid contamination of the sample.
- Order of sample collection:
  - PFAS
  - VOCs
  - 1,4-dioxane
  - SVOCs
  - Total Analyte List (TAL) metals
  - PCBs, pesticides, and herbicides
- No sampling equipment components or sample containers should come in contact with aluminum foil, low-density polyethylene, glass, or polytetrafluoroethylene (PTFE, Teflon™) materials, including plumber's tape and sample bottle cap liners with a PTFE layer.
- For low-stress/low-flow sampling, samples should be collected at a flow rate between 100 and 500 mL/min and such that drawdown of the water level within the well does not exceed the maximum allowable drawdown of 0.3 ft.
- The pumping rate used to collect a sample for VOC should not exceed 100 mL/min. Samples should be transferred directly to the final container of 40 mL glass vials, completely full and topped with a Teflon™ cap. Once capped, the vial must be inverted and tapped to check for headspace/air presence (bubbles). If air is present, the sample will be discarded and recollected until free of air.
- Groundwater sampling for PFAS will be performed in accordance with NYSDEC, DER, Sampling, Analysis, and Assessment of PFAS under NYSDEC Part 375 Remedial Program (April 2023)
- All samples must be labeled with:
  - A unique sample number
  - Date and time
  - Parameters to be analyzed
  - Project Reference ID
  - Sampler's initials
- Labels should be written in indelible ink and secured to the bottle with clear tape.

Equipment/Materials:

- pH meter, conductivity meter, DO meter, ORP meter, nephelometer, temperature gauge;
- Field filtration units (if required);
- Purging/sampling equipment;

  - Peristaltic Pump;
- Water level probe;
- Sampling materials (containers, log book/forms, coolers, chain of custody);
- Work Plan;
- HASP; and
- When sampling for PFAS, acceptable materials for sampling include stainless steel, HDPE, PVC, silicone, acetate, and polypropylene.

Note: Peristaltic pump use for VOC collection is not acceptable on NYSDEC/ U.S. Environmental Protection Agency (EPA)/ Resource Conservation and Recovery Act (RCRA) sites; this technique has gained acceptance in select areas where it is permissible to collect VOCs using a peristaltic pump at a low flow rate (e.g., Michigan).

Note: 1,4-dioxane and PFAS purge and sample techniques will be conducted following the NYSDEC guidance documents (see Appendix D of the RIWP). Acceptable groundwater pumps include stainless-steel inertia pump with HDPE tubing, peristaltic pump equipped with HDPE tubing and silicone tubing, stainless-steel bailer with stainless-steel ball or bladder pump (identified as PFAS-free) with HDPE tubing.

Field Notes:

- Field notes must document all the events, equipment used, and measurements collected during the sampling activities. Section 2 describes the data/recording procedure for field activities.
- The log book should document the following for each well sampled:
  - Identification of well;
  - Well depth;
  - Static water level depth and measurement technique;
  - Sounded well depth;
  - Presence of immiscible layers and detection/collection method;
  - Well yield – high or low;
  - Purge volume and pumping rate;
  - Time well purged;
  - Measured field parameters;
  - Purge/sampling device used;
  - Well sampling sequence;
  - Sampling appearance;
  - Sample odors;
  - Sample volume;
  - Types of sample containers and sample identification;
  - Preservative(s) used;
  - Parameters requested for analysis;
  - Field analysis data and method(s);

  - Sample distribution and transporter;
  - Laboratory shipped to;
  - Chain of custody number for shipment to laboratory;
  - Field observations on sampling event;
  - Name collector(s);
  - Climatic conditions including air temperature; and,
  - Problems encountered and any deviations made from the established sampling protocol.

A standard log form for documentation and reporting groundwater purging and sampling events is presented on the Groundwater Sampling Record, Low Flow Groundwater Sampling Form, and Low Flow Monitored Natural Attenuation (MNA) Field Sampling Form. Refer to Appendix A for example field forms.

Groundwater/Decontamination Fluid Disposal:

- Groundwater disposal methods will vary on a case-by-case basis but may range from:
  - Off-Site treatment at private treatment/disposal facilities or public-owned treatment facilities
  - On-Site treatment
  - Direct discharge to the surrounding ground surface, allowing groundwater infiltration to the underlying subsurface regime
- Decontamination fluids should be segregated and collected separately from wash waters/groundwater containers.

6.3 SOIL VAPOR SAMPLING

The following procedure is an introduction to soil vapor sampling techniques and an outline of field staff responsibilities.

6.3.1 Preparatory Requirements

Prior to collecting the field sample, ensure the stainless-steel or polyethylene soil vapor probe has been installed to the desired depth and sealed completely to the surface using a material such as bentonite. As part of the vapor intrusion evaluation, a tracer gas should be used in accordance with New York State Department of Health (NYSDOH) protocols to serve as a quality assurance/quality control (QA/QC) to verify the integrity of the soil vapor probe seal. A container (box, plastic pail, etc.) will serve to keep the tracer gas in contact with the probe during testing. A portable monitoring device will be used to analyze a sample of soil vapor for the tracer gas prior to sampling. If the tracer sample results show a significant presence of the tracer, the probe seals will be adjusted to prevent infiltration. At the conclusion of the sampling round, tracer monitoring should be performed a second time to confirm the integrity of the probe seals.

6.3.2 Sampling Techniques

Samples will be collected in appropriately sized Summa® canisters that have been certified clean by the laboratory, and samples will be analyzed by using EPA Method TO-15. Flow rate for both purging and sampling will not exceed 0.2 L/min. One to three implant volumes shall be purged prior to the collection of any soil-gas samples. A sample log sheet will be maintained summarizing sample identification, date and time of sample collection, sampling depth, identity of samplers, sampling methods and devices, soil vapor purge volumes, volume of the soil vapor extracted, vacuum of canisters before and after the samples are collected, apparent moisture content of the sampling zone, and chain of custody protocols.

6.4 SAMPLE HANDLING AND SHIPPING

Sample management is the continuous care given to each sample from the point of collection to receipt at the analytical laboratory. Good sample management ensures that samples are properly recorded, properly labeled, and not lost, broken, or exposed to conditions that may affect the sample's integrity.

All sample submissions must be accompanied by a chain of custody document to record sample collection and submission. Personnel performing sampling tasks must check the sample preparation and preservation requirements to ensure compliance with the QAPP.

The following sections provide the minimum standards for sample management.

6.4.1 Sample Handling

Prior to entering the field area where sampling is to be conducted, especially at sites with defined exclusion zones, the sampler should ensure that all materials necessary to complete the sampling are on hand. If samples must be maintained at a specified temperature after collection, dedicated coolers and ice must be available for use. Conversely, when sampling in cold weather, proper protection of water samples, trip blanks, and field blanks must be considered. Sample preservation will involve pH adjustment, cooling to 4 degrees Celsius, and sample filtration and preservation.

6.4.2 Sample Labeling

Samples must be properly labeled immediately upon collection.

Note that the data shown on the sample label is the minimum data required. The sample label data requirements are listed below for clarity.

- Project name
- Sample name/number/unique identifier
- Sampler's initials
- Date of sample collection
- Time of sample collection
- Analysis required
- Preservatives

To ensure that samples are not confused, a clear notation should be made on the container with a permanent marker. If the containers are too soiled for marking, the containers can be put into a "Zip Lock" bag, which can then be labeled.

All sample names will be as follows:

- Sample unique identifier: Enter the sample name or number. There should be no slashes, spaces, or periods in the date.
- Date: Enter the six-digit date when the sample was collected. Note that for one-digit days, months, and/or years, add zeros so that the format is MMDDYY (050210). There should be no slashes, dashes, or periods in the date.

The QA/QC samples will be numbered consecutively as collected with a sample name, date, and number of samples collected throughout the day (i.e., when multiple QA/QC samples are collected in one day).

Examples of this naming convention are as follows:

Sample Name:	Comments
TB-050202-0001	TRIP BLANK
TB-050202-0002	TRIP BLANK
FD-050202-0001	FIELD DUPLICATE
FD-050202-0002	FIELD DUPLICATE

NOTE: The QA/QC Sample number resets to 0001 EACH DAY, which will avoid having to look back to the previous day for the correct sequential number.

6.4.3 Field Code

The field code will be written in the "Comments" field on the chain of custody for every sample but will not be a part of the actual sample name. Enter the one/two-character code for the type of sample (must be in capitals):

N	Normal Field Sample
FD	Field Duplicate (note sample number [i.e., 0001] substituted for time)
TB	Trip Blank (note sample number [i.e., 0001] substituted for time)
EB	Equipment Blank (note sample number [i.e., 0001] substituted for time)
FB	Field Blank (note sample number [i.e., 0001] substituted for time)
KD	Known Duplicate
FS	Field Spike Sample
MS	Matrix Spike Sample (note on "Comments" field of chain of custody – laboratory to spike matrix)
MD	Matrix Spike Duplicate Sample (note on "Comments" field of chain of custody – laboratory to spike matrix
RM	Reference Material

The sample labeling – both chain and sample bottles must be exactly as detailed above. In addition, the Field Sample Key for each sample collected must be filled out.

6.4.4 Packaging

Sample container preparation and packing for shipment should be completed in a well-organized and clean area, free of any potential cross-contamination. The following is a list of standard guidelines that must be followed when packing samples for shipment.

- Double-bag ice in “Zip Lock” bags.
- Double check to ensure trip and temperature blanks have been included for all shipments containing VOCs, or where otherwise specified in the QAPP.
- Enclose the chain of custody form in a “Zip Lock” bag.
- Ensure custody seals (two, minimum) are placed on each cooler. Coolers with hinged lids should have both seals placed on the opening edge of the lid. Coolers with “free” lids should have seals placed on opposite diagonal corners of the lid. Place clear tape over custody seals.
- Containers should be wiped clean of all debris/water using paper towels (paper towels must be disposed of with other contaminated materials).
- Clear, wide packing tape should be placed over the sample label for protection.
- Do not bulk pack. Each sample must be individually padded.
- Large glass containers (1 liter and up) require much more space between containers.
- Ice is not a packing material due to the reduction in volume when it melts.

Note: Never store sterile sample containers in enclosures containing equipment which use any form of fuel or volatile petroleum-based product. When conducting sampling in freezing conditions at sites without a heated storage area (free of potential cross-contaminants), unused trip blanks should be isolated from coolers immediately after receipt. Trip blanks should be double bagged and kept from freezing.

6.4.5 Chain of Custody Records

Chain of custody forms will be completed for all samples collected. The form documents the transfer of sample containers. The chain of custody record, completed at the time of sampling, will contain, but not be limited to, the sample number, date and time of sampling, and the name of the sampler. The chain of custody document will be signed and dated by the sampler when transferring the samples.

Each sample cooler being shipped to the laboratory will contain a chain of custody form. The cooler will be sealed properly for shipment. The laboratory will maintain a copy for its records. One copy will be returned with the data deliverables package.

The following list provides guidance for the completion and handling of all chains of custody:

- Chains of custody used should be a Haley & Aldrich of New York standard form or supplied by the analytical laboratory.
- Chains of custody must be completed in black ballpoint ink only.
- Chains of custody must be completed neatly using printed text.

- If a simple mistake is made, cross out the error with a single line and initial and date the correction.
- Each separate sample entry must be sequentially numbered.
- If numerous repetitive entries must be made in the same column, place a continuous vertical arrow between the first entry and the next different entry.
- When more than one chain of custody form is used for a single shipment, each form must be consecutively numbered using the "Page ___ of ___" format.
- If necessary, place additional instructions directly onto the chain of custody in the Comment section. Do not enclose separate instructions.
- Include a contact name and phone number on the chain of custody in case there is a problem with the shipment.
- Before using an acronym on a chain of custody, define clearly the full interpretation of your designation (i.e., PCBs).

6.4.6 Shipment

Prior to the start of the field sampling, the carrier should be contacted to determine if pickup will be at the field Site location. If pick-up is not available at the Site, the nearest pick-up or drop-off location should be determined. Sample shipments must not be left at unsecured drop locations.

Copies of all shipment manifests must be maintained in the field file.

7. Field Instruments – Use and Calibration

A significant number of field activities involve the usage of electronic instruments to monitor environmental conditions and for health and safety purposes. It is imperative the instruments are used and maintained properly to optimize their performance and minimize the potential for inaccuracies in the data obtained. This section provides guidance on the usage, maintenance, and calibration of electronic field equipment.

- All monitoring equipment will be in proper working order and operated in accordance with manufacturer's recommendations.
- Field personnel will be responsible for ensuring that the equipment is maintained and calibrated in the field in accordance with manufacturer's recommendations.
- Instruments will be operated only by personnel trained in the proper usage and calibration.
- Personnel must be aware of the range of conditions, such as temperature and humidity, for instrument operation. Usage of instruments in conditions outside these ranges will only proceed with approval of the Project Manager and/or Health and Safety Officer as appropriate.
- Instruments that contain radioactive source material, such as x-ray fluorescence (XRF) analyzers or moisture-density gauges, require specific transportation, handling, and usage procedures that are generally associated with a license from the Nuclear Regulatory Commission (NRC) or an NRC-Agreement State. Under no circumstance will the operation of such instruments be allowed on the Site unless by properly authorized and trained personnel, using the proper personal dosimetry badges or monitoring instruments.

7.1 GENERAL PROCEDURE DISCUSSION

Care must be taken to minimize the potential for transfer of contaminated materials to the ground or onto other materials. Regardless of the size or nature of the equipment being decontaminated, the process will utilize a series of steps that involve the removal of gross material (dirt, grease, oil, etc.), washing with a detergent, and multiple rinsing steps. In lieu of a series of wash and rinse steps, steam cleaning with low-volume, high-pressure equipment (i.e., steam cleaner) is acceptable.

Exploration equipment, and all monitoring equipment in contact with the sampling media must be decontaminated prior to initiating Site activities, in between exploration locations to minimize cross-contamination, and prior to mobilizing off Site after completion of Site work.

The following specific decontamination procedure is recommended for sampling equipment and tools:

- Brush loose soil off equipment;
- Wash equipment with laboratory-grade detergent (i.e., Alconox or equivalent);
- Rinse with tap water;
- Rinse equipment with distilled water;
- Allow water to evaporate before reusing equipment; and,
- Wrap equipment in aluminum foil when not being used.

7.2 DECONTAMINATION OF MONITORING EQUIPMENT

Because monitoring equipment is difficult to decontaminate, care should be exercised to prevent contamination. Sensitive monitoring instruments should be protected when they are at risk of exposure to contaminants. This may include enclosing them in plastic bags, allowing an opening for the sample intake. Ventilation ports should not be covered.

If contamination does occur, decontamination of the equipment will be required; however, immersion in decontamination fluids is not possible. As such, care must be taken to wipe the instruments down with detergent-wetted wipes or sponges, and then with de-ionized water-wetted wipes or sponges.

7.3 DISPOSAL OF WASH SOLUTIONS AND CONTAMINATED EQUIPMENT

All contaminated wash water, rinses, solids, and materials used in the decontamination process that cannot be effectively decontaminated (such as polyethylene sheeting) will be containerized and disposed of in accordance with applicable regulations. All containers will be labeled with an indelible marker as to contents and date of placement in the container, and any appropriate stickers required (such as PCBs). Storage of decontamination wastes on the Site will not exceed 90 days under any circumstances.

Equipment/Materials:

Decontamination equipment and solutions are generally selected based on ease of decontamination and disposability.

- Polyethylene sheeting;
- Metal racks to hold equipment;
- Soft-bristle scrub brushes or long-handle brushes for removing gross contamination and scrubbing with wash solutions;
- Large, galvanized wash tubs, stock tanks, or wading pools for wash and rinse solutions;
- Plastic buckets or garden sprayers for rinse solutions;
- Large plastic garbage cans or other similar containers lined with plastic bags can be used to store contaminated clothing;
- Contaminated liquids and solids should be segregated and containerized in New York State Department of Transportation (NYSDOT)-approved plastic or metal drums, appropriate for off-Site shipping/disposal if necessary.

8. Investigation-Derived Waste Disposal

8.1 RATIONALE/ASSUMPTIONS

This procedure applies to the disposition of IDW, including soils and/or groundwater. IDW is dealt with using the following "Best Management Practices" and is not considered a listed waste due to the lack of generator knowledge concerning the chemical source, chemical origin, and timing of chemical introduction to the subsurface.

Consequently, waste sampling and characterization are performed to determine if the wastes exhibit a characteristic of hazardous waste. The disposal of soil cuttings, test pit soils, and/or purged groundwater will be reviewed on a case-by-case basis prior to initiation of field activities. Two scenarios typically exist:

- When no information is available in the area of activity or investigation, and impacted media/soils are identified. Activities such as new construction and /or maintenance below grade may encounter environmental conditions that were unknown.
- Disposal Required/Containerization Required – When sufficient Site information regarding the investigative Site conditions warrants that all materials handled will be contained and disposed of.

If a known listed hazardous and/or characteristically hazardous waste/contaminated environmental media is being handled, then handling must be performed in accordance with RCRA Subtitle C (reference 2, Part V, Section 1[a],[b],[c]).

The following outlines the waste characterization procedures to be employed when IDW disposal is required.

The following procedure describes the techniques for the characterization of IDW for disposal purposes. IDW may consist of soil cuttings (augering, boring, well installation soils, test pit soils), rock core or rock flour (from coring, reaming operations), groundwater (from well development, purging, and sampling activities), decontamination fluids, PPE, and disposal equipment (DE).

8.2 PROCEDURE

The procedures for handling and characterization of field activity-generated wastes are:

A.) Soil Cuttings - Soils removed from boring activities will be contained within an approved container, suitable for transportation and disposal.

- Once placed into the approved container, any free liquids (i.e., groundwater) will be removed for disposal as waste fluids or solidified within the approved container using a solidification agent such as Speedy Dri (or equivalent).
- Contained soils will be screened for the presence of VOCs using a PID; this data will be logged for future reference.
- Once screened, full, and closed, the container will be labeled and placed into the container storage area. At a minimum, the following information will be shown on each container

label: date of filling/generation, Site name, source of soils (i.e., borehole or well), and contact.

- Prior to container closure, representative samples from the containers will be collected for waste characterization purposes and submitted to the project laboratory.
- Typically, at a location where an undetermined Site-specific parameter group exists, sampling and analysis may consist of the full RCRA Waste Characterization (ignitability, corrosivity, reactivity, toxicity), or a subset of the above based upon data collected, historical information, and generator knowledge.

B.) Groundwater - purging and sampling groundwater, which requires disposal, will be contained.

- Containment may be performed in 55-gallon drums, tanks suitable for temporary storage (i.e., Nalgene tanks 500 to 1,000 gallons), or if large volumes of groundwater are anticipated, tanker trailer (5,000 to 10,000 gallons ±), or drilling "Frac" tanks may be utilized (20,000 gallons ±). In all cases, the container/tank used for groundwater storage must be clean before use such that cross-contamination does not occur.

C.) Decontamination Waters/Decontamination Fluids - Decontamination waters and/or fluids will be segregated, contained, and disposed of accordingly.

- Decontamination waters may be disposed of with the containerized groundwater once analytical results have been acquired.

D.) PPE/DE – A number of disposal options exist for spent PPE/DE generated from investigation tasks. The options typically employed are:

- Immediately disposed of within on-Site dumpster/municipal trash; or
- If known to be contaminated with RCRA hazardous waste, dispose off-Site at an RCRA Subtitle C facility.
- Spent Solvent/Acid Rinses - The need for sampling must be determined in consultation with the waste management organization handling the materials. If known that only the solvent and/or acids are present, then direct disposal/treatment using media-specific options may be possible without sampling (i.e., incineration).
- PPE/DE – Typically not sampled and included with the disposal of the solid wastes.

Equipment/Materials:

- Sample spoons, trier, auger;
- Sample mixing bowl;
- Sampling bailer, or pump;
- Sample glassware.

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APPENDIX A
Field Forms

EQUIPMENT CALIBRATION LOG

Project: _____

Location: _____

Model Name: _____

Model Number: _____ **Serial Number:** _____

Cal. Standards: _____

_____

_____

Instruments will be calibrated in accordance with manufacturer's recommendations at least once per day.

Date	Time	Calibration Satandard Solution	Calibration Result	Calibrated by

Other Comments: _____

_____

_____

_____

_____

_____

_____

_____

Groundwater Field Sampling Form

Location:

Job Number: _____
Well ID: _____
Field Sampling Crew: _____

Date: _____
Start Time: _____
Finished Time: _____

Initial Depth to Water: _____
Well Depth: _____
Depth to top of screen: _____
Depth to bottom of screen: _____
Depth of Pump Intake: _____

Purging Device: _____
Tubing present in well? _____
Tubing type: _____

Time Elapsed (24 hour)	Depth to Water (from casing)	Pump Setting (ml/min or gal/min)	Purge Rate (ml/min or gal/min)	Cumulative Purge Volume (liters or gallons)	Temperature (degrees Celsius)	pH	Conductivity us/cm	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP/eH (mv)	Comments

Comments:

HALEY ALDRICH

SAMPLE IDENTIFICATION KEY

Page of

PROJECT _____ **H&A FILE NO.** _____

LOCATION _____ **PROJECT MGR.** _____

CLIENT _____

CONTRACTOR _____

Sample ID	Parent Sample ID	Location ID	Sample Date	Sample Time (military)	Sample Type Code	Filtered (Water Only T/D/N)	Composite Y/N	Soil Type	Depth To Top Of Sample	Depth To Bottom Of Sample	C.O.C. Number	Notes	Collected By

Notes:

Common Sample Type Codes:

N Normal Environmental Samp	WG Groundwater	WS Surface Water	SO Soil	GS Soil Gas	SE Sediment
WQ Water for Quality Control	FD Field Duplicate	EB Equipment Blank	TB Trip Blank	MS Matris Spike	MSD Matrix Spike Duplicate

see Memorandum dated 08/08/05 from Melanie Satanek "Sample Labeling for Submission to Analytical Laboratory" for less common codes

DAILY FIELD REPORT

Page of

Project		Report No.	
Location		Date	
Client		Page	of
Contractor		File No.	
Weather		Temperature	

Field Representative(s)	Time on site	Report/Travel/Other	Total hours

Distribution:

Haley & Aldrich, Inc.

GEOPROBE BORING REPORT

BORING NO.

Page 1 of

PROJECT
LOCATION
CLIENT
CONTRACTOR
DRILLER

PROJECT MGR.
FIELD REP.
DATE STARTED
DATE FINISHED

Elevation ft. Datum

Boring Location

Item	Casing	Sampler	Core Barrel
Type			
Inside Diameter (in.)			
Hammer Weight (lb.)			
Hammer Fall (in.)			

Rig Make & Model

☐ Truck ☐ Tripod ☐ Cat-Head
☐ ATV ☐ Geoprobe ☐ Winch
☐ Track ☐ Air Track ☐ Roller Bit
☐ Skid ☐ _____ ☐ Cutting Head

Hammer Type: ☐ Safety ☐ Doughnut ☐ Automatic

Drilling Mud: ☐ Bentonite ☐ Polymer ☐ None

Casing Advance: Type Method Depth

Drilling Notes:

Depth (ft.)	Casing Blows	Sampler Blows per 6 in.	Sample No. & Recovery (in.)	Sample Depth (ft)	Elev./ Depth (ft)	Visual-Manual Identification & Description (density/consistency, color, GROUP NAME & SYMBOL, maximum particle size*, structure, odor, moisture, optional descriptions, geologic interpretation)

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth in feet to: Bottom of Casing	Bottom of Hole	Water
Date					

Sample ID

O Open End Rod
T Thin Wall Tube
U Undisturbed Sample
S Split Spoon Sample
G Geoprobe

Summary

Overburden (Linear ft.) _____
Rock Cored (Linear ft.) _____
Number of Samples _____

BORING NO.

*NOTE: Maximum Particle Size is determined by direct observation within the limitations of sampler size.

NOTE: Soil descriptions based on a modified Burmister method of visual-manual identification

Form #3000

APPENDIX B
Quality Assurance Project Plan

HALEY ALDRICH

www.haleyaldrich.com

QUALITY ASSURANCE PROJECT PLAN
168 BANKER STREET
BROOKLYN, NEW YORK

by
H & A of New York Engineering and Geology, LLP
New York, New York

for
Wythe Gem LLC
Brooklyn, New York

File No. 0211545
August 2026



Executive Summary

This Quality Assurance Project Plan outlines the scope of the quality assurance and quality control activities associated with the Site sampling activities associated with the Remedial Investigation Work Plan for the property located at 168 Banker Street, Brooklyn, New York (Site).

Protocols for sample collection, sample handling and storage, chain of custody procedures, and laboratory and field analyses are described herein or specifically referenced to related project documents.

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A	Project Team Resumes

1. Project Description

This Quality Assurance Project Plan (QAPP) has been prepared as a component of the Remedial Investigation Work Plan (RIWP) for the property located at 168 Banker Street, Brooklyn, New York (Site).

1.1 PROJECT OBJECTIVES

The primary objective for data collection activities is to collect sufficient data necessary to characterize the subsurface conditions at the Site and determine the nature and extent of contamination.

1.2 SITE DESCRIPTION AND HISTORY

The general Site description and Site history are provided in the Site Description and History Summary that accompanies the RIWP appended to the Brownfield Cleanup Program (BCP) application for the Site and incorporated herein by reference.

1.3 LABORATORY PARAMETERS

The laboratory parameters for soil include:

- Target Compound List (TCL) volatile organic compounds (VOCs) using U.S. Environmental Protection Agency (EPA) Method 8260B;
- TCL semi-volatile organic compounds (SVOCs) using EPA Method 8270C;
- Total Analyte List (TAL) Metals using EPA Method 6010;
- TCL Pesticides using EPA Method 8081B;
- Polychlorinated biphenyls (PCBs) using EPA Method 8082;
- Per- and polyfluoroalkyl substances (PFAS) using EPA Method 1633; and,
- 1,4-dioxane using EPA Method 8270.

The laboratory parameters for groundwater include:

- TCL VOCs using EPA Method 8260B;
- TCL SVOCs using EPA Method 8270C;
- Total Metals using EPA Methods 6010/7471;
- Dissolved Metals using EPA Methods 6010/7471;
- PCBs using EPA Method 8082;
- Pesticides by EPA Method 8081B;
- PFAS using EPA Method 1633; and,
- 1,4-dioxane using EPA Method 8270 SIM.

Note: PFAS will be collected in accordance with the New York State Department of Environmental Conservation (NYSDEC), Division of Environmental Remediation (DER), Sampling, Analysis and

Assessment of Per- and Polyfluoroalkyl Substances under NYSDEC Part 375 Remedial Program, April 2023.

During the collection of groundwater samples, pH, specific conductivity, temperature, dissolved oxygen (DO), and oxidation-reduction potential (ORP) will be measured until stabilized.

The analytical laboratory parameters for soil vapor samples include:

- VOCs using EPA Method TO-15

Laboratory parameters for disposal samples will be determined by the disposal facility after an approved facility has been determined.

1.4 SAMPLING LOCATIONS

The RIWP provides the locations of soil borings, soil vapor implants, and groundwater monitoring wells that will be sampled (as applicable).

2. Project Organization and Responsibilities

This section defines the roles and responsibilities of the individuals who will perform the RIWP monitoring activities. A New York State Department of Health (NYSDOH)-certified analytical laboratory will perform the analyses of environmental samples collected at the Site.

2.1 PROJECT TEAM

The following project personnel are anticipated for oversight of the RIWP implementation. Project team resumes are included in Attachment A.

NYSDEC Case Manager	Robert Strang
NYSDOH Case Manager	Megan Rivera
Qualified Environmental Professional (QEP)	James Bellew
Project Manager	Zachary Simmell
Haley & Aldrich of New York* Health & Safety Director	Brian Fitzpatrick, CHMM
Health & Safety Officer (HSO)	Brian Ferguson
Quality Assurance (QA) Officer	Nicole Mooney
Third-Party Validator	Katherine Miller

**H & A of New York Engineering and Geology, LLP (Haley & Aldrich of New York)*

2.2 MANAGEMENT RESPONSIBILITIES

The Project Manager is responsible for managing the implementation of the RIWP and monitoring and coordinating the collection of data. The Project Manager is responsible for technical quality control (QC) and project oversight. The Project Manager's responsibilities include the following:

- Acquire and apply technical and corporate resources as needed to ensure performance within budget and schedule restraints;
- Review work performed to ensure quality, responsiveness, and timeliness;
- Communicate with the client point of contact concerning the progress of the monitoring activities;
- Assure corrective actions are taken for deficiencies cited during audits of RIWP monitoring activities; and,
- Assure compliance with the Site health and safety plan (HASP).

2.3 QUALITY ASSURANCE RESPONSIBILITIES

The QA team will consist of a QA Officer and the Data Validation Staff. QA responsibilities are described as follows.

2.3.1 Quality Assurance Officer

The QA Officer reports directly to the Project Manager and will be responsible for overseeing the review of field and laboratory data. Additional responsibilities include the following:

- Assure the application and effectiveness of the QAPP by the analytical laboratory and the project staff;
- Provide input to the Project Manager as to corrective actions that may be required as a result of the above-mentioned evaluations; and,
- Prepare and/or review data validation and audit reports.

The QA Officer will be assisted by the Data Validation Staff in the evaluation and validation of field and laboratory-generated data.

2.3.2 Data Validation Staff

The Data Validation Staff will be independent of the laboratory and familiar with the analytical procedures performed. The validation will include a review of each validation criterion as prescribed by the guidelines presented in Section 9.2 of this document and will be presented in a Data Usability Summary Report (DUSR) for submittal to the QA Officer.

2.4 LABORATORY RESPONSIBILITIES

The Environmental Laboratory Approval Program (ELAP)-approved laboratory to be used will be Alpha Analytical Inc. (Alpha), located in Westborough, Massachusetts. Laboratory services in support of the RIWP monitoring include the following personnel.

2.4.1 Laboratory Project Manager

The Laboratory Project Manager will report directly to the QA Officer and Project Manager and will be responsible for ensuring all resources of the laboratory are available on an as-required basis. The Laboratory Project Manager will also be responsible for the approval of the final analytical reports.

2.4.2 Laboratory Operations Manager

The Laboratory Operations Manager will report to the Laboratory Project Manager and will be responsible for coordinating laboratory analysis, supervising in-house chain of custody reports, scheduling sample analyses, overseeing data review, and overseeing the preparation of analytical reports.

2.4.3 Laboratory QA Officer

The Laboratory QA Officer will have sole responsibility for the review and validation of the analytical laboratory data. The Laboratory QA Officer will provide Case Narrative descriptions of any data quality issues encountered during the analyses conducted by the laboratory. The QA Officer will also define appropriate QA procedures and oversee QA/QC documentation.

2.4.4 Laboratory Sample Custodian

The Laboratory Sample Custodian will report to the Laboratory Operations Manager and will be responsible for the following:

- Receive and inspect the incoming sample containers;
- Record the condition of the incoming sample containers;
- Sign appropriate documents;
- Verify chain of custody and its correctness;
- Notify the Project Manager and Operations Manager of sample receipt and inspection;
- Assign a unique identification number and enter each into the sample receiving log;
- Initiate transfer of samples to laboratory analytical sections; and,
- Control and monitor access/storage of samples and extracts.

2.4.5 Laboratory Technical Personnel

The Laboratory Technical Personnel will have the primary responsibility for the performance of sample analysis and the execution of the QA procedures developed to determine the data quality. These activities will include the proper preparation and analysis of the project samples in accordance with the laboratory's Quality Assurance Manual (QAM) and associated Standard Operating Procedures (SOPs).

2.5 FIELD RESPONSIBILITIES

2.5.1 Field Coordinator

The Field Coordinator is responsible for the overall operation of the field team and reports directly to the Project Manager. The Field Coordinator works with the project HSO to conduct operations in compliance with the project HASP. The Field Coordinator will facilitate communication and coordinate efforts between the Project Manager and the field team members.

Other responsibilities include the following:

- Develop and implement field-related work plans, ensuring schedule compliance, and adhering to management-developed project requirements;
- Coordinate and manage field staff;
- Perform field system audits;
- Oversee QC for technical data provided by the field staff;
- Prepare and approve text and graphics required for field team efforts;
- Coordinate and oversee technical efforts of subcontractors assisting the field team;
- Identify problems in the field, resolve difficulties in consultation with the Project QA Officer and Project Manager, and implement and document corrective action procedures; and,
- Participate in preparation of the final reports.

2.5.2 Field Team Personnel

Field Team Personnel will be responsible for the following:

- Perform field activities as detailed in the RIWP and in compliance with the Field Sampling Plan (FSP; Appendix A of the RIWP) and QAPP.
- Immediately report any accidents and/or unsafe conditions to the Site HSO and take reasonable precautions to prevent injury.

3. Sampling Procedures

The FSP in Appendix A of the RIWP provides the SOPs for sampling required by the RIWP. Sampling will be conducted in general accordance with the NYSDEC Technical Guidance for Site Investigation and Remediation (DER-10) and the Sampling, Analysis, and Assessment of PFAS under NYSDEC Part 375 Remedial Program (April 2023) when applicable. Proposed sample locations are shown on Figure 2 of the RIWP.

3.1 SAMPLE CONTAINERS

Sample containers for each sampling task will be provided by the laboratory performing the analysis. The containers will be cleaned by the manufacturer to meet or exceed the analyte specifications established in the EPA's "Specifications and Guidance for Obtaining Contaminant-Free Sample Containers," April 1992, OSWER Directive #9240.0-0.5A. Certificates of analysis for each lot of sample containers used will be maintained by the laboratory.

The appropriate sample containers, preservation method, maximum holding times, and handling requirements for each sampling task are provided in Table I.

3.2 SAMPLE LABELING

Each sample will be labeled with a unique sample identifier that will facilitate tracking and cross-referencing of sample information. Field blanks and field duplicate samples also will be numbered with a unique sample identifier to prevent analytical bias of field QC samples.

Refer to the FSP (Appendix A of the RIWP) for the sample labeling procedures.

3.3 FIELD QC SAMPLE COLLECTION

3.3.1 Field Duplicate Sample Collection

3.3.1.1 Water Samples

Field duplicate samples will be collected by filling the first sample container to the proper level and sealing and then repeating for the second set of sample containers.

1. The samples are properly labeled as specified in Section 3.2.
2. Steps 1 through 4 are repeated for the bottles for each analysis. The samples are collected in order of decreasing analyte volatility as detailed in Section 3.3.1.
3. Chain of custody documents are executed.
4. The samples will be handled as specified in Table I.

3.3.1.2 Soil Samples

Soil field duplicates will be collected as specified in the following procedure:

1. Soils will be sampled directly from acetate liners.

2. Soil for VOC analysis will be removed from the sampling device as specified in the FSP provided as Appendix A of the RIWP.
3. Soil for non-VOC analysis will be removed from the sampling device and collected into clean laboratory-provided containers.

3.4 GENERAL DECONTAMINATION PROCEDURES

Care must be taken to minimize the potential for the transfer of contaminated materials to the ground or onto other materials. Regardless of the size or nature of the equipment being decontaminated, the process will utilize a series of steps that involve removal of gross material (dirt, grease, oil, etc.), washing with a detergent, and multiple rinsing steps. In lieu of a series of wash and rinse steps, steam cleaning with low-volume, high-pressure equipment (i.e., steam cleaner) is acceptable.

Exploration equipment and all monitoring equipment in contact with the sampling media must be decontaminated prior to initiating Site activities, in between exploration locations to minimize cross-contamination, and prior to mobilizing off the Site after completion of Site work.

The following specific decontamination procedure is recommended for sampling equipment and tools:

- Brush loose soil off equipment;
- Wash equipment with laboratory-grade detergent (i.e., Alconox or equivalent);
- Rinse with tap water;
- Rinse equipment with distilled water;
- Allow water to evaporate before reusing equipment; and,
- Wrap equipment in aluminum foil when not being used.

4. Custody Procedures

Sample custody is addressed in three parts: field sample collection, laboratory analysis, and final project files. Custody of a sample begins when it is collected by or transferred to an individual and ends when that individual relinquishes or disposes of the sample.

A sample is under custody if:

1. The item is in actual possession of a person;
2. The item is in the view of the person after being in actual possession of the person;
3. The item was in actual possession and subsequently stored to prevent tampering; or,
4. The item is in a designated and identified secure area.

4.1 FIELD CUSTODY PROCEDURES

Field personnel will keep written records of field activities on applicable pre-printed field forms or in a bound field notebook to record data-collecting activities. These records will be written legibly in ink and will contain pertinent field data and observations. Entry errors or changes will be crossed out with a single line, dated, and initialed by the person making the correction. Field forms and notebooks will be periodically reviewed by the Field Coordinator.

The beginning of each entry in the log book or preprinted field form will contain the following information:

- Date;
- Start time;
- Weather;
- Names of field personnel (including subcontractors);
- Level of personal protection used at the Site; and,
- Names of all visitors and the purpose of their visit.

For each measurement and sample collected, the following information will be recorded:

- Detailed description of sample location;
- Equipment used to collect the sample or make the measurement and the date equipment was calibrated;
- Time sample was collected;
- Description of the sample conditions;
- Depth sample was collected (if applicable);
- Volume and number of containers filled with the sample; and,
- Sampler's identification.

4.1.1 Field Procedures

The following procedure describes the process to maintain the integrity of the samples:

- Upon collection, samples are placed in the proper containers. In general, samples collected for organic analysis will be placed in pre-cleaned glass containers, and samples collected for inorganic analysis will be placed in pre-cleaned plastic (polyethylene) bottles. Refer to the FSP in Appendix A of the RIWP for sample packaging procedures.
- Samples will be assigned a unique sample number and will be affixed to a sample label. Refer to the FSP in Appendix A of the RIWP for sample labeling procedures.
- Samples will be properly and appropriately preserved by field personnel in order to minimize loss of the constituent(s) of interest due to physical, chemical, or biological mechanisms.
- Appropriate volumes will be collected to ensure that the appropriate reporting limits can be successfully achieved and that the required QC sample analyses can be performed.

4.1.2 Transfer of Custody and Shipment Procedures

- A chain of custody record will be completed at the time of sample collection and will accompany each shipment of project samples to the laboratory. The field personnel collecting the samples will be responsible for the custody of the samples until the samples are relinquished to the laboratory. Sample transfer will require the individuals relinquishing and receiving the samples to sign, date, and note the time of sample transfer on the chain of custody record.
- Samples will be shipped or delivered in a timely fashion to the laboratory so that holding times and/or analysis times as prescribed by the methodology can be met.
- Samples will be transported in containers (coolers) which will maintain the refrigeration temperature for those parameters for which refrigeration is required in the prescribed preservation protocols.
- Samples will be placed in an upright position and limited to one layer of samples per cooler. Additional bubble wrap or packaging material will be added to fill the cooler. Shipping containers will be secured with strapping tape and custody tape for shipment to the laboratory.
- When samples are split with the NYSDEC representatives, a separate chain of custody will be prepared and marked to indicate with whom the samples are shared. The person relinquishing the samples will require the representative's signature acknowledging sample receipt.
- If samples are sent by a commercial carrier, a bill of lading will be used. A copy of the bill of lading will be retained as part of the permanent record. Commercial carriers will not sign the custody record as long as the custody record is sealed inside the sample cooler and the custody tape remains intact.
- Samples will be picked up by a laboratory courier or transported to the laboratory the same day they are collected, unless collected on a weekend or holiday. In these cases, the samples will be stored in a secure location until delivery to the laboratory. Additional ice will be added to the cooler as needed to maintain proper preservation temperatures.

4.2 LABORATORY CHAIN OF CUSTODY PROCEDURES

A Sample Custodian will be designated by the laboratory and will have the responsibility of receiving all incoming samples. Once received, the Custodian will document if the sample is received in good condition (i.e., unbroken, cooled, etc.) and that the associated paperwork, such as chain of custody forms, has been completed. The Custodian will sign the chain of custody forms.

The Custodian will also document if sufficient sample volume has been received to complete the analytical program. The Sample Custodian will then place the samples into secure, limited-access storage (refrigerated storage, if required). The Sample Custodian will assign a unique number to each incoming sample for use in the laboratory. The unique number will then be entered into the sample-receiving log, with the verified time and date of receipt also noted.

Consistent with the analyses requested on the chain of custody form, analyses by the laboratory's analysts will begin in accordance with the appropriate methodologies. Samples will be removed from secure storage with internal chain of custody sign-out procedures followed.

4.3 STORAGE OF SAMPLES

Empty sample bottles will be returned to secure and limited-access storage after the available volume has been consumed by the analysis. Upon completion of the entire analytical work effort, samples will be disposed of by the Sample Custodian. The length of time that samples are held will be at least 30 days after reports have been submitted. Disposal of remaining samples will be completed in compliance with all federal, state, and local requirements.

4.4 Final Project Files Custody Procedures

The final project files will be the central repository for all documents with information relevant to sampling and analysis activities as described in this QAPP. The Haley & Aldrich of New York Project Manager will be the custodian of the project file. The project files, including all relevant records, reports, logs, field notebooks, pictures, subcontractor reports, and data reviews, will be maintained in a secured, limited-access area and under the custody of the Project Director or his designee.

The final project file will include the following:

- Project plans and drawings;
- Field data records;
- Sample identification documents and soil boring/monitoring well logs;
- All chain of custody documentation;
- Correspondence;
- References, literature;
- Laboratory data deliverables;
- Data validation and assessment reports;
- Progress reports, QA reports; and,

- A final report.

The laboratory will be responsible for maintaining analytical log books, laboratory data, and sample chain of custody documents. Raw laboratory data files and copies of hard copy reports will be inventoried and maintained by the laboratory for a period of six years, at which time the laboratory will contact the Haley & Aldrich of New York Project Manager regarding the disposition of the project-related files.

5. Calibration Procedures and Frequency

5.1 FIELD INSTRUMENT CALIBRATION PROCEDURES

Several field instruments will be used for both on-Site screening of samples and for health and safety monitoring, as described in the HASP. On-Site air monitoring for health and safety purposes may be accomplished using a vapor detection device, such as a photoionization detector (PID).

Field instruments will be calibrated at the beginning of each day and checked during field activities to verify performance. Instrument-specific calibration procedures will be performed in accordance with the instrument manufacturer's requirements.

5.2 LABORATORY INSTRUMENT CALIBRATION PROCEDURES

Reference materials of known purity and quality will be utilized for the analysis of environmental samples. The laboratory will carefully monitor the preparation and use of reference materials, including solutions, standards, and reagents through well-documented procedures.

All solid chemicals and acids/bases used by the laboratory will be rated as "reagent grade" or better. All gases will be "high" purity or better. All Standard Reference Materials (SRMs) or Performance Evaluation (PE) materials will be obtained from approved vendors of the National Institute of Standards and Technology (NIST; formerly National Bureau of Standards), the EPA Environmental Monitoring Support Laboratories (EMSL), or reliable Cooperative Research and Development Agreement (CRADA)-certified commercial sources.

6. Analytical Procedures

Analytical procedures to be utilized for the analysis of environmental samples will be based on referenced EPA analytical protocols and/or project-specific SOPs.

6.1 FIELD ANALYTICAL PROCEDURES

Field analytical procedures include the measurement of pH, temperature, ORP, DO, and specific conductivity during sampling of groundwater, and the qualitative measurement of VOC during the collection of soil samples.

6.2 LABORATORY ANALYTICAL PROCEDURES

Laboratory analyses will be based on the EPA methodology requirements promulgated in:

- "Test Methods for Evaluating Solid Waste," SW-846 EPA, Office of Solid Waste, and promulgated updates, 1986.

6.2.1 List of Project Target Compounds and Laboratory Detection Limits

The method detection limits (MDLs) studies are performed by the laboratories in accordance with the procedures established in the Code of Federal Register, Title 40, Part 136.

Laboratory parameters for soil samples are listed in the RIWP. Laboratory parameters for disposal samples will be determined by the disposal facility after an approved facility has been determined.

6.2.2 List of Method-Specific QC Criteria

The laboratory SOPs include a section that presents the minimum QC requirements for the project analyses. Section 7 references the frequency of the associated QC samples for each sampling effort and matrix.

7. Internal QC Checks

This section presents the internal QC checks that will be employed for field and laboratory measurements.

7.1 FIELD QC

7.1.1 Field Blanks

Internal QC checks will include analysis of field blanks to validate equipment cleanliness. Whenever possible, dedicated equipment will be employed to reduce the possibility of cross-contamination of samples.

7.1.2 Trip Blanks

Trip blank samples will be prepared by the project laboratory using ASTM International (ASTM) Type II or equivalent water placed within pre-cleaned 40-milliliter (mL) VOC vials equipped with Teflon septa. Trip blanks will accompany each sample delivery group (SDG) of environmental samples collected for analysis of VOCs.

Trip blank samples will be placed in each cooler that stores and transports project samples that are to be analyzed for VOCs.

7.2 LABORATORY PROCEDURES

Procedures that contribute to the maintenance of overall laboratory QA/QC include appropriately cleaned sample containers, proper sample identification and logging, applicable sample preservation, storage, analysis within prescribed holding times, and use of controlled materials.

7.2.1 Field Duplicate Samples

The precision or reproducibility of the data generated will be monitored through the use of field duplicate samples. Field duplicate analysis will be performed at a frequency of one in 20 project samples.

Precision will be measured in terms of the absolute value of the relative percent difference (RPD) as expressed by the following equation:

$$RPD = [|R1-R2|/[(R1+R2)/2]] \; X \; 100\%$$

Acceptance criteria for duplicate analyses performed on solid matrices will be 100 percent and aqueous matrices will be 35 percent (or the absolute difference rule was satisfied if detects were less than five times the reporting limit [RL]). RPD values outside these limits will require an evaluation of the sampling and/or analysis procedures by the project QA Officer and/or laboratory QA Director. Corrective actions may include re-analysis of additional sample aliquots and/or qualification of the data for use.

7.2.2 Matrix Spike Samples

Ten percent of each project sample matrix for each analytical method performed will be spiked with known concentrations of the specific target compounds/analytes.

The amount of the compound recovered from the sample compared to the amount added will be expressed as a percent recovery. The percent recovery of an analyte is an indication of the accuracy of an analysis within the site-specific sample matrix. Percent recovery will be calculated for matrix spike and matrix spike duplicate (MS/MSD) samples using the following equation.

$$\%\ Recovery = \frac{Spiked\ Sample - Background}{Known\ Value\ of\ Spike} x100\%$$

If the QC value falls outside the control limits (upper control limit [UCL] or lower control limit [LCL]) due to sample matrix effects, the results will be reported with appropriate data qualifiers. To determine the effect a non-compliant MS recovery has on the reported results, the recovery data will be evaluated as part of the validation process.

7.2.3 Laboratory Control Sample (LCS) Analyses

The laboratory will perform LCS analyses prepared from SRMs. The SRMs will be supplied from an independent manufacturer and traceable to NIST materials with known concentrations of each target analyte to be determined by the analytical methods performed. In cases where an independently supplied SRM is not available, the LCS may be prepared by the laboratory from a reagent lot other than that used for instrument calibration.

The laboratory will evaluate LCS analyses in terms of percent recovery using the most recent laboratory-generated control limits.

LCS recoveries that do not meet acceptance criteria will be deemed invalid. Analysis of project samples will cease until an acceptable LCS analysis has been performed. If sample analysis is performed in association with an out-of-control LCS sample analysis, the data will be deemed invalid.

Corrective actions will be initiated by the Haley & Aldrich of New York QA Officer and/or Laboratory QA Officer to investigate the problem. After the problem has been identified and corrected, the solution will be noted in the instrument run log book, and re-analysis of project samples will be performed, if possible.

The analytical anomaly will be noted in the SDG Case Narrative and reviewed by the Data Validator. The Data Validator will confirm that appropriate corrective actions were implemented and recommend the applicable use of the affected data.

7.2.4 Surrogate Compound/Internal Standard Recoveries

For VOCs, surrogates will be added to each sample prior to analysis to establish purge and trap efficiency. Quantitation will be accomplished via internal standardization techniques.

The recovery of surrogate compounds and internal standards will be monitored by laboratory personnel to assess possible Site-specific matrix effects on instrument performance.

For SVOC analyses, surrogates will be added to the raw sample to assess extraction efficiency. Internal standards will be added to all sample extracts and instrument calibration standards immediately before analysis for quantitation via internal standardization techniques.

Method-specific QC limits are provided in the attached laboratory method SOPs. Surrogate compound/internal standard recoveries that do not fall within accepted QC limits for the analytical methodology performed will have the analytical results flagged with data qualifiers as appropriate by the laboratory and will not be noted in the laboratory report Case Narrative.

To ascertain the effect non-compliant surrogate compound/internal standard recoveries may have on the reported results, the recovery data will be evaluated as part of the validation process. The Data Validator will provide recommendations for corrective actions, including but not limited to additional data qualification.

7.2.5 Calibration Verification (CV) Standards

CV standards will be utilized to confirm instrument calibrations and performance throughout the analytical process. CV standards will be prepared as prescribed by the respective analytical protocols. Continuing calibration will be verified by compliance with method-specific criteria prior to additional analysis of project samples.

Non-compliant analysis of CV standards will require immediate corrective action by the project laboratory QA Officer and/or designated personnel. Corrective action may include a re-analysis of each affected project sample, a detailed description of the problem, the corrective action undertaken, the person who performed the action, and the resolution of the problem.

7.2.6 Laboratory Method Blank Analyses

Method blank sample analysis will be performed as part of each analytical batch for each methodology performed. If target compounds are detected in the method blank samples, the reported results will be flagged by the laboratory in accordance with the SOPs. The Data Validator will provide recommendations for corrective actions, including but not limited to additional data qualification.

8. Data Quality Objectives (DQOs)

Sampling that will be performed as described in the RIWP is designed to produce data of the quality necessary to achieve the minimum standard requirements of the field and laboratory analytical objectives described below. These data are being obtained with the primary objective to assess levels of contaminants of concern associated with the Site.

The overall project DQO is to implement procedures for field data collection, sample collection, handling, laboratory analysis, and reporting that achieve the project objectives. The following section is a general discussion of the criteria that will be used to measure the achievement of the project DQO.

8.1 PRECISION

8.1.1 Definition

Precision is defined as a quantitative measure of the degree to which two or more measurements are in agreement. Precision will be determined by collecting and analyzing field duplicate samples and by creating and analyzing laboratory duplicates from one or more of the field samples. The overall precision of measurement data is a mixture of sampling and analytical factors. The analytical results from the field duplicate samples will provide data on sampling precision. The results from duplicate samples created by the laboratory will provide data on analytical precision. The measurement of precision will be stated in terms of RPD. RPD is defined as the absolute difference of duplicate measurements divided by the mean of these analyses, normalized to a percentage.

8.1.2 Field Precision Sample Objectives

Field precision will be assessed through the collection and measurement of field duplicate samples at a rate of one duplicate per 20 investigative samples. The RPD criteria for the project field duplicate samples will be +/- 100 percent for soil and +/- 35 percent for groundwater for parameters of analysis detected at concentrations greater than five times the laboratory RL.

8.1.3 Laboratory Precision Sample Objectives

Laboratory precision will be assessed through the analysis of LCS and laboratory control duplicate samples (LCDS), including MS/MSD samples for groundwater and soil samples, and the analysis of laboratory duplicate samples for air and soil vapor samples. Air and soil vapor laboratory duplicate sample analyses will be performed by analyzing the same SUMMA canister twice. The RPD criteria for the air/soil vapor laboratory duplicate samples will be +/- 35 percent for parameters of analysis detected at concentrations greater than five times the laboratory RL.

8.2 ACCURACY

8.2.1 Definition

Accuracy relates to the bias in a measurement system. Bias is the difference between the observed and the "true" value. Sources of error are the sampling process, field contamination, preservation techniques, sample handling, sample matrix, sample preparation, and analytical procedure limitations.

8.2.2 Field Accuracy Objectives

Sampling bias will be assessed by evaluating the results of field equipment rinse and trip blanks. Equipment rinse and trip blanks will be collected as appropriate based on sampling and analytical methods for each sampling effort.

If non-dedicated sampling equipment is used, equipment rinse blanks will be collected by passing ASTM Type II water over and/or through the respective sampling equipment utilized during each sampling effort. One equipment rinse blank will be collected for each type of non-dedicated sampling equipment used for the sampling effort. Equipment rinse blanks will be analyzed for each target parameter for the respective sampling effort for which environmental media have been collected.

Note: If dedicated or disposable sampling equipment is used, equipment rinse samples will not be collected as part of that field effort.

Trip blank samples will be prepared by the laboratory and provided with each shipping container that includes containers for the collection of groundwater samples for the analysis of VOCs. Trip blank samples will be analyzed for each VOC for which groundwater samples have been collected for analysis.

8.3 LABORATORY ACCURACY OBJECTIVES

Analytical bias will be assessed through the use of LCS and Site-specific MS sample analyses. LCS analyses will be performed with each analytical batch of project samples to determine the accuracy of the analytical system.

One set of MS/MSD analyses will be performed with each batch of 20 project samples collected for analysis to assess the accuracy of the identification and quantification of analytes within the Site-specific sample matrices. Additional sample volume will be collected at sample locations selected for the preparation of MS/MSD samples so that the standard laboratory RLs are achieved.

The accuracy of analyses that include a sample extraction procedure will be evaluated through the use of system monitoring or surrogate compounds. Surrogate compounds will be added to each sample, standard, blank, and QC sample prior to sample preparation and analysis. Surrogate compound percent recoveries will provide information on the effect of the sample matrix on the accuracy of the analyses.

8.4 REPRESENTATIVENESS

8.4.1 Definition

Representativeness expresses the degree to which sample data represent a characteristic of a population, a parameter variation at a sampling point, or an environmental condition. Representativeness is a qualitative parameter that is dependent upon the design of the sampling program. The representativeness criterion is satisfied through the proper selection of sampling locations, the quantity of samples, and the use of appropriate procedures to collect and analyze the samples.

8.4.2 Measures to Ensure Representativeness of Field Data

Representativeness will be addressed by prescribing sampling techniques and the rationale used to select sampling locations. Sampling locations may be biased (based on existing data, instrument surveys, observations, etc.) or unbiased (completely random or stratified-random approaches).

8.5 COMPLETENESS

8.5.1 Definition

Completeness is a measure of the amount of valid (usable) data obtained from a measuring system compared to the total amount anticipated to be obtained. The completeness goal for all data uses is that a sufficient amount of valid data be generated so that determinations can be made related to the intended data use with a sufficient degree of confidence. Valid data is determined by independent confirmation of compliance with method-specific and project-specific DQOs. The calculation of data set completeness will be performed by the following equation.

$$\frac{Number\ of\ Valid\ Sample\ Results}{Total\ Number\ of\ Samples\ Planned}\ X\ 100 = \%\ Complete$$

8.5.2 Field Completeness Objectives

Completeness is a measure of the amount of valid measurements obtained from measurements taken in this project versus the number planned. The field completeness objective for this project will be greater than 90 percent.

8.5.3 Laboratory Completeness Objectives

Laboratory data completeness objective is a measure of the amount of valid data obtained from laboratory measurements. The evaluation of the data completeness will be performed at the conclusion of each sampling and analysis effort.

The completeness of the data generated will be determined by comparing the amount of valid data, based on independent validation, with the total laboratory data set. The completeness goal will be greater than 90 percent.

8.6 COMPARABILITY

8.6.1 Definition

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another.

8.6.2 Measures to Ensure Comparability of Laboratory Data

Comparability of laboratory data will be measured from the analysis of SRM obtained from either EPA CRADA suppliers or the NIST. The reported analytical data will also be presented in standard units of mass of contaminant within a known volume of environmental media. The standard units for various sample matrices are as follows:

- Solid Matrices – micrograms per kilogram (µg/kg) for PFAS analyses, milligrams per kilogram (mg/kg) of media (Dry Weight).
- Aqueous Matrices – nanograms per liter (ng/L) for PFAS analyses, micrograms per liter (µg/L) of media for organic analyses, and milligrams per liter (mg/L) for inorganic analyses.

8.7 LEVEL OF QUALITY CONTROL EFFORT

If non-dedicated sampling equipment is used, equipment rinse blanks will be prepared by field personnel and submitted for analysis of target parameters. Equipment rinse blank samples will be analyzed to check for potential cross-contamination between sampling locations that may be introduced during the investigation. One equipment rinse blank will be collected per sampling event to the extent that non-dedicated sampling equipment is used.

If necessary, a separate equipment rinse blank sample will be collected for PFAS.

Note: If dedicated or disposable sampling equipment is used, equipment rinse samples will not be collected as part of that field effort.

Trip blanks will be used to assess the potential for contamination during sample storage and shipment. Trip blanks will be provided with the sample containers to be used for the collection of groundwater samples for the analysis of VOCs. Trip blanks will be preserved and handled in the same manner as the project samples. One trip blank will be included along with each shipping container containing project samples to be analyzed for VOCs.

Method blank samples will be prepared by the laboratory and analyzed concurrently with all project samples to assess potential contamination introduced during the analytical process.

Field duplicate samples will be collected and analyzed to determine sampling and analytical reproducibility. One field duplicate will be collected for every 20 or fewer investigative samples collected for off-Site laboratory analysis.

MS will provide information to assess the precision and accuracy of the analysis of the target parameters within the environmental media collected. One MS/MSD will be collected for every 20 or fewer investigative samples per sample matrix.

Note: Soil MS/MSD samples require triple sample volume for VOCs only. Aqueous MS/MSD samples require triple the normal sample volume for VOC analysis and double the volume for the remaining parameters.

9. Data Reduction, Validation, and Reporting

Data generated by the laboratory operation will be reduced and validated prior to reporting in accordance with the following procedures.

9.1 DATA REDUCTION

9.1.1 Field Data Reduction Procedures

Field data reduction procedures will be minimal in scope compared to those implemented in the laboratory setting. The pH, conductivity, temperature, turbidity, DO, ORP, and breathing zone VOC readings collected in the field will be generated from direct-read instruments. The data will be written into field log books immediately after measurements are taken. If errors are made, data will be legibly crossed out, initialed and dated by the field member, and corrected in a space adjacent to the original entry.

9.1.2 Laboratory Data Reduction Procedures

Laboratory data reduction procedures are provided by the appropriate chapter of the EPA's "Test Methods for Evaluating Solid Waste," SW-846, Third Edition. Errors will be noted; corrections made with the original notations crossed out legibly. Analytical results for soil samples will be calculated and reported on a dry weight basis.

9.1.3 Quality Control Data

QC data (e.g., laboratory duplicates, surrogates, MS, and MSD) will be compared to the method acceptance criteria. Data determined to be acceptable will be entered into the laboratory information management system.

Unacceptable data will be appropriately qualified in the project report. Case Narratives will be prepared, which will include information concerning data that fell outside acceptance limits and any other anomalous conditions encountered during sample analysis.

9.2 DATA VALIDATION

Data validation procedures of the analytical data will be performed by the Haley & Aldrich of New York QA Officer or designee using the following documents as guidance for the review process:

- "U.S. EPA National Functional Guidelines for Organic Data Review," "Analysis of Volatile Organic Compounds in Air Contained in Canisters by Method TO-15," "Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances Under NYSDEC's Part 375 Remedial Programs," and the "U.S. EPA National Functional Guidelines for Inorganic Data Review."
- The specific data qualifiers used will be applied to the reported results as presented and defined in the EPA National Functional Guidelines. Validation will be performed by qualified personnel at the direction of the Haley & Aldrich of New York QA Officer. Tier 1 data validation (the equivalent of EPA's Stage 2A validation) will be performed to evaluate data quality.

- The completeness of each data package will be evaluated by the Data Validator. Completeness checks will be administered on all data to determine that the deliverables are consistent with the NYSDEC Analytical Services Protocol (ASP) Category A and Category B data package requirements. The validator will determine whether the required items are present and request copies of missing deliverables (if necessary) from the laboratory.

9.3 DATA REPORTING

Data reporting procedures will be carried out for field and laboratory operations as indicated below.

- Field Data Reporting: Field data reporting will be conducted principally through the transmission of report sheets containing tabulated results of measurements made in the field and documentation of field calibration activities.
- Laboratory Data Reporting: The laboratory data reporting package will enable data validation based on the protocols described above. The final laboratory data report format will include the QA/QC sample analysis deliverables to enable the development of a DUSR based on NYSDEC DER-10 Appendix 2B.

10. Performance and System Audits

A performance audit is an independent quantitative comparison with data routinely obtained in the field or the laboratory. Performance audits include two separate, independent parts: internal and external audits.

10.1 FIELD PERFORMANCE AND SYSTEM AUDITS

10.1.1 Internal Field Audit Responsibilities

Internal audits of field activities will be initiated at the discretion of the Project Manager and will include the review of sampling and field measurements. The audits will verify that all procedures are being followed. Internal field audits will be conducted periodically during the project. The audits will include examination of the following:

- Field sampling records, screening results, instrument operating records;
- Sample collection;
- Handling and packaging in compliance with procedures;
- Maintenance of QA procedures; and,
- Chain of custody reports.

10.1.2 External Field Audit Responsibilities

External audits may be conducted by the Project Coordinator at any time during the field operations. These audits may or may not be announced and are at the discretion of the NYSDEC. The external field audits can include (but are not limited to) the following:

- Sampling equipment decontamination procedures;
- Sample bottle preparation procedures;
- Sampling procedures;
- Examination of HASPs;
- Procedures for verification of field duplicates; and,
- Field screening practices.

10.2 LABORATORY PERFORMANCE AND SYSTEM AUDITS

10.2.1 Internal Laboratory Audit Responsibilities

The laboratory system audits are typically conducted by the laboratory QA Officer or designee on an annual basis. The system audit will include an examination of laboratory documentation, including sample receiving logs, sample storage, chain of custody procedures, sample preparation and analysis, and instrument operating records.

At the conclusion of internal system audits, reports will be provided to the laboratory's operating divisions for appropriate comment and remedial/corrective action where necessary. Records of audits and corrective actions will be maintained by the Laboratory QA Officer.

10.2.2 External Laboratory Audit Responsibilities

External audits will be conducted as required by the NYSDOH or designee. External audits may include any of the following:

- Review of laboratory analytical procedures;
- Laboratory on-site visits; and,
- Submission of performance evaluation samples for analysis.

Failure of any of the above audit procedures can lead to laboratory decertification. An audit may consist of, but is not limited to:

- Sample receipt procedures;
- Custody, sample security, and log-in procedures;
- Review of instrument calibration logs;
- Review of QA procedures;
- Review of log books;
- Review of analytical SOPs; and,
- Personnel interviews.

A review of a data package from samples recently analyzed by the laboratory can include (but not be limited to) the following:

- Comparison of resulting data to the SOP or method;
- Verification of initial and continuing calibrations within control limits;
- Verification of surrogate recoveries and instrument timing results;
- Review of extended quantitation reports for comparisons of library spectra to instrument spectra, where applicable; and,
- Assurance that samples are run within holding times.

11. Preventive Maintenance

11.1 FIELD INSTRUMENT PREVENTIVE MAINTENANCE

The field equipment preventive maintenance program is designed to ensure the effective completion of the sampling effort and to minimize equipment downtime. Program implementation is concentrated in three areas:

- Maintenance responsibilities;
- Maintenance schedules; and,
- Inventory of critical spare parts and equipment.

The maintenance responsibilities for field equipment will be assigned to the task leaders in charge of specific field operations. Field personnel will be responsible for daily field checks and calibrations and for reporting any problems with the equipment. The maintenance schedule will follow the manufacturer's recommendations. In addition, the field personnel will be responsible for determining that an inventory of spare parts will be maintained with the field equipment. The inventory will primarily contain parts that are subject to frequent failure, have limited useful lifetimes, and/or cannot be obtained in a timely manner.

11.2 LABORATORY INSTRUMENT PREVENTIVE MAINTENANCE

Analytical instruments at the laboratory will undergo routine and/or preventive maintenance. The extent of the preventive maintenance will be a function of the complexity of the equipment.

Generally, annual preventive maintenance service will involve cleaning, adjusting, inspecting, and testing procedures designed to deduce instrument failure and/or extend useful instrument life. Between visits, routine operator maintenance and cleaning will be performed according to manufacturer's specifications by laboratory personnel.

12. Specific Routine Procedures Used to Assess Data Precision, Accuracy, and Completeness

12.1 FIELD MEASUREMENTS

Field-generated information will be reviewed by the Field Coordinator and typically includes evaluation of bound log books/forms, data entry, and calculation checks. Field data will be assessed by the Project Coordinator, who will review the field results for compliance with the established QC criteria that are specified in Sections 7 and 8 of this QAPP. The accuracy of pH and specific conductance will be assessed using daily instrument calibration, calibration checks, and blank data. Accuracy will be measured by determining the percent recovery (% R) of calibration check standards. Precision of the pH and specific conductance measurements will be assessed on the basis of the reproducibility of duplicate readings of a field sample and will be measured by determining the RPD. Accuracy and precision of the soil VOC screening will be determined using duplicate readings of calibration checks. Field data completeness will be calculated using the following equation:

$$Completeness = \frac{Valid\ (usable)\ Data\ Obtained}{Total\ Data\ Planned} \ X\ 100$$

12.2 LABORATORY DATA

Laboratory data will be assessed by the Haley & Aldrich of New York QA Officer or designee, who will review the laboratory results for compliance with the established QC criteria that are specified in Sections 7 and 8 of this QAPP.

13. QA Reports

Critically important to the successful implementation of the QAPP is a reporting system that provides the means by which the program can be reviewed, problems identified, and programmatic changes made to improve the plan.

QA reports to management can include:

- Audit reports, internal and external audits, with responses;
- Performance evaluation sample results, internal and external sources; and,
- Daily QA/QC exception reports/corrective actions.

QA/QC corrective action reports will be prepared by the Haley & Aldrich of New York QA Officer when appropriate and presented to the project and/or laboratory management personnel so that performance criteria can be monitored for all analyses from each analytical department. The updated trend/QA charts prepared by the laboratory QA personnel will be distributed and reviewed by various levels of laboratory management.

References

1. New York State Department of Environmental Conservation. 1991. NYSDEC Analytical Services Protocol (ASP), Bureau of Environmental Investigation, 1991 with updates.

2. New York State Department of Environmental Conservation. 2010. Division of Environmental Remediation, Technical Guidance for Site Investigation and Remediation, DER-10. May.

3. New York State Department of Environmental Conservation. 2023. Division of Environmental Remediation, Sampling, Analysis and Assessment of Per- and Polyfluoroalkyl Substances (PFAS) under NYSDEC Part 375 Remedial Program. April.

4. United States Environmental Protection Agency. 1986. Test Methods for Evaluating Solid Waste, Office of Solid Waste, U.S. EPA, SW-846, November 1986, with updates.

5. United States Environmental Protection Agency. 1991. Preparation Aids for the Development of Category I Quality Assurance Project Plans. U.S. EPA/600/8-91/003, Risk Reduction Engineering Laboratory, Office of Research and Development, Cincinnati, Ohio. February.

6. United States Environmental Protection Agency. 1992. Specifications and Guidance for Contaminant-Free Sample Containers. OSWER Directive 9240.0-05A. April.

7. United States Environmental Protection Agency. 1993. Data Quality Objectives Process for Superfund Interim Final Guidance. U.S. EPA/540/R-93-071, Office of Solid Waste and Emergency Response (OSWER). September.

8. United States Environmental Protection Agency. 1999. EPA Requirements for Quality Assurance Project Plans for Environmental Data Operations. EPA QA/R-5 Interim Final. November.

9. United States Environmental Protection Agency. U.S. EPA National Functional Guidelines for Organic Data Review. U.S. EPA 540/R-2017-002.

10. United States Environmental Protection Agency. U.S. EPA National Functional Guidelines for Organic Data Review. U.S. EPA 540/R-2017-001.

TABLE

TABLE I
SUMMARY OF ANALYSIS METHOD, PRESERVATION METHOD, HOLDING TIME, SAMPLE SIZE REQUIREMENTS AND SAMPLE CONTAINERS
168 BANKER STREET
BROOKLYN, NEW YORK

Analysis/Method	Sample Type	Preservation	Holding Time	Volume/Weight	Container
Volatile Organic Compounds/8260C/5035	Soil	1 - 1 Vial MeOH/2 Vial Water, Cool, 4 ± 2 °C	14 days[1]	120 mL	3 - 40ml glass vials
Semi-volatile Organic Compounds/8270D	Soil	Cool, 4 ± 2 °C	14 days	250 mL	1 - 8 oz Glass
Metals/6010C	Soil	Cool, 4 ± 2 °C	180 days	60 mL	1 - 2 oz Glass
Polychlorinated Biphenyls/8082A	Soil	Cool, 4 ± 2 °C	14 days	250 mL	1 - 8 oz Glass
Pesticides (8081B)	Soil	Cool, 4 ± 2 °C	14 days	250 mL	1 - 8 oz Glass
PFAS 1633	Soil	Cool, 4 ± 2 °C	14 days	250 mL	1 - 8 oz Glass
1,4-Dioxane 8270	Soil	Cool, 4 ± 2 °C	14 days	250 mL	1 - 8 oz Glass
Volatile Organic Compounds/8260B	Groundwater	HCl, Cool, 4 ± 2 °C	14 days	120 mL	3 - 40ml glass vials
Semi-volatile Organic Compounds/8270C	Groundwater	Cool, 4 ± 2 °C	7 days	500 mL	2 - 250 mL amber glass
TAL Metals 6010/7471	Groundwater	HNO_3Cool, 4 ± 2 °C	180 days	500 mL	1 - 500 mL plastic bottle
Polychlorinated Biphenyls/8082	Groundwater	Cool, 4 ± 2 °C	365 days	2000 mL	2 - 1000 mL amber glass
Pesticides & Herbicides (8081B and 8151A)	Groundwater	Cool, 4 ± 2 °C	7 days	3000 mL	2 - 500 mL amber glass 2 - 1000 mL amber glass
PFAS 1633	Groundwater	H2O Cool, 4 ± 2 °C	14 days	500 mL	2 - Teflon free 250 ml plastic containers
1,4-Dioxane 8270D	Groundwater	Cool, 4 ± 2 °C	7 days	500 mL	1 - 500 mL plastic bottle
Volatile Organic Compounds/TO-15	Soil Vapor	N/A	30 days	2.7 - 6 L	1 2.7 or 6 L Summa Canister

Notes:
1. Terracores and encores must be frozen within 48 hours of collection
2. Refer to text for additional information.

ATTACHMENT A
Project Team Resumes



JAMES BELLEW

Principal

EDUCATION

M.S., Environmental Geology, Queens College
B.S., Geology, Pre-Law, Environmental Science, Binghamton University

PROFESSIONAL SOCIETIES

American Council of Engineering Companies, Member, 2017
Urban Land Institute, Member, 2016
Business Council of New York, Member, 2018

SPECIAL STUDIES AND COURSES

40-Hour OSHA Hazardous Waste Operations and Emergency Response Training (29 CFR 1910.120)
30-Hour OSHA Construction Safety and Heath
8-hour OSHA Site Supervisor Certification
OSHA Confined Space Entry Training Certification
Erosion and Sediment Control, New York, No. 006925
USDOT/IATA Training on the Shipping and/or Transportation of Hazardous Materials

James has a hands-on approach to every project. He believes that being present and putting himself into his clients' shoes is the best way to understand their needs. As a Principal, James' expertise includes due diligence, environmental risk development, building surveys, remedial investigations, remedial design, and technical oversight. Mr. Bellew has completed over 50 New York City Office of Environmental Remediation (NYCOER) E-Designation Sites and New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP) Sites which include preparation of all reports through the certificate of completion and a certificate of occupancy.

Clients appreciate James' strategies from the inception of a project through closure under various regulatory programs nationwide. That comprehensive approach is what James loves the most about his job. He enjoys taking on complex projects and finding rational, cost-effective, remedial solutions. His biggest reward? When he can bring a client cost relief through value engineering.

RELEVANT PROJECT EXPERIENCE

Development, NYCDDC Shirley Chisholm Recreational Center, Brooklyn, New York. Principal for the project released by the New York City Department of Design and Construction (NYCDDC), on behalf of the NYC Parks Department, for the design and construction of a new recreational center located at 3002 Foster Avenue in Brooklyn, New York. Scope of services included execution of a Phase II Environmental Site Assessment (ESA), soil characterization, remedial oversight, geotechnical percolation testing, and closure with the New York City Department of Environmental Protection (NYCDEP).

Developments, New York State Superfund Site, Former NuHart Plastics Site, New York State Superfund Site (NuHart West) and BCP Site (NuHart East), Brooklyn, New York. Principal for the preparation of the feasibility study, offsite investigation reports, Resource Conservation and Recovery Act (RCRA) Closure Work Plan, execution of the RCRA Closure, preparation of the Brownfield Cleanup Application (NuHart East), 100% Remedial Design, preparation of all BCP-related work plans (NuHart East), coordination to vest the site for 421-a and all community outreach programs for a former plasticizer facility with on- and off-site pollutant concerns. Responsible for all remedial costs and alternative analyses with the client to bring the site to a certificate of completion. NuHart is a high-profile site that requires coordination with the NYSDEC, the NYCOER, local regulatory agencies, community stakeholders, and local elected officials. The NuHart East Site has completed the remediation and received the Certificate of Completion with the NYSDEC and the NuHart West Site is close to completion with an anticipated 2024 transition from a Class 2 to a Class 4 Inactive Hazardous Waste Site.

Developments, 101 Fleet Place, Brooklyn, New York. Principal responsible for the due diligence during acquisition, preparation of the BCP Application, Change of Use Documents, Brownfield Cleanup Agreement (BCA) Amendments, remedial investigation, and remedial action design (BCP and NYCOER) for a former bus depot site under the New York State BCP and NYCOER E-Designation Programs (Air/Noise). The Site has a footprint of 20,000 square feet (sq ft) with a planned development of a 21-story mixed-use building with approximately 292 units which include affordable housing.

Developments, Speedway Portfolio, Multiple Boroughs, New York. Principal responsible for the expedited due diligence during the acquisition of five former Speedway Sites of Phase I ESAs and Limited Phase II Environmental Site Investigations (ESIs), preparation of the BCP Applications, Remedial Investigation Work Plans, Interim Remedial Measure Work Plans and Air/Noise Remedial Action Work Plans (NYCOER). Five of the sites were accepted into the NYSDEC BCP. Remedial Investigations for compliance with the BCP have been completed and the remedial designs on the sites include a variety of remedial approaches which include in situ chemical treatment for groundwater, soil vapor extraction, excavation, and dewatering removal and treatment.

Development, 138 Bruckner Boulevard, Bronx, New York. Principal responsible for the due diligence during acquisition, preparation of the BCP Application, Change of Use Documents, coordination to vest the site for 421-a, BCA Amendments, remedial investigation, and remedial action design (BCP and NYCOER) for the former Zaro's Bakery Site under the New York State BCP and NYCOER E-Designation Programs (Air/Noise). The Site has a footprint of 50,000 sq ft with a planned development of a 12-story mixed-use building with approximately 447 units which include affordable housing.

Development, 310 Grand Concourse, Bronx, New York. Principal responsible for environmental and construction management services required to successfully navigate this two-building redevelopment project through the NYSDEC BCP and NYCOER E-Designation Program (Air/Noise). Project included site investigation, design, and remediation for development of two buildings within a 30,000-sq-ft lot in the Bronx, New York. Remediation included excavation of approximately 20,000 cubic yards (cu yd) of soil, groundwater extraction and treatment, underground storage tank (UST) removal, design, and installation of an ex-situ chemical in situ soil stabilization process for elevated levels of metals.

Development, 40 Bruckner Boulevard, Bronx, New York. Principal responsible for the due diligence during acquisition, preparation of the BCP Application, Change of Use Documents, BCA Amendments, remedial investigation, and remedial action design (BCP and NYCOER) for the former Mill Sanitary Wiping Cloth Site under the New York State BCP and NYCOER E-Designation Programs (Air/Noise). The Site has a footprint of 45,000 sq ft with a planned development of a 12-story mixed-use building with approximately 480 units which include affordable housing.

Development, 297 Wallabout Street, Brooklyn New York. Principal responsible for the due diligence during acquisition, preparation of the BCP Application, Change of Use Documents, BCA Amendments, remedial investigation, and remedial action design (BCP and NYCOER) for the 297 Wallabout Street site under the New York State BCP and NYCOER E-Designation Programs (Air). Successfully delineated the on-site tetrachloroethene (PCE) plume in soil and groundwater. The site is currently in the remedial implementation phase.

Developments, 89-91 Gerry & 93 Gerry Street, Brooklyn New York. Principal responsible for the due diligence during acquisition, preparation of the BCP Application, Change of Use Documents, BCA Amendments, remedial investigation, and remedial action design (BCP and NYCOER) for two sites (adjacent to each other) located at 89-91 Gerry Street and 93 Gerry Street under the New York State BCP and NYCOER E-Designation Programs (Air). The sites are currently preparing to execute the remedial action.

Development, Former Techtronics Site (8 Walworth Street), Brooklyn, New York. Principal for the remedial investigation, remedial action design, and remedial action implementation for the former Techtronics Site under the New York State BCP as a Participant where trichloroethene (TCE) and PCE were encountered in soil and groundwater. James successfully delineated the vertical and lateral extents of the plumes which were identified as upgradient, on-site. For this site we have designed source removal to 20 feet (ft) below ground surface (bgs), Zero Valent Iron (ZVI)

Reactive Barrier Wall, in situ ZVI injections sitewide, and a vertical vapor mitigation system. The site is currently in the remedial implementation phase.

Development, 346 Grand Concourse, Bronx, New York. Principal for the proposed nine-story, 60-key commercial building with a one-level deep cellar. Design phase environmental services consist of guiding the Site through the NYCOER Voluntary Cleanup and E-Designation Programs, including Hazmat, Air Quality, and Noise requirements. This program included the submission of a Remedial Investigation Work Plan, implementation of a Remedial Investigation, submittal of a Remedial Investigation Report, Remedial Action Work Plans (Hazmat Air and Noise), and the Final Installation Report for the Certificate of Occupancy.

Development, 3294 Atlantic Avenue, Brooklyn, New York. Principal for the proposed 12-story, 80-key commercial building with a one-level deep cellar. Design phase environmental services consist of guiding the site through the NYCOER Voluntary Cleanup and E-Designation Programs, including Hazmat, Air Quality, and Noise requirements. This program included the submission of a Remedial Investigation Work Plan, implementation of a Remedial Investigation, submittal of a Remedial Investigation Report, Remedial Action Work Plans (Hazmat Air and Noise), and the Final Installation Report for the Certificate of Occupancy.

590-594 Myrtle Avenue, Brooklyn, New York. Principal for the proposed six-story, 12-unit residential building with a one-level deep cellar. Design phase environmental services consist of guiding the site through the NYCOER Voluntary Cleanup and E-Designation Programs, including Hazmat, Air Quality, and Noise requirements. This program included the submission of a Remedial Investigation Work Plan, implementation of a Remedial Investigation, submittal of a Remedial Investigation Report, Remedial Action Work Plans (Hazmat Air and Noise), and the Final Installation Report for the Certificate of Occupancy.

Development, 3530 Webster Avenue, Bronx, New York. Principal for the proposed eight-story, 75-key commercial building with a one-level deep cellar. Design phase environmental services consist of guiding the site through the NYCOER Voluntary Cleanup and E-Designation Programs, including Hazmat, Air Quality, and Noise requirements. This program included submission of a Remedial Investigation Work Plan, implementation of a Remedial Investigation, submittal of a Remedial Investigation Report, and Remedial Action Work Plans (Hazmat Air and Noise). The project is currently in the construction phase of the NYCOER program.

Development, Former BP Station, Elmhurst Queens, New York. Principal for the preparation of a full environmental impact statement with respect to a mixed-use development proposed in Elmhurst Queens for submission to the New York City Department of City Planning to rezone the project. The work included a full impact assessment of the proposed construction with respect to the neighborhood, evaluation of green/open spaces for the community, and environmental site investigation and remediation services.

New York State Brownfield Site, Former Delta Metals Site, Brooklyn, New York. Senior Project manager for the remedial investigation and remedial action design for the former Delta Metal Products Company. Project is under the New York State BCP as a Participant where TCE and PCE were encountered in soil and groundwater. James successfully delineated the vertical and lateral extents of the plumes which were identified as an upgradient, on-site, and downgradient plume. Investigation results triggered the NYSDEC to utilize its call-out contract to perform a plume trackdown for the immediate area and identify additional Potentially Responsible Parties. The design for an Air Sparge Soil Vapor Extraction system has been accepted and the project is currently under construction.

Manufacturing-Industrial, Hess Amerada, Bogota and Edgewater, New Jersey. Senior Project Manager and Technical Lead for the construction management services for the demolition of two waterfront terminals on the Hackensack and Hudson Rivers. Services included demolition design, submittal review, site execution, and coordination of activities related to asbestos abatement, demolition of buildings, thirty holding tanks, piping structures, containment structures, and stormwater structures.

Manufacturing-Industrial, PQ Corporation, Northeastern United States. Senior Project Manager responsible for the design and implementation of a three-phased program for handling polychlorinated biphenyl (PCB)-containing materials on approximately 100 tank structures at large, active industrial sites, which included coating removal, encapsulation, demolition, and Toxic Substances Control Act (TSCA) remediation. He was responsible for development of the overall program, specifications, drawings, bid packages, construction oversight, and project administration until closure. The program also included the design and oversight of a new façade and roof upgrades completed concurrently with client operations.

Development, New York State Brownfield Site, Former Cascade Laundry, Brooklyn, New York. Senior Project Manager responsible for environmental and construction management services required to successfully navigate a seven-building redevelopment project through the NYSDEC BCP and NYCOER E-Designation Program (Air/Noise). Project included site investigation, design, and remediation for development of seven buildings within a 2-acre site in Brooklyn, New York. Remediation included excavation of approximately 40,000 cu yd of soil, groundwater extraction and treatment, UST removal, design, and installation of a sub-slab depressurization system (SSDS), and ex situ chemical oxidation of groundwater impacted by petroleum.

Development, New York City Brownfield Site - 520-534 West 29th Street, New York, New York. James was responsible for environmental site investigation and remediation activities required to successfully navigate the project through the NYCOER's E-Designation and Voluntary Cleanup Programs. This program included submission of a Remedial Investigation Work Plan, implementation of a Remedial Investigation, submittal of a Remedial Investigation Report, and Remedial Action Work Plans (Hazmat Air and Noise). The project is currently in the construction phase of the NYCOER program.

Development, New York State Brownfield Site, BJ's Wholesale, Brooklyn, New York. Senior Project Manager for the remedial execution within the NYSDEC BCP and NYCOER E-Designation programs at an 8-acre peninsula in Gravesend Bay being redeveloped by BJ's Wholesale Club (BJ's) into a "big-box" warehouse and parking garage, and a publicly accessible, waterfront open space. He implemented a comprehensive Community Air Monitoring Plan (CAMP), managed the design and installation of a passive SSDS, and oversaw handling and off-site disposal of impacted material generated by BJ's (the Lessee for the subject site) during their foundation construction activities.

Development, New York State Brownfield Site, Coney Island, Brooklyn, New York. Senior Project Manager responsible for the environmental design during the rehabilitation and expansion of a 1970s-era mixed-use complex, which covers an area equivalent to three city blocks. He facilitated the BCP applications for two adjacent parcels within the complex impacted by historic dry-cleaning uses. Site investigations performed had documented the presence of PCE in soil gas and were delineated over three separate structural slabs in commercial and residential space utilizing a mobile laboratory. He designed and installed two SSDS and prepared a Remedial Investigation Work Plan which outlined the work required to delineate the vertical and horizontal extent of the impacted soils, soil vapor, and groundwater at both BCP sites. The system was designed with below slab suction pits, remote sensing vacuum monitoring points, and a variable frequency drive blower tied into the monitoring points for optimization and power savings.

Development, New York City Brownfield Site, Hospitals, Memorial Sloan Kettering Cancer Center (MSKCC), New York, New York. Project Manager for environmental remediation for this MSKCC development project. James was solely responsible for subsurface investigation and remediation activities, large, manufactured gas plant (MGP) gas holder removal (from former Con Edison Operations), UST removal, daily status updates to the NYCOER, implementation of the CAMP and the management, handling, characterization, and off-site disposal of MGP-impacted soil and dewatering fluids.

New York State Spill Remediation, Metropolitan Transportation Agency Bridges and Tunnels, New York, New York. Project Manager responsible for the execution of a remedial action scope which included UST removal, excavation of 600 cu yd of petroleum-impacted soil, design and installation of a groundwater extraction and treatment system, and post-remediation samples. He implemented the In Situ Chemical Oxidation program for the injection of 54,000 gallons

of 8 percent solution Fenton's Reagent and the Operation and Maintenance (O&M) of the petroleum spill with respect to Fenton's performance and the plume migration.

Various Public Schools, New York City School Construction Authority, New York, New York. Project Manager responsible for environmental remediation proposed for several school development sites, including P.S. 312, P.S. 281, and P.S. 27K. Assisted in the design and implementation of the remediation programs for the sites for petroleum spills, PCB TSCA contamination, and hazardous lead hot spots.

Development, i.Park Edgewater, Edgewater, New Jersey. Project Manager responsible for the design and environmental remediation on-site. Implemented the construction plan for remediation of arsenic, pitch- and PCB-impacted soil for excavation and off-site disposal of 20,000 tons. He managed the air monitoring system on-site which consisted of four permanent stations set upwind and downwind on-site for volatile organic compounds (VOCs) and particulate migration off-site. Also, James performed redesigns throughout the project to keep within the current schedule and budget.

Development, New York State Brownfield, Queens West, Long Island City, New York. Project Manager responsible for oversight of the Environmental Remediation on-site. James implemented the construction plan for remediation of 20,000 cu yd of light non-aqueous phase liquid (LNAPL) on the site; he assisted in the design and oversight of the In Situ Chemical Oxidation mixing on-site. The project was eventually developed into three large towers and a new school.

MGP, National Grid, Rockaway, New York. James aided in the design and implementation of the soil characterization plan for MGP-impacted sands. After delineation of the contamination plume, drafted work plans and site layout of the negative pressure tent. He performed and trained the on-site staff on the use of personal air monitoring equipment and aided with design considerations on the installation of a waterloo barrier to be advanced to minus 80 ft below grade surface. James also helped with the design and permitting for the groundwater treatment system installed on-site.

MGP, Con Edison, New York, New York. Environmental engineer for responsible party for all environmental issues associated with this job, including transportation and disposal of 8,000 tons of MGP-contaminated soil from former Con Edison operations. James scheduled weekly work for all civil and environmental tasks on the job. He was responsible for the design and installation of the dewatering treatment system with a daily discharge of 25,000 gallons per day of MGP-impacted water.

New York State Superfund Project, NYSDEC, Hicksville, New York. James performed O&M and reporting on the site's Potassium Permanganate Injection System, which was on a timed system; maintaining the system, troubleshooting problems and ensuring that the proper ratios were being injected. He performed the fieldwork for analysis and drafted interim reports for the project manager.

Retail Petroleum, New York State Spills Program, Hess Amerada, Various Locations, New York. Environmental Engineer responsible for the design and installation of groundwater and soil vapor remedial systems at over 30 retail petroleum stations for Hess. Responsible for ensuring that the remedial systems were operating properly and performing repairs as necessary during operation. He performed groundwater and soil vapor monitoring and drafted O&M reports for the NYSDEC. Plume size ranged from within the retail station property with monitoring off-site impacts in local neighborhoods greater than a 3-mile radius.

Retail Petroleum, New York State Spills Program, British Petroleum (BP), Various Locations, New York. Environmental Engineer responsible for the design and installation of groundwater and soil vapor remedial systems at over 10 retail petroleum stations for BP. He was responsible for ensuring that the remedial systems were operating properly and performing repairs necessary during operation. He performed groundwater and soil vapor monitoring and drafted O&M reports for the NYSDEC. Plume size ranged from within the retail station property with monitoring off-site impacts in local neighborhoods greater than a 2-mile radius.

Development, 524 West 19th Street, New York, NY (Metal Shutter Homes). Project Engineer for responsible party for all environmental and civil issues associated with this job, including transportation and disposal of 5,000 tons of MGP-contaminated soil from former Con Edison operations. James scheduled weekly work for all civil and environmental tasks on the job. He successfully redesigned the grout cutoff wall connections to the installed steel sheeting with a secant wall installed off-site. He provided technical guidance for drilling 4-ft-diameter exploratory casings for subsurface anomalies. Additionally, James was responsible for the design and installation of the dewatering treatment system with a daily discharge of 25,000 gallons per day of MGP-impacted water.

U. S. Environmental Protection Agency (EPA) Superfund Site, Newtown Creek Superfund, Brooklyn, New York. Environmental Engineer who aided in the design of the pump and treat system installed at Peerless Importers. He also aided in the design and installation of the harbor boom setup. Operated and maintained groundwater/LNAPL extraction systems on-site and performed monthly site gauging as part of the O&M plan.



BRIAN FITZPATRICK, CHMM

Corporate Director, Health and Safety

EDUCATION

M.P.A., Environmental Policy, Syracuse University
B.S., Environmental Science, University of Massachusetts-Amherst
A.S., Chemistry, Valley Forge Military Junior College
Commissioned Officer, United States Army

CERTIFICATIONS

Certified Hazardous Materials Manager (Reg. No. 13454)
Certified Department of Transportation Shipper
Certified International Air Transport Authority Shipper

PROFESSIONAL SOCIETIES

Alliance of Hazardous Materials Professionals
Academy of Certified Hazardous Materials Managers, New England Chapter

SPECIAL STUDIES AND COURSES

Department of Transportation
International Air Transport Authority
Incident Commander
Confined Space Entry and Rescue
Radiation Safety Officer
RCRA Hazardous Waste
Massachusetts Industrial Waste Water Operator Grade 2I (expired)

AWARDS

Presidents Club Award (one million hours worked without a recordable injury, Cabot Corporation
Chancellors Award for Excellence, Syracuse University

Brian has over 25 years of experience in developing, implementing, and managing a wide range of environmental, health, and safety (EH&S) solutions for a variety of clients. Brian has served as the Health and Safety Manager and Incident Commander at several research and development sites and has managed extensive programs to maintain and clean contaminated sites under Federal and State regulatory programs. He has provided expertise in managing EH&S programs as a consultant, and has actively developed, implemented, and managed these programs as an EH&S professional for various industries.

Brian is currently working as the Chief Health and Safety Officer for Haley & Aldrich, Inc. He, and his staff, are involved in every project Haley & Aldrich, Inc. undertakes. Brian is involved on several projects, directly overseeing the health and safety on the project site of our staff, our contractors, and the public. Brian also acts as support for our on-site health and safety staff on other larger construction and remediation projects.

Through Brian's leadership our safety culture and focus extend from the top of our organization to each and every Haley & Aldrich employee as well as subconsultants and subcontractors. Utilizing a Behavior Based Safety approach, Haley & Aldrich expects every project team member to play an important role in making our projects safe and has given authority to every Haley & Aldrich employee, subconsultant, and subcontractor to stop any activity at any time for health or safety concerns. Our record illustrates that our hard work is paying off. The company has gone 4 years without a lost time injury, and our TRIR and EMR have consistently improved each of the last 3 years.

RELEVANT PROJECT EXPERIENCE

Haley & Aldrich, Inc., Burlington, Massachusetts. As Chief Health and Safety Officer, Brian has led and facilitated the development and implementation of corporate health and safety (H&S) improvement plans to enhance compliance and improve H&S performance. In Brian's time with Haley & Aldrich, Inc., the company has realized dramatic improvement on H&S goals and in Key Performance Indicators. Brian is responsible for developing a risk competence culture, where our staff are empowered to look for and engage to address risk before anyone is injured. Brian oversees the development, implementation and continuous improvement of all H&S programs for the company. Additional responsibilities include:

- Developing a safety culture through incident reporting, root cause analysis, behavior-based safety, hazard recognition and risk assessment, communication, and developing leaders;
- Monitoring proposed and existing SH&E regulations and legislation to determine their impact on operations and to ensure continued compliance;
- Overseeing the safety, industrial hygiene, and toxicology programs for over 600 staff members engaged in remediation, construction, health and safety, consulting, and general office work across 28 offices in the United States and on assignment to international project sites;
- Continuously seeks to improve H&S performance as measured by the OSHA Incident Rating (IR) and Worker's Compensation Experience Modification Rating (EMR), as well as Leading Indicators developed with the management team; and
- Participating in the corporate audit program as an auditor or lead auditor;

Energy Client, California. As Chief Health and Safety Officer, Brian led and facilitated the Alliance Partnership Safety Council in 2017, is still an active contributor to the council, and hosts routine contractor safety forums for the client. Brian is actively involved in the development and implementation of program safety, health, and environmental (SH&E) plans to ensure safe operations on project sites. Brian developed permits and Health and Safety Plans for large projects and routinely audits the site safety. Additional responsibilities include:

- Driving reporting and behavior-based safety initiatives to support our internal safety culture and developing monthly summary reports to illustrate performance to our client.
- Develop, assess and continuously improve site safety plans and practices, including specific safety protocols for working safely over and around water.
- Worked as an extension of the client's organization to provide assurance that the remedy was completed safely and consistent with client-specific requirements.
- Support on-site safety personnel in ensuring the health and safety of the general public, our staff, and our sub-contracted employees.
- Audits and visits sites to ensure compliance with our internal policies and client-specific requirements.

Energy Client, Ohio. As Chief Health and Safety Officer, Brian supports the project team in developing and executing client and project specific health and safety measures, such as a site specific Health and Safety Plan, Job Hazard Analyses, Industrial Hygiene program, and site specific training. Brian also routinely visits the site to assess current practices and condition and to ensure continuous improvement. Additional responsibilities include:

- Develop, assess, and continuously improve site safety plans and practices, including specific safety protocols to comply with supplemental EH&S requirements such as the Duke Health and Safety Handbook, Environmental Supplemental, and EHS Keys to Life.
- Develop, assess, and continuously improve site safety plans and practices to address the risks associated with the work being performed on site, as well as the environmental conditions and simultaneous operations, including trenching and excavation, hot work, work over and near water, heavy equipment, HAZWOPER, etc.
- Worked as an extension of the client's organization to provide assurance that the remedy was completed safely and consistent with client-specific requirements.
- Support on-site safety personnel in ensuring the health and safety of the general public, our staff, and our sub-contracted employees.
- Audits and visits site to ensure compliance with our internal policies and client-specific requirements.

BRIAN A. FERGUSON

Senior Engineer

EDUCATION

M. S. Geotechnical Engineering, Tufts University, Medford, Massachusetts; 2012
B. S. Civil Engineering, State University of New York - Environmental, Science, and Forestry, Syracuse, New York; 2000
Ass. Science Degree in Applied Science and Technology (Nuclear Engineering), Thomas A. Edison State College, Trenton, New Jersey; 2000

PROFESSIONAL SOCIETIES

Order of the Engineer – 2000
Boston Society of Civil Engineers (BSCE)
American Society of Civil Engineers (ASCE)

SPECIAL STUDIES AND COURSES

American Concrete Institute – Certified Field Technician Certified Grade 1
Radiation Safety and Operations of Nuclear Testing Equipment – Troxler
40-Hour OSHA Hazardous Waste Operations Training (+ 8-Hour annual refresher)
10-Hour OSHA Construction training
Confined Space Entry Training
16-Hour Asbestos Operations and Maintenance

Mr. Ferguson has over six years of experience serving as project engineer on a variety of real estate development projects. His project experience has included monitoring field investigations and performing construction oversight, performing due diligence and engineering analyses, performing geotechnical analyses and developing geotechnical recommendations, and preparing geotechnical reports and project specifications.

In addition to providing engineering design support, Mr. Ferguson has managed and participated in a number of field service activities. Field work has included construction monitoring and documentation of contractors' deep and shallow foundation related construction, including slurry walls, caissons, pile driving, pile cap installation, earthwork, backfilling and compaction, installation of soldier pile and wood lagging support systems, installation of tie backs, reading inclinometers, conducting in-place field unit weight tests, tie-back load testing, seismograph installation, monitoring, and evaluating, and preparation of footing bearing surfaces. Other responsibilities have included site development activities, including placement of utilities and subgrade preparation for roads; observations and testing to determine that work is completed in compliance with contract documents; on-site soil management; sampling of soil and groundwater for chemical laboratory testing and conducting in situ field screening; maintenance of job records including pile driving logs, results of field density tests, records of caisson and footing installations; preparation of daily field reports; in contact with key personnel; and resolution of field related problems.

RELEVANT PROJECT EXPERIENCE

St. Elizabeths Hostpital – West Campus Forensic Evaluations, Washington, D.C. Project Engineer for forensic evaluations on the adaptive reuse of former hospital buildings. Responsibilities included coordination of a field exploration program, including test borings and test pits to obtain subsurface information for project design and construction, overseeing multiple field personnel, subcontractors, assisting with project management, reviewing subcontractors invoices, reviewing and summarizing subsurface data and writing data reports.

TUFTS University, New Central Energy Plant, Medford, MA. Project engineer for a new Central Energy Plant that will house new co-generation steam boilers, centralized chilled water and electrical transformer switchgear that is planned to occupy approximately 20,000 square feet across two or three levels. Responsibilities included coordination of construction monitoring, observing SOE and footing installation, assisting with project management,

reviewing weekly field construction reports, reviewing and responding to geotechnical design submittals and attending project meetings.

Lahey Hospital and Medical Center – Stilts Infill Project, Burlington, MA Project Engineer for an addition to the existing Stilts building on the Lahey campus. Responsibilities included coordination and overseeing geotechnical and environmental subsurface investigations, coordination of construction monitoring, observing footing installation, assisting with project management, reviewing weekly field construction reports, reviewing and responding to geotechnical design submittals and attending project meetings.

Gloucester Beauport Hotel, Gloucester, MA Project engineer for a four story hotel with a seawall constructed adjacent to tidal beach. Responsibilities included coordination and overseeing geotechnical and environmental subsurface investigations, coordination of construction monitoring, assisting with project management, reviewing weekly field construction reports, reviewing and responding to geotechnical design submittals and attending project meetings, design and implementation of a sub-slab gas mitigation system.

275 Wyman Street, New Office Building, Waltham, MA. Project engineer for a new office building and parking garage founded on a shallow foundation system. Responsibilities included preparing proposals, assisting with management and planning of a subsurface investigation program, summarizing subsurface data and reviewing geotechnical test boring logs, coordination of construction monitoring and instrumentation monitoring programs, reviewing weekly field construction reports, reviewing and responding to specialty geotechnical design submittals and RFIs by others and attending project meetings.

Suffolk University - 20 Somerset Street, Boston, MA Project engineer for design of 8-story academic building with two levels of below grade finished space. Responsibilities included coordination of construction monitoring, observing SOE and footing installation, assisting with project management, reviewing weekly field construction reports, reviewing and responding to geotechnical design submittals and attending project meetings.

Worcester State University, New Student Housing, Worcester, MA Project engineer for design and construction of a 7-story residence/dining hall with a single level basement and a major site retaining wall structure. Responsibilities included overseeing geotechnical subsurface investigations, provided foundation recommendations and specifications, and prepared a retaining wall contract document. Responsibilities included coordination of construction monitoring, excavation and construction of footings, and soil reuse and management, assisting with project management, reviewing weekly field construction reports, reviewing and responding to geotechnical design submittals and attending project meetings.

University of Massachusetts Boston, General Academic Building No.1, Boston, MA. Project engineer responsible for assisting project manager in preliminary foundation engineering recommendations and construction considerations for a new academic building on a part of Columbia Point, a historic landfill area. Assisted in design phase services that included preparing foundation support design recommendations including the use of high allowable stresses for 190-ft long end-bearing H-piles and application of Slickcoat coating to address downdrag concerns and reduce foundation costs.

Waltham Watch Factory, Waltham, MA project engineer for redevelopment of former watch factory. Responsibilities included construction oversight of new precast parking garage, utilitiy upgrades, soil remediation and management, installation of gas mitigation systems, assisting with project management, reviewing weekly field construction reports, reviewing and responding to geotechnical design submittals and attending project meetings.

Massachusetts Green High Performance Computing Center, Holyoke, MA. Project engineer for 60,000 sq. ft high level computing center and associated support utilities. Redevelopment of the site included recycling 50,000 cy of construction debris into the site fills at this historic site along the Connecticut River. Responsibilities included coordinating geotechnical and environmental field investigations, coordination of construction monitoring, seismic analysis, reviewing weekly field construction reports, reviewing and responding to geotechnical design submittals and attending project meetings.

The Shops at Riverwood, Hyde Park, MA. The project consisted of the redevelopment of a colonial era paper mill. The multi-building complex was demolished and the concrete and brick from the previous buildings were recycled. The project involved crushing 50,000 cy of brick and concrete and placement of excavated soils and recycled brick and concrete as compacted fill materials to support proposed buildings, pavement areas, and achieve 5 to 9 ft. raises in grade. Field Representative was responsible for management and reuse of brick and concrete stockpiles, in-place density testing, coordination of test pits, installation of soldier pile and versa-lok walls, and backfilling of underground vaults. Remedial activities included: excavation of 5,000 cy of petroleum contaminated soils, on-site cement batching in a pug mill, and placement of compacted recycled materials in roadway areas; delineation, excavation and off-site disposal of TSCA-regulated PCB contaminated soils associated with historical Askarel transformers and dioxin-contaminated soils associated with historical bleaching operations; and disposition of 1,000 tons of paper mill sludge encountered within an abandoned granite-walled sluiceway structure. In addition, assisted with weekly project meetings, maintaining a record of material reuse, and providing weekly field reports.

Harvard Law School, Cambridge, MA. The Harvard Law School project is located on Massachusetts Avenue in Cambridge. The project consisted of a multistory building above ground with 5 levels below ground for a parking garage. Field Representative was responsible for overseeing the installation of slurry walls into bedrock and LBEs with three installation rigs while monitoring the removal of urban fill and transfer to several different receiving facilities from another portion of the site. The slurry walls were constructed into bedrock. Other Field Representative activities were: testing of the slurry, management of the excavated soils, and record keeping of the Contractor's obstruction and down time of the equipment. In addition, assisted with weekly project meetings, maintaining a record of obstruction and machine time, and providing weekly field reports.

ZACHARY SIMMEL

Project Manager | Environmental Engineer

EDUCATION

BS, Environmental Engineering, Syracuse University

SPECIAL STUDIES AND COURSES

40-Hour OSHA Hazardous Waste Operations and Emergency Response Training (29 CFR 1910.120)
8-Hour OSHA HAZWOPER Refresher Training
10-Hour OSHA Construction Safety Training
8-Hour DOT Hazmat Employee & RCRA Hazardous Waste Generator Training
American Red Cross First Aid Training and CPR Course
XRF Training
Asbestos Inspector Training

Zachary is an engineer with experience in remedial site investigations, subsurface investigations, observations of rock blasting/excavation, preparation of technical reports, and data collection and analysis. He also has extensive experience with conducting Phase I environmental site assessments and Phase II environmental site assessments, and other forms of environmental due diligence. He has performed groundwater sampling events, soil gas/vapor surveys, and assisted with preparation of soils management plans. Zachary regularly utilizes computer programs such as Microsoft Excel, Microsoft Word, and Bluebeam in his daily job functions.

He will focus his time at Haley & Aldrich serving the Building and Infrastructure markets with performing site reconnaissance to observe existing conditions, assess site access for subsurface explorations, and identify important site features. He will also monitor subsurface exploration activities to collect soil, bedrock, groundwater, as well as other pertinent information for project design, and assist in the development of remedial work plans.

RELEVANT PROJECT EXPERIENCE

Environmental

310 Grand Concourse Residential Construction, South Bronx, New York. As a field engineer, Zachary performed excavation oversight and was responsible for the collection of endpoint samples, air monitoring, and logging trucks for off-site disposal. He assisted in the development of a map that accounted for the different impacted zones on the site including hazardous lead and petroleum areas. He was exposed to general support of excavation (SOE) practices including the installation of soldier piles, structural piles, timber lagging, walers, and rakers. Approximately 24,000 tons of soil was excavated and transported off-site (includes hazardous lead, petroleum impacted, urban fill, and native soil) and approximately 10,250 tons of broken-up bedrock was removed from the site. Thirteen underground storage tanks containing gasoline were encountered and removed as part of the remediation. The site achieved the most stringent remediation standards in New York state.

Former Techtronics Facility, 8 Walworth Street, Brooklyn, New York. As field engineer, Zachary was responsible for the oversight of soil borings by Direct Push and installation of fifteen permanent groundwater monitoring wells using mud-rotary drilling. Cluster wells were installed to vertically delineate chlorinated volatile organic compounds (CVOCs) on-site plume and to evaluate other plumes migrating onto the site. Adjusted well locations due to site-specific challenges, specifically shallow refusal. His responsibilities included collecting soil and groundwater environmental samples, gauging wells, overseeing survey performed by license surveyor, and compiling laboratory data and hydrogeologic information to formulate an interim remedial measure (IRM) design involving soil vapor extraction/air sparging systems and implementing a bioremediation injection barrier wall.

297 Wallabout Street, Brooklyn, New York. As field engineer, Zachary was responsible for the oversight of soil borings and installation of five permanent groundwater monitoring wells. His responsibilities included classifying soil, developing/purging wells, collecting environmental soil samples, and conducting low-flow groundwater sampling for various analyses.

Excavation Oversight and CAMP Monitoring, Various Sites, Bronx and Brooklyn, New York. Zachary served as field engineer for several projects under the NYC Mayor's Office of Environmental Remediation (NYCOER) program. His responsibilities included performing excavation oversight, air monitoring, vapor barrier installation oversight, and logging trucks for off-site disposal.

Former NuHart Plastics Manufacturing Plant, Brooklyn, New York. Zachary worked as field engineer for multiple monitoring events which consisted of the removal of light non-aqueous-phase liquid (LNAPL) performed in compliance with the site-specific, NYSDEC-approved Operation, Maintenance, and Monitoring Plan (OM&M Plan) for the product recovery system.

Rock Brokerage Environmental Site Assessments, New York City, New York. Zachary served as field engineer for environmental waste characterization services as required by the disposal facility at several sites throughout the greater New York City area.

Building & Infrastructure Construction/Development

I-95 Express Lanes Fredericksburg Extension, Fredericksburg/Stafford, Virginia. As field engineer, Zachary was responsible for the oversight of geotechnical borings using (HSAs) along Interstate 95. Work areas included both road work and limited access areas (i.e. wetlands, medians). He provided quality real-time data under an intense project deadline and collaborated daily with earthwork firm (i.e. branch civil). Logged soils using Virginia Department of Transportation Classification System and collected both split spoon and Shelby tube samples. Equipment used for soil classification included a pocket penetrometer.

Greenwich Country Day School South Campus Addition, Greenwich, Connecticut. As field engineer, Zachary observed construction activities for south campus addition which included rock removal (line drilling and blasting), installing footings, preparing bearing surfaces, installing underslab and perimeter drainage systems, and earthworks. Project responsibilities also included collecting blast vibration monitoring information from the blaster and regularly checking in with surveyor to maintain elevation control of excavation.

Corbin Avenue Mixed-Use Residential Development, Darien, Connecticut. Zachary served field engineer for subsequent site investigation for a mixed-use residential development. The development will consist of several, mixed-use residential buildings, and an underground parking structure. His responsibilities included monitoring of test borings (using HAS and mud rotary) and rock drilling, collecting pertinent information from drill rig crews (monitored two at a time), collecting environmental samples, and gauging previously installed groundwater monitoring wells. Adjusted test boring locations due to site specific challenges including shallow refusal depth, utilities, and other site (i.e. parked vehicles, access restrictions).

Lambert Houses Parcel 5, Bronx, New York. As field engineer for site investigation of proposed development at E 179th Street, Zachary monitored 15 test borings and one test it to obtain information on subgrade and depth of bedrock across the site.

Lincoln Avenue Bridge Replacement, Trenton, New Jersey. As field engineer for site investigation of proposed replacement of bridge, Zachary monitored test borings to obtain information on subgrade and depth to bedrock. Test boring extended down to approximately 100 feet; 25 feet was rock cored. Both soil and rock cores were collected, observed, and properly identified in logs.

Keeler Brook Force Main Final Design, Connecticut Avenue, Norwalk, Connecticut. Zachary served as field engineer for site investigation of proposed installation of 2,475 linear feet (lf) of 16-in.-dia., HDPE-force main running along the south side on Connecticut Avenue. Final design included 1,100 lf horizontal directional drilling (HDD) and 725 lf pipe jacking area. His responsibilities included monitoring of test borings and rock drilling to obtain information on subgrade and depth to bedrock.

Environmental Remediation Experience

The Stanwich School, Environmental Remediation Investigation, Greenwich, Connecticut. As field engineer, Zachary was responsible for the oversight of the remediation of former hiking trails impacted by historical placement of fill material (e.g., primarily ash, coal, slag). Primary contaminants of concern included heavy metals, specifically arsenic and lead. Assisted with preliminary subsurface investigation involving the installation of test pits in order to characterize and assess distribution of fill material. Primary responsibilities included oversight of the removal of fill material, segregating cut stone for re-use, collecting endpoint samples to determine performance of the remedy, compiling laboratory data, oversight of the installation of filter fabric, and preparing a site remediation report with appropriate figures. Acted as liaison between general contractor and both soil brokerage firm and environmental laboratory.

Marc Service Station, Environmental Remediation, Stamford, Connecticut. As field engineer, Zachary was responsible for the remedial oversight of former gasoline service station. He conducted both Phase I and Phase II Environmental Site Assessments prior to remediation. Primary responsibilities included oversight of the excavation and removal of two abandoned in-ground hydraulic lifts, an out-of-service oil/water separator, and interior drain lines. Project also called for the removal of historic impacted soil in the vicinity of a former pump island and locations of former underground storage tanks grossly contaminated with primarily Benzene, Toluene, Ethylbenzene and Xylene (BTEX) contaminants and petroleum. He was responsible for the collection and analysis of soil samples, verification of completeness of the work, documentation, and preparation of a closure/soil remediation report.

Rubino Brothers Scrap Metal, Environmental Remediation Investigation, Stamford, Connecticut. As field engineer, Zachary was responsible for the remedial oversight of former storage lot operated by scrap metal yard. The storage lot was comprised of three different parcels which were formerly operated by a variety of light industrial and commercial businesses including a foundry and lumber yard. Assisted in the development of a grid system across the entirety of the site, each approximately 25 ft x 25 ft. Remediation was conducted in several phases: removal of top layer of asphalt and millings, removal of reinforced concrete slabs across the entirety of the site, and removal of impacted soil (primary contaminants of concern [Extractable Total Petroleum Hydrocarbons], arsenic, and lead). Encountered orphan underground gasoline storage tanks and a waste oil tank. Primary responsibilities included oversight of the removal of impacted soil, segregating non-native material, collecting endpoint samples, and documenting completion of work. Collected composite samples from stockpiles for waste characterization and disposal facility. Created spreadsheet and tables of laboratory results, prepared appropriate site plans, and assisted with compilation of remediation report.

Environmental Investigation Experience

Multiple Confidential Clients, Phase I ESAs and Due Diligence, Multiple Locations in Connecticut, New York, New Jersey. Zachary conducted Phase I ESAs, for buyer and vendor sides, on a variety of properties including commercial, industrial, and residential sites. Experience with conducting Phase I ESAs and Transaction Screens (in CT) on dry cleaners, auto body shops, and service stations.

Multiple Confidential Clients, Phase II, Multiple Locations, Connecticut. As field engineer, Zachary conducted Phase II ESAs and supplemental Phase III ESAs on a variety of different sites. His assisted with the development of sampling plans primarily based off previous environmental investigations and due diligence. Primary responsibilities for Phase II investigations included oversight of the installation of test borings and/or test pits and the installation of groundwater

monitoring wells. Some project scopes also called for the completion of a soil gas survey using a photoionization detector as a field instrument. Phase III investigations involved further intrusive environmental media sampling to further delineate the vertical and horizontal extent of contamination.

Other Experience

Spill Management and Closure Services, Multiple Sites, Connecticut. As field engineer, Zachary was responsible for spill closure activities including monitoring removal of underground storage tanks and at times, overseeing excavation of contaminated soil related to leaking underground storage tanks. Primary responsibilities for underground storage tank closure/removal included oversight of the removal of impacted soil, collecting endpoint samples, preparing soil samples for laboratory analysis, and preparing a closure report to be submitted to state agency.

Multiple Dry Cleaners, Stamford, Connecticut. Zachary's responsibilities included conducting quarterly groundwater sampling events using low flow sampling technique, preparing data and reports. Air monitoring and routine soil vapor extraction system maintenance checks were also required at several of the dry cleaners.

ALI REACH

Assistant Project Manager, Geologist

EDUCATION

B.S., Environmental Geosciences, Bucknell University

SPECIAL STUDIES AND COURSES

40-Hour OSHA Hazardous Waste Operations and Emergency Response Training (29 CFR 1910.120)
8-Hour OSHA HAZWOPER Refresher Training
8-Hour OSHA Site Supervisor Training
10-Hour OSHA Construction Safety Training
30-Hour OSHA Construction Training
NYC SST-307 8-Hour Fall Prevention for Construction
NYC SST-302 2-Hour Drug and Alcohol Awareness for Construction

Ali is a geologist with experience leading and executing environmental site investigations and managing remedial action projects. She serves as a liaison between clients, regulatory agencies, and project teams, ensuring project goals align with client needs and regulatory requirements. Alison represents client interests in communications and negotiations with agencies to ensure compliance with environmental regulations and permitting.

Ali designs, leads, and executes investigations to identify soil, groundwater, and soil vapor contaminants, and synthesizes data into reports and guidance documents for regulatory review. She manages both on-site and off-site elements of remedial action plans, overseeing contractors and ensuring projects comply with programs such as the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program and the New York City Office of Environmental Remediation (NYCOER) Volunteer Cleanup Program.

Her skills include project management, data analysis, cross-functional collaboration, and training new staff on field and office best practices. Alison is known for her customer-focused mindset, adaptability, and problem-solving abilities.

RELEVANT PROJECT EXPERIENCE

Related Companies, New York State Department of Environmental Conservation (NYSDEC), Brownfield Cleanup Program (BCP), Willets Point, Queens, New York. As staff geologist, Ali was responsible for on-site field management of a 20+ acre redevelopment enrolled in the NYSDEC BCP with a significant history of landfilling and multiple sources and types of contamination. She managed daily operations and was the field staff performing remedial oversight and inspections to ensure compliance with technical plans, construction specifications, and regulatory requirements. She was also responsible for coordinating with the client, contractor, and project management team to ensure milestone schedules were achieved.

New York City Football Club, NYSDEC BCP, Willets Point, Queens, New York. As a project geologist, Ali assisted with the project management for the redevelopment of the site enrolled in the NYSDEC BCP. She managed the junior field team on the project and was responsible for ensuring redevelopment operations adhered to the Site Management Plan (SMP). She was also responsible for coordinating with the client, contractor, and project field team to ensure milestone schedules were achieved.

1660 Boone Avenue, Remedial Investigation, Bronx, New York. As a project geologist, Ali was responsible for leading a Remedial Investigation for a site within the NYSDEC BCP program. Her responsibilities included managing sub-contractors and overseeing the installation of soil borings and soil vapor points and the collection of soil and soil vapor samples.

Remedial Oversight, Various Sites, Multiple Locations in New York City. As a project geologist, Ali was responsible for overseeing remedial activities for several projects in the NYSDEC Brownfield Cleanup Program (BCP) as well as the NYCOER cleanup program. Her responsibilities included excavation oversight, community air monitoring, material tracking of imports and off-site disposal of excavated materials, collection of endpoint and/or documentation samples, vapor barrier inspection, and sub-membrane depressurization system installation inspection.

Multiple Clients, BCP Applications for NYSDEC, Multiple Locations in New York City. Ali has prepared several BCP Application packages for various clients in New York State, which requires reviewing the site's history and any previous investigation reports available to assist with entry into the BCP to be remediated and redeveloped in accordance with applicable NYSDEC requirements.

Multiple Clients, Phase I ESAs and Due Diligence, Multiple Locations in New York. As a project geologist, Ali completed several Phase I ESAs for buyers of properties in New York. She has experience completing site reconnaissance and reviewing historical site documentation to identify potential environmental concerns at properties.

Multiple Clients, Phase II ESIs, Multiple Locations in New York. As a project geologist, Ali has designed and lead several Phase II ESIs for projects in New York, including oversight of the installation of soil borings, groundwater monitoring wells, and soil vapor points and the collection of soil, groundwater, and soil vapor samples. She assisted with the development of sampling plans based on previous environmental investigations and due diligence findings.

APPENDIX C
NYSDEC Emerging Contaminant Field Sampling Guidance

NEW YORK STATE OF OPPORTUNITY.
Department of Environmental Conservation

SAMPLING, ANALYSIS, AND ASSESSMENT OF PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS)

Under NYSDEC's Part 375 Remedial Programs

April 2023



www.dec.ny.gov

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ERRATA SHEET for

SAMPLING, ANALYSIS, AND ASSESSMENT OF PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS) Under NYSDEC's Part 375 Remedial Programs Issued January 17, 2020

Citation and Page Number	Current Text	Corrected Text	Date
Title of Appendix I, page 32	Appendix H	Appendix I	2/25/2020
Document Cover, page 1	Guidelines for Sampling and Analysis of PFAS	Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances (PFAS) Under NYSDEC's Part 375 Remedial Programs	9/15/2020
Data Assessment and Application to Site Cleanup Page 3	Until such time as Ambient Water Quality Standards (AWQS) and Soil Cleanup Objectives (SCOs) for PFOA and PFOS are published	Until such time as Soil Cleanup Objectives (SCOs) for PFOA and PFOS are published	3/28/2023
Water Sample Results Page 3	PFOA and PFOS should be further assessed and considered as potential contaminants of concern in groundwater or surface water if PFOA or PFOS is detected in any water sample at or above 10 ng/L (ppt) and is determined to be attributable to the site, either by a comparison of upgradient and downgradient levels, or the presence of soil source areas, as defined below.	NYSDEC has adopted ambient water quality guidance values for PFOA and PFOS. Groundwater samples should be compared to the human health criteria of 6.7 ng/l (ppt) for PFOA and 2.7 ng/l (ppt) for PFOS. These guidance values also include criteria for surface water for PFOS applicable for aquatic life, which may be applicable at some sites. Drinking water sample results should be compared to the NYS maximum contaminant level (MCL) of 10 ng/l (ppt).Analysis to determine if PFOA and PFOS concentrations are attributable to the site should include a comparison between upgradient and downgradient levels, and the presence of soil source areas, as defined below.	3/28/2023
Soil Sample Results Page 3	Soil cleanup objectives for PFOA and PFOS have been proposed in an upcoming revision to 6 NYCRR Part 375-6. Until SCOs are in effect, the following are to be used as guidance values:	NYSDEC will delay adding soil cleanup objectives for PFOA and PFOS to 6 NYCRR Part 375-6 until the PFAS rural soil background study has been completed. Until SCOs are in effect, the following are to be used as guidance values:	3/28/2023
Protection of Groundwater Page 3	PFOA (ppb) 1.1 PFOS (ppb) 3.7	PFOA (ppb) 0.8 PFOS (ppb) 1.0	3/28/2023

Citation and Page Number	Current Text	Corrected Text	Date
Footnote 2 Page 3	The movement of PFAS in the environment is being aggressively researched at this time; that research will eventually result in more accurate models for the behaviors of these chemicals. In the meantime, DEC has calculated the guidance value for the protection of groundwater using the same procedure used for all other chemicals, as described in Section 7.7 of the Technical Support Document (http://www.dec.ny.gov/docs/remediation_hudson_pdf/techsuppdoc.pdf).	The Protection of Groundwater values are based on the above referenced ambient groundwater guidance values. Details on that calculation are available in the following document, prepared for the February 2022 proposed changes to Part 375 (https://www.dec.ny.gov/docs/remediation_hudson_pdf/part375techsupport.pdf). The movement of PFAS in the environment is being aggressively researched at this time; that research will eventually result in more accurate models for the behaviors of these chemicals. In the meantime, DEC has calculated the guidance value for the protection of groundwater using the same procedure used for all other chemicals, as described in Section 7.7 of the Technical Support Document (http://www.dec.ny.gov/docs/remediation_hudson_pdf/techsuppdoc.pdf).	3/28/2023
Testing for Imported Soil Page 4	If the concentrations of PFOA and PFOS in leachate are at or above 10 ppt (the Maximum Contaminant Levels established for drinking water by the New York State Department of Health), then the soil is not acceptable.	If the concentrations of PFOA and PFOS in leachate are at or above the ambient water quality guidance values for groundwater, then the soil is not acceptable.	3/28/2023
Routine Analysis, page 9	"However, laboratories analyzing environmental samples…PFOA and PFOS in drinking water by EPA Method 537, 537.1 or ISO 25101."	"However, laboratories analyzing environmental samples…PFOA and PFOS in drinking water by EPA Method 537, 537.1, ISO 25101, or Method 533."	9/15/2020
Additional Analysis, page 9, new paragraph regarding soil parameters	None	"In cases where site-specific cleanup objectives for PFOA and PFOS are to be assessed, soil parameters, such as Total Organic Carbon (EPA Method 9060), soil pH (EPA Method 9045), clay content (percent), and cation exchange capacity (EPA Method 9081), should be included in the analysis to help evaluate factors affecting the leachability of PFAS in site soils."	9/15/2020

Citation and Page Number	Current Text	Corrected Text	Date
Data Assessment and Application to Site Cleanup Page 10	Until such time as Ambient Water Quality Standards (AWQS) and Soil Cleanup Objectives (SCOs) for PFAS are published, the extent of contaminated media potentially subject to remediation should be determined on a case-by-case basis using the procedures discussed below and the criteria in DER-10. Target levels for cleanup of PFAS in other media, including biota and sediment, have not yet been established by the DEC.	Until such time as Ambient Water Quality Standards (AWQS) and Soil Cleanup Objectives (SCOs) for PFOA and PFOS are published, the extent of contaminated media potentially subject to remediation should be determined on a case-by-case basis using the procedures discussed below and the criteria in DER-10. Preliminary target levels for cleanup of PFOA and PFOS in other media, including biota and sediment, have not yet been established by the DEC.	9/15/2020
Water Sample Results Page 10	PFAS should be further assessed and considered as a potential contaminant of concern in groundwater or surface water (…) If PFAS are identified as a contaminant of concern for a site, they should be assessed as part of the remedy selection process in accordance with Part 375 and DER-10.	PFOA and PFOS should be further assessed and considered as potential contaminants of concern in groundwater or surface water (…) If PFOA and/or PFOS are identified as contaminants of concern for a site, they should be assessed as part of the remedy selection process in accordance with Part 375 and DER-10.	9/15/2020

Citation and Page Number	Current Text	Corrected Text	Date
Soil Sample Results, page 10	"The extent of soil contamination for purposes of delineation and remedy selection should be determined by having certain soil samples tested by Synthetic Precipitation Leaching Procedure (SPLP) and the leachate analyzed for PFAS. Soil exhibiting SPLP results above 70 ppt for either PFOA or PFOS (individually or combined) are to be evaluated during the cleanup phase."	"Soil cleanup objectives for PFOA and PFOS will be proposed in an upcoming revision to 6 NYCRR Part 375-6. Until SCOs are in effect, the following are to be used as guidance values. " [Interim SCO Table] "PFOA and PFOS results for soil are to be compared against the guidance values listed above. These guidance values are to be used in determining whether PFOA and PFOS are contaminants of concern for the site and for determining remedial action objectives and cleanup requirements. Site-specific remedial objectives for protection of groundwater can also be presented for evaluation by DEC. Development of site-specific remedial objectives for protection of groundwater will require analysis of additional soil parameters relating to leachability. These additional analyses can include any or all the parameters listed above (soil pH, cation exchange capacity, etc.) and/or use of SPLP. As the understanding of PFAS transport improves, DEC welcomes proposals for site-specific remedial objectives for protection of groundwater. DEC will expect that those may be dependent on additional factors including soil pH, aqueous pH, % organic carbon, % Sand/Silt/Clay, soil cations: K, Ca, Mg, Na, Fe, Al, cation exchange capacity, and anion exchange capacity. Site-specific remedial objectives should also consider the dilution attenuation factor (DAF). The NJDEP publication on DAF can be used as a reference: https://www.nj.gov/dep/srp/guidance/rs/daf.pdf. "	9/15/2020

Citation and Page Number	Current Text	Corrected Text	Date
Testing for Imported Soil Page 11	Soil imported to a site for use in a soil cap, soil cover, or as backfill is to be tested for PFAS in general conformance with DER-10, Section 5.4(e) for the PFAS Analyte List (Appendix F) using the analytical procedures discussed below and the criteria in DER-10 associated with SVOCs. If PFOA or PFOS is detected in any sample at or above 1 µg/kg, then soil should be tested by SPLP and the leachate analyzed for PFAS. If the SPLP results exceed 10 ppt for either PFOA or PFOS (individually) then the source of backfill should be rejected, unless a site-specific exemption is provided by DER. SPLP leachate criteria is based on the Maximum Contaminant Levels proposed for drinking water by New York State's Department of Health, this value may be updated based on future Federal or State promulgated regulatory standards. Remedial parties have the option of analyzing samples concurrently for both PFAS in soil and in the SPLP leachate to minimize project delays. Category B deliverables should be submitted for backfill samples, though a DUSR is not required.	Testing for PFAS should be included any time a full TAL/TCL analyte list is required. Results for PFOA and PFOS should be compared to the applicable guidance values. If PFOA or PFOS is detected in any sample at or above the guidance values then the source of backfill should be rejected, unless a site-specific exemption is provided by DER based on SPLP testing, for example. If the concentrations of PFOA and PFOS in leachate are at or above 10 ppt (the Maximum Contaminant Levels established for drinking water by the New York State Department of Health), then the soil is not acceptable. PFOA, PFOS and 1,4-dioxane are all considered semi-volatile compounds, so composite samples are appropriate for these compounds when sampling in accordance with DER-10, Table 5.4(e)10. Category B deliverables should be submitted for backfill samples, though a DUSR is not required.	9/15/2020

Citation and Page Number	Current Text	Corrected Text	Date
Footnotes	None	[1] TOP Assay analysis of highly contaminated samples, such as those from an AFFF (aqueous film-forming foam) site, can result in incomplete oxidation of the samples and an underestimation of the total perfluoroalkyl substances. [2] The movement of PFAS in the environment is being aggressively researched at this time; that research will eventually result in more accurate models for the behaviors of these chemicals. In the meantime, DEC has calculated the soil cleanup objective for the protection of groundwater using the same procedure used for all other chemicals, as described in Section 7.7 of the Technical Support Document (http://www.dec.ny.gov/docs/remediation_hudson_pdf/techsuppdoc.pdf).	9/15/2020
Additional Analysis, page 9	In cases… soil parameters, such as Total Organic Carbon (EPA Method 9060), soil…	In cases… soil parameters, such as Total Organic Carbon (Lloyd Kahn), soil…	1/8/2021
Appendix A, General Guidelines, fourth bullet	List the ELAP-approved lab(s) to be used for analysis of samples	List the ELAP- certified lab(s) to be used for analysis of samples	1/8/2021
Appendix E, Laboratory Analysis and Containers	Drinking water samples collected using this protocol are intended to be analyzed for PFAS by ISO Method 25101.	Drinking water samples collected using this protocol are intended to be analyzed for PFAS by EPA Method 537, 537.1, 533, or ISO Method 25101	1/8/2021
Water Sample Results Page 9	"In addition, further assessment of water may be warranted if either of the following screening levels are met: a. any other individual PFAS (not PFOA or PFOS) is detected in water at or above 100 ng/L; or b. total concentration of PFAS (including PFOA and PFOS) is detected in water at or above 500 ng/L"	Deleted	6/15/2021

Citation and Page Number	Current Text	Corrected Text	Date
Routine Analysis, Page XX	Currently, New York State Department of Health's Environmental Laboratory Approval Program (ELAP)… criteria set forth in the DER's laboratory guidelines for PFAS in non-potable water and solids (Appendix H - Laboratory Guidelines for Analysis of PFAS in Non-Potable Water and Solids).	Deleted	5/31/2022
Analysis and Reporting, Page XX	As of October 2020, the United States Environmental Protection Agency (EPA) does not have a validated method for analysis of PFAS for media commonly analyzed under DER remedial programs (non-potable waters, solids). DER has developed the following guidelines to ensure consistency in analysis and reporting of PFAS.	Deleted	5/31/2022
Routine Analysis, Page XX	LC-MS/MS analysis for PFAS using methodologies based on EPA Method 537.1 is the procedure to use for environmental samples. Isotope dilution techniques should be utilized for the analysis of PFAS in all media.	EPA Method 1633 is the procedure to use for environmental samples.	
Soil Sample Results, Page XX	Soil cleanup objectives for PFOA and PFOS will be proposed in an upcoming revision to 6 NYCRR Part 375-6	Soil cleanup objectives for PFOA and PFOS have been proposed in an upcoming revision to 6 NYCRR Part 375-6	
Appendix A	"Include in the text… LC-MS/MS for PFAS using methodologies based on EPA Method 537.1"	"Include in the text ….EPA Method 1633"	
Appendix A	"Laboratory should have ELAP certification for PFOA and PFOS in drinking water by EPA Method 537, 537.1, EPA Method 533, or ISO 25101"	Deleted	
Appendix B	"Samples collected using this protocol are intended to be analyzed for PFAS using methodologies based on EPA Method 537.1"	"Samples collected using this protocol are intended to be analyzed for PFAS using EPA Method 1633"	

Citation and Page Number	Current Text	Corrected Text	Date
Appendix C	"Samples collected using this protocol are intended to be analyzed for PFAS using methodologies based on EPA Method 537.1"	"Samples collected using this protocol are intended to be analyzed for PFAS using EPA Method 1633"	
Appendix D	"Samples collected using this protocol are intended to be analyzed for PFAS using methodologies based on EPA Method 537.1"	"Samples collected using this protocol are intended to be analyzed for PFAS using EPA Method 1633"	
Appendix G		Updated to include all forty PFAS analytes in EPA Method 533	
Appendix H		Deleted	
Appendix I	Appendix I	Appendix H	
Appendix H	"These guidelines are intended to be used for the validation of PFAS analytical results for projects within the Division of Environmental Remediation (DER) as well as aid in the preparation of a data usability summary report."	"These guidelines are intended to be used for the validation of PFAS using EPA Method 1633 for projects within the Division of Environmental Remediation (DER)."	
Appendix H	"The holding time is 14 days…"	"The holding time is 28 days…"	
Appendix H, Initial Calibration	"The initial calibration should contain a minimum of five standards for linear fit…"	"The initial calibration should contain a minimum of six standards for linear fit…"	
Appendix H, Initial Calibration	Linear fit calibration curves should have an R^2 value greater than 0.990.	Deleted	
Appendix H, Initial Calibration Verification	Initial Calibration Verification Section	Deleted	
Appendix H	secondary Ion Monitoring Section	Deleted	
Appendix H	Branched and Linear Isomers Section	Deleted	

Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances (PFAS) Under NYSDEC's Part 375 Remedial Programs

Objective

New York State Department of Environmental Conservation's Division of Environmental Remediation (DER) performs or oversees sampling of environmental media and subsequent analysis of PFAS as part of remedial programs implemented under 6 NYCRR Part 375. To ensure consistency in sampling, analysis, reporting, and assessment of PFAS, DER has developed this document which summarizes currently accepted procedures and updates previous DER technical guidance pertaining to PFAS.

Applicability

All work plans submitted to DEC pursuant to one of the remedial programs under Part 375 shall include PFAS sampling and analysis procedures that conform to the guidelines provided herein.

As part of a site investigation or remedial action compliance program, whenever samples of potentially affected media are collected and analyzed for the standard Target Analyte List/Target Compound List (TAL/TCL), PFAS analysis should also be performed. Potentially affected media can include soil, groundwater, surface water, and sediment. Based upon the potential for biota to be affected, biota sampling and analysis for PFAS may also be warranted as determined pursuant to a Fish and Wildlife Impact Analysis. Soil vapor sampling for PFAS is not required.

Field Sampling Procedures

DER-10 specifies technical guidance applicable to DER's remedial programs. Given the prevalence and use of PFAS, DER has developed "best management practices" specific to sampling for PFAS. As specified in DER-10 Chapter 2, quality assurance procedures are to be submitted with investigation work plans. Typically, these procedures are incorporated into a work plan, or submitted as a stand-alone document (e.g., a Quality Assurance Project Plan). Quality assurance guidelines for PFAS are listed in Appendix A - Quality Assurance Project Plan (QAPP) Guidelines for PFAS.

Field sampling for PFAS performed under DER remedial programs should follow the appropriate procedures outlined for soils, sediments, or other solids (Appendix B), non-potable groundwater (Appendix C), surface water (Appendix D), public or private water supply wells (Appendix E), and fish tissue (Appendix F).

QA/QC samples (e.g. duplicates, MS/MSD) should be collected as specified in DER-10, Section 2.3(c). For sampling equipment coming in contact with aqueous samples only, rinsate or equipment blanks should be collected. Equipment blanks should be collected at a minimum frequency of one per day per site or one per twenty samples, whichever is more frequent.

Analysis and Reporting

The investigation work plan should describe analysis and reporting procedures, including laboratory analytical procedures for the methods discussed below. As specified in DER-10 Section 2.2, laboratories should provide a full Category B deliverable. In addition, a Data Usability Summary Report (DUSR) should be prepared by an independent, third-party data validator. Electronic data submissions should meet the requirements provided at: https://www.dec.ny.gov/chemical/62440.html.

DER has developed a *PFAS Analyte List* (Appendix G) for remedial programs to understand the nature of contamination at sites. It is expected that reported results for PFAS will include, at a minimum, all the compounds listed. If lab and/or matrix specific issues are encountered for any analytes, the DER project manager, in consultation with the DER chemist, will make case-by-case decisions as to whether certain analytes may be temporarily or permanently discontinued from analysis at each site. As with other contaminants that are analyzed for at a site, the *PFAS Analyte List* may be refined for future sampling events based on investigative findings.

Routine Analysis

EPA Method 1633 is the procedure to use for environmental samples. Reporting limits for PFOA and PFOS in aqueous samples should not exceed 2 ng/L. Reporting limits for PFOA and PFOS in solid samples should not exceed 0.5 µg/kg. Reporting limits for all other PFAS in aqueous and solid media should be as close to these limits as possible. If laboratories indicate that they are not able to achieve these reporting limits for the entire *PFAS Analyte List*, site-specific decisions regarding acceptance of elevated reporting limits for specific PFAS can be made by the DER project manager in consultation with the DER chemist. Data review guidelines were developed by DER to ensure data comparability and usability (Appendix H - Data Review Guidelines for Analysis of PFAS in Non-Potable Water and Solids).

Additional Analysis

Additional laboratory methods for analysis of PFAS may be warranted at a site, such as the Synthetic Precipitation Leaching Procedure (SPLP) and Total Oxidizable Precursor Assay (TOP Assay).

In cases where site-specific cleanup objectives for PFOA and PFOS are to be assessed, soil parameters, such as Total Organic Carbon (Lloyd Kahn), soil pH (EPA Method 9045), clay content (percent), and cation exchange capacity (EPA Method 9081), should be included in the analysis to help evaluate factors affecting the leachability of PFAS in site soils.

SPLP is a technique used to determine the mobility of chemicals in liquids, soils and wastes, and may be useful in determining the need for addressing PFAS-containing material as part of the remedy. SPLP by EPA Method 1312 should be used unless otherwise specified by the DER project manager in consultation with the DER chemist.

Impacted materials can be made up of PFAS that are not analyzable by routine analytical methodology. A TOP Assay can be utilized to conceptualize the amount and type of oxidizable PFAS which could be liberated in the environment, which approximates the maximum concentration of perfluoroalkyl substances that could be generated if all polyfluoroalkyl substances were oxidized. For example, some polyfluoroalkyl substances may degrade or transform to form perfluoroalkyl substances (such as PFOA or PFOS), resulting in an increase in perfluoroalkyl substance concentrations as contaminated groundwater moves away from a source. The TOP Assay converts, through oxidation, polyfluoroalkyl substances (precursors) into perfluoroalkyl substances that can be detected by routine analytical methodology.[1]

[1] TOP Assay analysis of highly contaminated samples, such as those from an AFFF (aqueous film-forming foam) site, can result in incomplete oxidation of the samples and an underestimation of the total perfluoroalkyl substances.

Commercial laboratories have adopted methods which allow for the quantification of targeted PFAS in air and biota. The EPA's Office of Research and Development (ORD) is currently developing methods which allow for air emissions characterization of PFAS, including both targeted and non-targeted analysis of PFAS. Consult with the DER project manager and the DER chemist for assistance on analyzing biota/tissue and air samples.

Data Assessment and Application to Site Cleanup

Until such time as Soil Cleanup Objectives (SCOs) for PFOA and PFOS are published, the extent of contaminated media potentially subject to remediation should be determined on a case-by-case basis using the procedures discussed below and the criteria in DER-10. Preliminary target levels for cleanup of PFOA and PFOS in other media, including biota and sediment, have not yet been established by the DEC.

Water Sample Results

NYSDEC has adopted ambient water quality guidance values for PFOA and PFOS. Groundwater samples should be compared to the human health criteria of 6.7 ng/l (ppt) for PFOA and 2.7 ng/l (ppt) for PFOS. These human health criteria should also be applied to surface water that is used as a water supply. This guidance also includes criteria for surface water for PFOS applicable for aquatic life, which may be applicable at some sites. Drinking water sample results should be compared to the NYS maximum contaminant level (MCL) of 10 ng/l (ppt). Analysis to determine if PFOA and PFOS concentrations are attributable to the site should include a comparison between upgradient and downgradient levels, and the presence of soil source areas, as defined below.

If PFOA and/or PFOS are identified as contaminants of concern for a site, they should be assessed as part of the remedy selection process in accordance with Part 375 and DER-10.

Soil Sample Results

NYSDEC will delay adding soil cleanup objectives for PFOA and PFOS to 6 NYCRR Part 375-6 until the PFAS rural soil background study has been completed. Until SCOs are in effect, the following are to be used as guidance values:

Guidance Values for Anticipated Site Use	PFOA (ppb)	PFOS (ppb)
Unrestricted	0.66	0.88
Residential	6.6	8.8
Restricted Residential	33	44
Commercial	500	440
Industrial	600	440
Protection of Groundwater[2]	0.8	1.0

PFOA and PFOS results for soil are to be compared against the guidance values listed above. These guidance values are to be used in determining whether PFOA and PFOS are contaminants of concern for the site and for determining remedial action objectives and cleanup requirements. Site-specific remedial objectives for protection of groundwater can also be presented for evaluation by DEC. Development of site-specific remedial objectives for protection of groundwater will require analysis of additional soil parameters relating to leachability. These

[2] The Protection of Groundwater values are based on the above referenced ambient groundwater guidance values. Details on that calculation are available in the following document, prepared for the February 2022 proposed changes to Part 375 (https://www.dec.ny.gov/docs/remediation_hudson_pdf/part375techsupport.pdf). The movement of PFAS in the environment is being aggressively researched at this time; that research will eventually result in more accurate models for the behaviors of these chemicals. In the meantime, DEC has calculated the guidance value for the protection of groundwater using the same procedure used for all other chemicals, as described in Section 7.7 of the Technical Support Document (http://www.dec.ny.gov/docs/remediation_hudson_pdf/techsuppdoc.pdf).

additional analyses can include any or all the parameters listed above (soil pH, cation exchange capacity, etc.) and/or use of SPLP.

As the understanding of PFAS transport improves, DEC welcomes proposals for site-specific remedial objectives for protection of groundwater. DEC will expect that those may be dependent on additional factors including soil pH, aqueous pH, % organic carbon, % Sand/Silt/Clay, soil cations: K, Ca, Mg, Na, Fe, Al, cation exchange capacity, and anion exchange capacity. Site-specific remedial objectives should also consider the dilution attenuation factor (DAF). The NJDEP publication on DAF can be used as a reference: https://www.nj.gov/dep/srp/guidance/rs/daf.pdf.

Testing for Imported Soil

Testing for PFAS should be included any time a full TAL/TCL analyte list is required. Results for PFOA and PFOS should be compared to the applicable guidance values. If PFOA or PFOS is detected in any sample at or above the guidance values then the source of backfill should be rejected, unless a site-specific exemption is provided by DER based on SPLP testing, for example. If the concentrations of PFOA and PFOS in leachate are at or above the ambient water quality guidance values for groundwater, then the soil is not acceptable.

PFOA, PFOS and 1,4-dioxane are all considered semi-volatile compounds, so composite samples are appropriate for these compounds when sampling in accordance with DER-10, Table 5.4(e)10. Category B deliverables should be submitted for backfill samples, though a DUSR is not required.

Appendix A - Quality Assurance Project Plan (QAPP) Guidelines for PFAS

The following guidelines (general and PFAS-specific) can be used to assist with the development of a QAPP for projects within DER involving sampling and analysis of PFAS.

General Guidelines in Accordance with DER-10

- Document/work plan section title – Quality Assurance Project Plan
- Summarize project scope, goals, and objectives
- Provide project organization including names and resumes of the project manager, Quality Assurance Officer (QAO), field staff, and Data Validator
    - The QAO should not have another position on the project, such as project or task manager, that involves project productivity or profitability as a job performance criterion
- List the ELAP certified lab(s) to be used for analysis of samples
- Include a site map showing sample locations
- Provide detailed sampling procedures for each matrix
- Include Data Quality Usability Objectives
- List equipment decontamination procedures
- Include an "Analytical Methods/Quality Assurance Summary Table" specifying:
    - Matrix type
    - Number or frequency of samples to be collected per matrix
    - Number of field and trip blanks per matrix
    - Analytical parameters to be measured per matrix
    - Analytical methods to be used per matrix with minimum reporting limits
    - Number and type of matrix spike and matrix spike duplicate samples to be collected
    - Number and type of duplicate samples to be collected
    - Sample preservation to be used per analytical method and sample matrix
    - Sample container volume and type to be used per analytical method and sample matrix
    - Sample holding time to be used per analytical method and sample matrix
- Specify Category B laboratory data deliverables and preparation of a DUSR

Specific Guidelines for PFAS

- Include in the text that sampling for PFAS will take place
- Include in the text that PFAS will be analyzed by EPA Method 1633
- Include the list of PFAS compounds to be analyzed (*PFAS Analyte List*)
- Include the laboratory SOP for PFAS analysis
- List the minimum method-achievable Reporting Limits for PFAS
    - Reporting Limits should be less than or equal to:
        - Aqueous – 2 ng/L (ppt)
        - Solids – 0.5 µg/kg (ppb)
- Include the laboratory Method Detection Limits for the PFAS compounds to be analyzed
-
- Include detailed sampling procedures
    - Precautions to be taken
    - Pump and equipment types
    - Decontamination procedures
    - Approved materials only to be used
- Specify that regular ice only will be used for sample shipment
- Specify that equipment blanks should be collected at a minimum frequency of 1 per day per site for each matrix

Appendix B - Sampling Protocols for PFAS in Soils, Sediments and Solids

General

The objective of this protocol is to give general guidelines for the collection of soil, sediment and other solid samples for PFAS analysis. The sampling procedure used should be consistent with Sampling Guidelines and Protocols – Technological Background and Quality Control/Quality Assurance for NYS DEC Spill Response Program – March 1991 (http://www.dec.ny.gov/docs/remediation_hudson_pdf/sgpsect5.pdf), with the following limitations.

Laboratory Analysis and Containers

Samples collected using this protocol are intended to be analyzed for PFAS using EPA Method 1633.

The preferred material for containers is high density polyethylene (HDPE). Pre-cleaned sample containers, coolers, sample labels, and a chain of custody form will be provided by the laboratory.

Equipment

Acceptable materials for sampling include stainless steel, HDPE, PVC, silicone, acetate, and polypropylene. Additional materials may be acceptable if pre-approved by New York State Department of Environmental Conservation's Division of Environmental Remediation.

No sampling equipment components or sample containers should come in to contact with aluminum foil, low density polyethylene, glass, or polytetrafluoroethylene (PTFE, Teflon™) materials including sample bottle cap liners with a PTFE layer.

A list of acceptable equipment is provided below, but other equipment may be considered appropriate based on sampling conditions.

- stainless steel spoon
- stainless steel bowl
- steel hand auger or shovel without any coatings

Equipment Decontamination

Standard two step decontamination using detergent (Alconox is acceptable) and clean, PFAS-free water will be performed for sampling equipment. All sources of water used for equipment decontamination should be verified in advance to be PFAS-free through laboratory analysis or certification.

Sampling Techniques

Sampling is often conducted in areas where a vegetative turf has been established. In these cases, a pre-cleaned trowel or shovel should be used to carefully remove the turf so that it may be replaced at the conclusion of sampling. Surface soil samples (e.g. 0 to 6 inches below surface) should then be collected using a pre-cleaned, stainless steel spoon. Shallow subsurface soil samples (e.g. 6 to ~36 inches below surface) may be collected by digging a hole using a pre-cleaned hand auger or shovel. When the desired subsurface depth is reached, a pre-cleaned hand auger or spoon shall be used to obtain the sample.

When the sample is obtained, it should be deposited into a stainless steel bowl for mixing prior to filling the sample containers. The soil should be placed directly into the bowl and mixed thoroughly by rolling the material into the middle until the material is homogenized. At this point the material within the bowl can be placed into the laboratory provided container.

Sample Identification and Logging

A label shall be attached to each sample container with a unique identification. Each sample shall be included on the chain of custody (COC).

Quality Assurance/Quality Control

- Immediately place samples in a cooler maintained at 4 ± 2º Celsius using ice
- Collect one field duplicate for every sample batch, minimum 1 duplicate per 20 samples. The duplicate shall consist of an additional sample at a given location
- Collect one matrix spike / matrix spike duplicate (MS/MSD) for every sample batch, minimum 1 MS/MSD per 20 samples. The MS/MSD shall consist of an additional two samples at a given location and identified on the COC
- Request appropriate data deliverable (Category B) and an electronic data deliverable

Documentation

A soil log or sample log shall document the location of the sample/borehole, depth of the sample, sampling equipment, duplicate sample, visual description of the material, and any other observations or notes determined to be appropriate. Additionally, care should be performed to limit contact with PFAS containing materials (e.g. waterproof field books, food packaging) during the sampling process.

Personal Protection Equipment (PPE)

For most sampling Level D PPE is anticipated to be appropriate. The sampler should wear nitrile gloves while conducting field work and handling sample containers.

Field staff shall consider the clothing to be worn during sampling activities. Clothing that contains PTFE material (including GORE-TEX®) or that have been waterproofed with PFAS materials should be avoided. All clothing worn by sampling personnel should have been laundered multiple times.

Appropriate rain gear (PVC, polyurethane, or rubber rain gear are acceptable), bug spray, and sunscreen should be used that does not contain PFAS. Well washed cotton coveralls may be used as an alternative to bug spray and/or sunscreen.

PPE that contains PFAS is acceptable when site conditions warrant additional protection for the samplers and no other materials can be used to be protective. Documentation of such use should be provided in the field notes.

Appendix C - Sampling Protocols for PFAS in Monitoring Wells

General

The objective of this protocol is to give general guidelines for the collection of groundwater samples for PFAS analysis. The sampling procedure used should be consistent with Sampling Guidelines and Protocols – Technological Background and Quality Control/Quality Assurance for NYS DEC Spill Response Program – March 1991 (http://www.dec.ny.gov/docs/remediation_hudson_pdf/sgpsect5.pdf), with the following limitations.

Laboratory Analysis and Container

Samples collected using this protocol are intended to be analyzed for PFAS using EPA Method 1633.

The preferred material for containers is high density polyethylene (HDPE). Pre-cleaned sample containers, coolers, sample labels, and a chain of custody form will be provided by the laboratory.

Equipment

Acceptable materials for sampling include: stainless steel, HDPE, PVC, silicone, acetate, and polypropylene. Additional materials may be acceptable if pre-approved by New York State Department of Environmental Conservation's Division of Environmental Remediation.

No sampling equipment components or sample containers should come in contact with aluminum foil, low density polyethylene, glass, or polytetrafluoroethylene (PTFE, Teflon™) materials including plumbers tape and sample bottle cap liners with a PTFE layer.

A list of acceptable equipment is provided below, but other equipment may be considered appropriate based on sampling conditions.

- stainless steel inertia pump with HDPE tubing
- peristaltic pump equipped with HDPE tubing and silicone tubing
- stainless steel bailer with stainless steel ball
- bladder pump (identified as PFAS-free) with HDPE tubing

Equipment Decontamination

Standard two step decontamination using detergent (Alconox is acceptable) and clean, PFAS-free water will be performed for sampling equipment. All sources of water used for equipment decontamination should be verified in advance to be PFAS-free through laboratory analysis or certification.

Sampling Techniques

Monitoring wells should be purged in accordance with the sampling procedure (standard/volume purge or low flow purge) identified in the site work plan, which will determine the appropriate time to collect the sample. If sampling using standard purge techniques, additional purging may be needed to reduce turbidity levels, so samples contain a limited amount of sediment within the sample containers. Sample containers that contain sediment may cause issues at the laboratory, which may result in elevated reporting limits and other issues during the sample preparation that can compromise data usability. Sampling personnel should don new nitrile gloves prior to sample collection due to the potential to contact PFAS containing items (not related to the sampling equipment) during the purging activities.

Sample Identification and Logging

A label shall be attached to each sample container with a unique identification. Each sample shall be included on the chain of custody (COC).

Quality Assurance/Quality Control

- Immediately place samples in a cooler maintained at 4 ± 2º Celsius using ice
- Collect one field duplicate for every sample batch, minimum 1 duplicate per 20 samples. The duplicate shall consist of an additional sample at a given location
- Collect one matrix spike / matrix spike duplicate (MS/MSD) for every sample batch, minimum 1 MS/MSD per 20 samples. The MS/MSD shall consist of an additional two samples at a given location and identified on the COC
- Collect one equipment blank per day per site and minimum 1 equipment blank per 20 samples. The equipment blank shall test the new and decontaminated sampling equipment utilized to obtain a sample for residual PFAS contamination. This sample is obtained by using laboratory provided PFAS-free water and passing the water over or through the sampling device and into laboratory provided sample containers
- Additional equipment blank samples may be collected to assess other equipment that is utilized at the monitoring well
- Request appropriate data deliverable (Category B) and an electronic data deliverable

Documentation

A purge log shall document the location of the sample, sampling equipment, groundwater parameters, duplicate sample, visual description of the material, and any other observations or notes determined to be appropriate. Additionally, care should be performed to limit contact with PFAS containing materials (e.g. waterproof field books, food packaging) during the sampling process.

Personal Protection Equipment (PPE)

For most sampling Level D PPE is anticipated to be appropriate. The sampler should wear nitrile gloves while conducting field work and handling sample containers.

Field staff shall consider the clothing to be worn during sampling activities. Clothing that contains PTFE material (including GORE-TEX®) or that have been waterproofed with PFAS materials should be avoided. All clothing worn by sampling personnel should have been laundered multiple times.

Appropriate rain gear (PVC, polyurethane, or rubber rain gear are acceptable), bug spray, and sunscreen should be used that does not contain PFAS. Well washed cotton coveralls may be used as an alternative to bug spray and/or sunscreen.

PPE that contains PFAS is acceptable when site conditions warrant additional protection for the samplers and no other materials can be used to be protective. Documentation of such use should be provided in the field notes.

Appendix D - Sampling Protocols for PFAS in Surface Water

General

The objective of this protocol is to give general guidelines for the collection of surface water samples for PFAS analysis. The sampling procedure used should be consistent with Sampling Guidelines and Protocols – Technological Background and Quality Control/Quality Assurance for NYS DEC Spill Response Program – March 1991 (http://www.dec.ny.gov/docs/remediation_hudson_pdf/sgpsect5.pdf), with the following limitations.

Laboratory Analysis and Container

Samples collected using this protocol are intended to be analyzed for PFAS using EPA Method 1633.

The preferred material for containers is high density polyethylene (HDPE). Pre-cleaned sample containers, coolers, sample labels, and a chain of custody form will be provided by the laboratory.

Equipment

Acceptable materials for sampling include: stainless steel, HDPE, PVC, silicone, acetate, and polypropylene. Additional materials may be acceptable if pre-approved by New York State Department of Environmental Conservation's Division of Environmental Remediation.

No sampling equipment components or sample containers should come in contact with aluminum foil, low density polyethylene, glass, or polytetrafluoroethylene (PTFE, Teflon™) materials including sample bottle cap liners with a PTFE layer.

A list of acceptable equipment is provided below, but other equipment may be considered appropriate based on sampling conditions.

- stainless steel cup

Equipment Decontamination

Standard two step decontamination using detergent (Alconox is acceptable) and clean, PFAS-free water will be performed for sampling equipment. All sources of water used for equipment decontamination should be verified in advance to be PFAS-free through laboratory analysis or certification.

Sampling Techniques

Where conditions permit, (e.g. creek or pond) sampling devices (e.g. stainless steel cup) should be rinsed with site medium to be sampled prior to collection of the sample. At this point the sample can be collected and poured into the sample container.

If site conditions permit, samples can be collected directly into the laboratory container.

Sample Identification and Logging

A label shall be attached to each sample container with a unique identification. Each sample shall be included on the chain of custody (COC).

Quality Assurance/Quality Control

- Immediately place samples in a cooler maintained at 4 ± 2º Celsius using ice
- Collect one field duplicate for every sample batch, minimum 1 duplicate per 20 samples. The duplicate shall consist of an additional sample at a given location
- Collect one matrix spike / matrix spike duplicate (MS/MSD) for every sample batch, minimum 1 MS/MSD per 20 samples. The MS/MSD shall consist of an additional two samples at a given location and identified on the COC
- Collect one equipment blank per day per site and minimum 1 equipment blank per 20 samples. The equipment blank shall test the new and decontaminated sampling equipment utilized to obtain a sample for residual PFAS contamination. This sample is obtained by using laboratory provided PFAS-free water and passing the water over or through the sampling device and into laboratory provided sample containers
- Request appropriate data deliverable (Category B) and an electronic data deliverable

Documentation

A sample log shall document the location of the sample, sampling equipment, duplicate sample, visual description of the material, and any other observations or notes determined to be appropriate. Additionally, care should be performed to limit contact with PFAS containing materials (e.g. waterproof field books, food packaging) during the sampling process.

Personal Protection Equipment (PPE)

For most sampling Level D PPE is anticipated to be appropriate. The sampler should wear nitrile gloves while conducting field work and handling sample containers.

Field staff shall consider the clothing to be worn during sampling activities. Clothing that contains PTFE material (including GORE-TEX®) or that have been waterproofed with PFAS materials should be avoided. All clothing worn by sampling personnel should have been laundered multiple times.

Appropriate rain gear (PVC, polyurethane, or rubber rain gear are acceptable), bug spray, and sunscreen should be used that does not contain PFAS. Well washed cotton coveralls may be used as an alternative to bug spray and/or sunscreen.

PPE that contains PFAS is acceptable when site conditions warrant additional protection for the samplers and no other materials can be used to be protective. Documentation of such use should be provided in the field notes.

Appendix E - Sampling Protocols for PFAS in Private Water Supply Wells

General

The objective of this protocol is to give general guidelines for the collection of water samples from private water supply wells (with a functioning pump) for PFAS analysis. The sampling procedure used should be consistent with Sampling Guidelines and Protocols – Technological Background and Quality Control/Quality Assurance for NYS DEC Spill Response Program – March 1991 (http://www.dec.ny.gov/docs/remediation_hudson_pdf/sgpsect5.pdf), with the following limitations.

Laboratory Analysis and Container

Drinking water samples collected using this protocol are intended to be analyzed for PFAS by EPA Method 537, 537.1, 533, or ISO Method 25101. The preferred material for containers is high density polyethylene (HDPE). Pre-cleaned sample containers, coolers, sample labels, and a chain of custody form will be provided by the laboratory.

Equipment

Acceptable materials for sampling include stainless steel, HDPE, PVC, silicone, acetate, and polypropylene. Additional materials may be acceptable if pre-approved by New York State Department of Environmental Conservation's Division of Environmental Remediation.

No sampling equipment components or sample containers should come in contact with aluminum foil, low density polyethylene, glass, or polytetrafluoroethylene (PTFE, Teflon™) materials (e.g. plumbers tape), including sample bottle cap liners with a PTFE layer.

Equipment Decontamination

Standard two step decontamination using detergent (Alconox is acceptable) and clean, PFAS-free water will be performed for sampling equipment. All sources of water used for equipment decontamination should be verified in advance to be PFAS-free through laboratory analysis or certification.

Sampling Techniques

Locate and assess the pressure tank and determine if any filter units are present within the building. Establish the sample location as close to the well pump as possible, which is typically the spigot at the pressure tank. Ensure sampling equipment is kept clean during sampling as access to the pressure tank spigot, which is likely located close to the ground, may be obstructed and may hinder sample collection.

Prior to sampling, a faucet downstream of the pressure tank (e.g., washroom sink) should be run until the well pump comes on and a decrease in water temperature is noted which indicates that the water is coming from the well. If the homeowner is amenable, staff should run the water longer to purge the well (15+ minutes) to provide a sample representative of the water in the formation rather than standing water in the well and piping system including the pressure tank. At this point a new pair of nitrile gloves should be donned and the sample can be collected from the sample point at the pressure tank.

Sample Identification and Logging

A label shall be attached to each sample container with a unique identification. Each sample shall be included on the chain of custody (COC).

Quality Assurance/Quality Control

- Immediately place samples in a cooler maintained at 4 ± 2º Celsius using ice
- Collect one field duplicate for every sample batch, minimum 1 duplicate per 20 samples. The duplicate shall consist of an additional sample at a given location
- Collect one matrix spike / matrix spike duplicate (MS/MSD) for every sample batch, minimum 1 MS/MSD per 20 samples. The MS/MSD shall consist of an additional two samples at a given location and identified on the COC
- If equipment was used, collect one equipment blank per day per site and a minimum 1 equipment blank per 20 samples. The equipment blank shall test the new and decontaminated sampling equipment utilized to obtain a sample for residual PFAS contamination. This sample is obtained by using laboratory provided PFAS-free water and passing the water over or through the sampling device and into laboratory provided sample containers.
- A field reagent blank (FRB) should be collected at a rate of one per 20 samples. The lab will provide a FRB bottle containing PFAS free water and one empty FRB bottle. In the field, pour the water from the one bottle into the empty FRB bottle and label appropriately.
- Request appropriate data deliverable (Category B) and an electronic data deliverable
- For sampling events where multiple private wells (homes or sites) are to be sampled per day, it is acceptable to collect QC samples at a rate of one per 20 across multiple sites or days.

Documentation

A sample log shall document the location of the private well, sample point location, owner contact information, sampling equipment, purge duration, duplicate sample, visual description of the material, and any other observations or notes determined to be appropriate and available (e.g. well construction, pump type and location, yield, installation date). Additionally, care should be performed to limit contact with PFAS containing materials (e.g. waterproof field books, food packaging) during the sampling process.

Personal Protection Equipment (PPE)

For most sampling Level D PPE is anticipated to be appropriate. The sampler should wear nitrile gloves while conducting field work and handling sample containers.

Field staff shall consider the clothing to be worn during sampling activities. Clothing that contains PTFE material (including GORE-TEX®) or that have been waterproofed with PFAS materials should be avoided. All clothing worn by sampling personnel should have been laundered multiple times.

Appendix F - Sampling Protocols for PFAS in Fish

This appendix contains a copy of the latest guidelines developed by the Division of Fish and Wildlife (DFW) entitled "General Fish Handling Procedures for Contaminant Analysis" (Ver. 8).

Procedure Name: General Fish Handling Procedures for Contaminant Analysis

Number: FW-005

Purpose: This procedure describes data collection, fish processing and delivery of fish collected for contaminant monitoring. It contains the chain of custody and collection record forms that should be used for the collections.

Organization: Environmental Monitoring Section
Bureau of Ecosystem Health
Division of Fish and Wildlife (DFW)
New York State Department of Environmental Conservation (NYSDEC)
625 Broadway
Albany, New York 12233-4756

Version: 8

Previous Version Date: 21 March 2018

Summary of Changes to this Version: Updated bureau name to Bureau of Ecosystem Health. Added direction to list the names of all field crew on the collection record. Minor formatting changes on chain of custody and collection records.

Originator or Revised by: Wayne Richter, Jesse Becker

Date: 26 April 2019

Quality Assurance Officer and Approval Date: Jesse Becker, 26 April 2019

Appendix G – PFAS Analyte List

Group	Chemical Name	Abbreviation	CAS Number
Perfluoroalkyl sulfonic acids	Perfluorobutanesulfonic acid	PFBS	375-73-5
	Perfluoropentanesulfonic acid	PFPeS	2706-91-4
	Perfluorohexanesulfonic acid	PFHxS	355-46-4
	Perfluoroheptanesulfonic acid	PFHpS	375-92-8
	Perfluorooctanesulfonic acid	PFOS	1763-23-1
	Perfluorononanesulfonic acid	PFNS	68259-12-1
	Perfluorodecanesulfonic acid	PFDS	335-77-3
	Perfluorododecanesulfonic acid	PFDoS	79780-39-5
Perfluoroalkyl carboxylic acids	Perfluorobutanoic acid	PFBA	375-22-4
	Perfluoropentanoic acid	PFPeA	2706-90-3
	Perfluorohexanoic acid	PFHxA	307-24-4
	Perfluoroheptanoic acid	PFHpA	375-85-9
	Perfluorooctanoic acid	PFOA	335-67-1
	Perfluorononanoic acid	PFNA	375-95-1
	Perfluorodecanoic acid	PFDA	335-76-2
	Perfluoroundecanoic acid	PFUnA	2058-94-8
	Perfluorododecanoic acid	PFDoA	307-55-1
	Perfluorotridecanoic acid	PFTrDA	72629-94-8
	Perfluorotetradecanoic acid	PFTeDA	376-06-7
Per- and Polyfluoroether carboxylic acids	Hexafluoropropylene oxide dimer acid	HFPO-DA	13252-13-6
	4,8-Dioxa-3H-perfluorononanoic acid	ADONA	919005-14-4
	Perfluoro-3-methoxypropanoic acid	PFMPA	377-73-1
	Perfluoro-4-methoxybutanoic acid	PFMBA	863090-89-5
	Nonafluoro-3,6-dioxaheptanoic acid	NFDHA	151772-58-6
Fluorotelomer sulfonic acids	4:2 Fluorotelomer sulfonic acid	4:2-FTS	757124-72-4
	6:2 Fluorotelomer sulfonic acid	6:2-FTS	27619-97-2
	8:2 Fluorotelomer sulfonic acid	8:2-FTS	39108-34-4
Fluorotelomer carboxylic acids	3:3 Fluorotelomer carboxylic acid	3:3 FTCA	356-02-5
	5:3 Fluorotelomer carboxylic acid	5:3 FTCA	914637-49-3
	7:3 Fluorotelomer carboxylic acid	7:3 FTCA	812-70-4
Perfluorooctane sulfonamides	Perfluorooctane sulfonamide	PFOSA	754-91-6
	N-methylperfluorooctane sulfonamide	NMeFOSA	31506-32-8
	N-ethylperfluorooctane sulfonamide	NEtFOSA	4151-50-2
Perfluorooctane sulfonamidoacetic acids	N-methylperfluorooctane sulfonamidoacetic acid	N-MeFOSAA	2355-31-9
	N-ethylperfluorooctane sulfonamidoacetic acid	N-EtFOSAA	2991-50-6
Perfluorooctane sulfonamide ethanols	N-methylperfluorooctane sulfonamidoethanol	MeFOSE	24448-09-7
	N-ethylperfluorooctane sulfonamidoethanol	EtFOSE	1691-99-2

Group	Chemical Name	Abbreviation	CAS Number
Ether sulfonic acids	9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (F-53B Major)	9Cl-PF3ONS	756426-58-1
	11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor)	11Cl-PF3OUdS	763051-92-9
	Perfluoro(2-ethoxyethane) sulfonic acid	PFEESA	113507-82-7

Appendix H - Data Review Guidelines for Analysis of PFAS in Non-Potable Water and Solids

General

These guidelines are intended to be used for the validation of PFAS using EPA Method 1633 for projects within the Division of Environmental Remediation (DER). Data reviewers should understand the methodology and techniques utilized in the analysis. Consultation with the end user of the data may be necessary to assist in determining data usability based on the data quality objectives in the Quality Assurance Project Plan. A familiarity with the laboratory's Standard Operating Procedure may also be needed to fully evaluate the data. If you have any questions, please contact DER's Quality Assurance Officer, Dana Barbarossa, at dana.barbarossa@dec.ny.gov.

Preservation and Holding Time

Samples should be preserved with ice to a temperature of less than 6°C upon arrival at the lab. The holding time is 28 days to extraction for aqueous and solid samples. The time from extraction to analysis for aqueous samples is 28 days and 40 days for solids.

Temperature greatly exceeds 6ºC upon arrival at the lab*	Use professional judgement to qualify detects and non-detects as estimated or rejected
Holding time exceeding 28 days to extraction	Use professional judgement to qualify detects and non-detects as estimated or rejected if holding time is grossly exceeded

*Samples that are delivered to the lab immediately after sampling may not meet the thermal preservation guidelines. Samples are considered acceptable if they arrive on ice or an attempt to chill the samples is observed.

Initial Calibration

The initial calibration should contain a minimum of six standards for linear fit and six standards for a quadratic fit. The relative standard deviation (RSD) for a quadratic fit calibration should be less than 20%.

The low-level calibration standard should be within 50% - 150% of the true value, and the mid-level calibration standard within 70% - 130% of the true value.

%RSD >20%	J flag detects and UJ non detects

Continuing Calibration Verification

Continuing calibration verification (CCV) checks should be analyzed at a frequency of one per ten field samples. If CCV recovery is very low, where detection of the analyte could be in question, ensure a low level CCV was analyzed and use to determine data quality.

CCV recovery <70 or >130%	J flag results

Blanks

There should be no detections in the method blanks above the reporting limits. Equipment blanks, field blanks, rinse blanks etc. should be evaluated in the same manner as method blanks. Use the most contaminated blank to evaluate the sample results.

Blank Result	Sample Result	Qualification
Any detection	<Reporting limit	Qualify as ND at reporting limit
Any detection	>Reporting Limit and >10x the blank result	No qualification
>Reporting limit	>Reporting limit and <10x blank result	J+ biased high

Field Duplicates

A blind field duplicate should be collected at rate of one per twenty samples. The relative percent difference (RPD) should be less than 30% for analyte concentrations greater than two times the reporting limit. Use the higher result for final reporting.

RPD >30%	Apply J qualifier to parent sample

Lab Control Spike

Lab control spikes should be analyzed with each extraction batch or one for every twenty samples. In the absence of lab derived criteria, use 70% - 130% recovery criteria to evaluate the data.

Recovery <70% or >130% (lab derived criteria can also be used)	Apply J qualifier to detects and UJ qualifier to non detects

Matrix Spike/Matrix Spike Duplicate

One matrix spike and matrix spike duplicate should be collected at a rate of one per twenty samples. Use professional judgement to reject results based on out of control MS/MSD recoveries.

Recovery <70% or >130% (lab derived criteria can also be used)	Apply J qualifier to detects and UJ qualifier to non detects of parent sample only
RPD >30%	Apply J qualifier to detects and UJ qualifier to non detects of parent sample only

Extracted Internal Standards (Isotope Dilution Analytes)

Problematic analytes (e.g. PFBA, PFPeA, fluorotelomer sulfonates) can have wider recoveries without qualification. Qualify corresponding native compounds with a J flag if outside of the range.

Recovery <50% or >150%	Apply J qualifier
Recovery <25% or >150% for poor responding analytes	Apply J qualifier
Isotope Dilution Analyte (IDA) Recovery <10%	Reject results

Signal to Noise Ratio

The signal to noise ratio for the quantifier ion should be at least 3:1. If the ratio is less than 3:1, the peak is discernable from the baseline noise and symmetrical, the result can be reported. If the peak appears to be baseline noise and/or the shape is irregular, qualify the result as tentatively identified.

Reporting Limits

If project-specific reporting limits were not met, please indicate that in the report along with the reason (e.g. over dilution, dilution for non-target analytes, high sediment in aqueous samples).

Peak Integrations

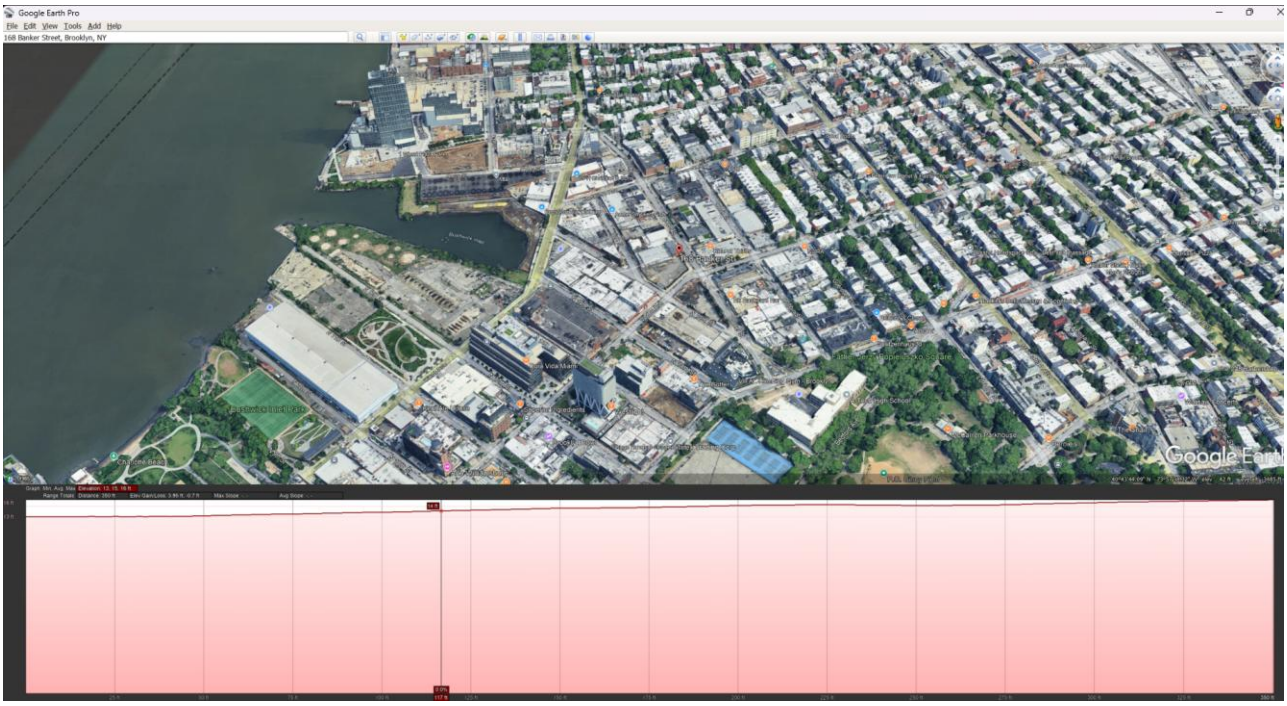
Target analyte peaks should be integrated properly and consistently when compared to standards. Ensure branched isomer peaks are included for PFAS where standards are available. Inconsistencies should be brought to the attention of the laboratory or identified in the data review summary report.

APPENDIX D
Climate Screening Checklist

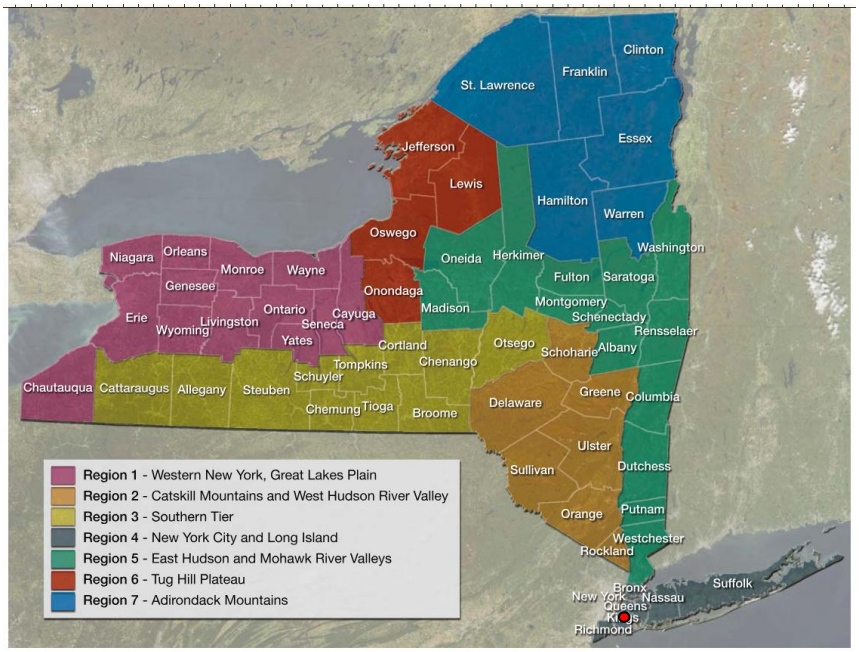
Climate Screening Checklist

Background Information

- Project Manager: Zachary P. Simmel
- Site Name: Proposed Former Corzo Maintenance Site
- Site Number: C224442
- Site Location: 168 Banker Street, Brooklyn, New York
- Site Elevation (average above sea level): Approximately 12 feet (ft) above sea level (Google Earth)



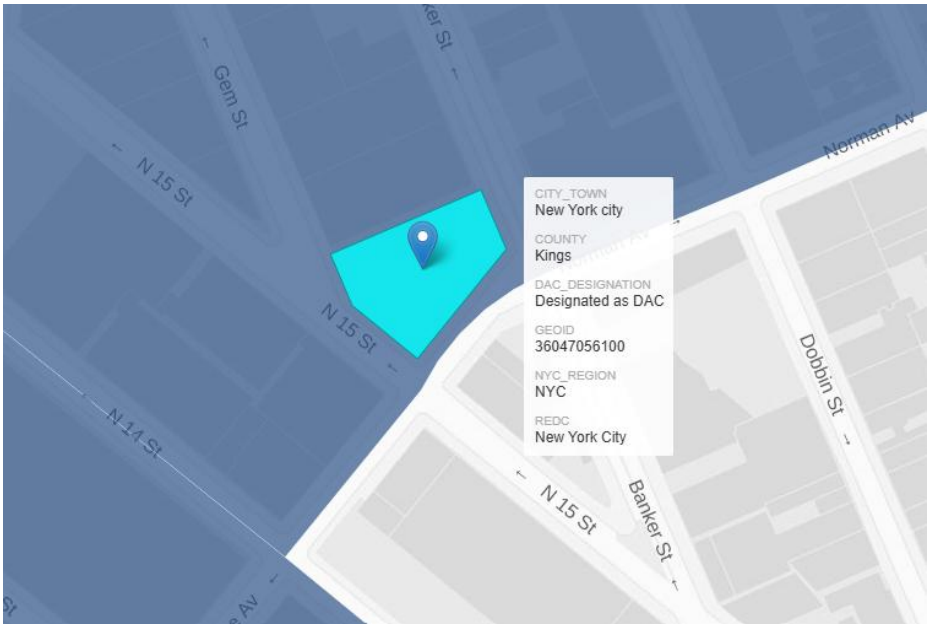
- ClimAID Region (Responding Climate Change in New York State (ClimAID) - NYSERDA): Region 4 – New York City and Long Island



- Remedial Stage/Site Classification: Remedial Investigation
- Contamination - Media Impacted/ Contaminants of Concern: Soil – metals, semi-volatile organic compounds (SVOCs), volatile organic compounds (VOCs); groundwater – VOCs, SVOCs, and metals; and soil vapor – VOCs (chlorinated VOCs [CVOCs]).
- Proposed/Current Remedy: Investigation/Design Phase
- What is the predicted timeframe of the remedy? Will components of the remedy still be in place in 10+ years? Remedy is anticipated to be completed in approximately two years. If required, engineering controls will remain in place and be maintained or replaced as needed for the duration of the requirement under future Site management.
- Is the site in proximity to any sensitive receptors? (e.g., wetlands, waterbodies, residential properties, hospitals, schools, drinking water supplies, etc.) There are no sensitive receptors within a 500-ft radius of the Site.

Is the site in a disadvantaged community (DAC) or potential environmental justice area (PEJA) (Use DECinfolocator: DECinfo Locator (ny.gov))?

X Yes ☐ No



If the site is in a DAC or PEJA, will climate impacts be magnified? If yes, list how and why.

☐**Yes X No**

Should thresholds of concern be lowered to account for magnification of impacts? If yes, indicate how lower thresholds will be used in the screening.

☐**Yes X No**

Climate Screening Table*

Potential Climate Hazards	**Relevant to the Site Location** (Y/N/NA)[1]	**Projected Change** (Resilience Analysis and Planning Tool [RAPT]/arcgis.com)[3]	**Potential to Impact Remedy** (Y/N)	**Is remedy/site already resilient?** (Y/N)[4]
Precipitation	Potentially	N/A	N/A	N/A
Temperature[2] (Extreme Heat or Cold Weather Impacts)	Y	Y	Y	Future remedy will evaluate
Sea Level Rise	N	N/A	N/A	N/A
Flooding	N	N/A	N/A	N/A
Storm Surge	N	N/A	N/A	N/A
Wildfire	N	N/A	N/A	N/A
Drought	N	N/A	N/A	N/A
Storm Severity	Y	Y	Y	Future remedy will evaluate
Landslides	N	N/A	N/A	N/A
Other Hazards:	N/A	N/A	N/A	N/A

* Links to potential data sources can be found on the following page

[1] If the first column is N --> The rest of the columns will be N/A, the hazard is not applicable to the site.

[2] Extreme Heat: periods of three or more days above 90°F- Extreme Cold: Individual days with minimum temperatures at or below 0 degrees F (NYSERDA ClimAID report)

[3] List the projected change in specific terms or units, e.g., inches of rainfall, feet of sea level rise, etc.

[4] If final column is Y, provide reasoning; if the final column is N --> Climate Vulnerability Assessment (CVA) required.

Required Next Steps (If no further action is required, provide justification):

Upon development of the future remedy, more robust analysis of elements needed to aid in resiliency planning for the redevelopment will be incorporated into a Climate Vulnerability assessment.

Potential Data Sources (not an exhaustive list)- from Superfund Climate Resilience: Vulnerability Assessment | US EPA

NYSERDA ClimAID report- Responding Climate Change in New York State (ClimAID) - NYSERDA

FEMA- National Flood Hazard Layer | FEMA.gov

NOAA- National Storm Surge Risk Maps - Version 3 (noaa.gov)

Department of Agriculture Forest Service Wildfire Risk to Communities

EPA Climate Change Indicators in the United States

EPA Climate Resilience Evaluation & Awareness Tool (CREAT) | U.S. Climate Resilience Toolkit

EPA National Stormwater Calculator

National Integrated Drought Information System U.S. Drought Portal

National Interagency Coordination Center National Interagency Fire Center

National Oceanic and Atmospheric Administration Coastal Services Digital Coast

- Resources to help communities assess coastal hazards, such as the Sea Level Rise Viewer for visualizing community-level impacts of flooding or sea level rise and downloadable LIDAR data

National Oceanic and Atmospheric Administration National Centers for Environmental Information website

National Oceanic and Atmospheric Administration Sea Level Trends

National Weather Service Climate Prediction Center

National Weather Service National Hurricane Center

National Weather Service Sea, Lake, and Overland Surges from Hurricanes (SLOSH)

National Weather Service Storm Surge Hazard Maps

U.S. Federal Government Climate Resilience Toolkit: The Climate Explorer

U.S. Army Corps of Engineers Climate Preparedness and Resilience

U.S. Geological Survey Coastal Change Hazards Portal

U.S. Geological Survey Landslide Hazards Program

U.S. Geological Survey National Ground-water Monitoring Network Data Portal

U.S. Geological Survey National Climate Change Viewer

U.S. Geological Survey National Water Dashboard

U.S. Geological Survey StreamStats

NYS Department of State- Assess | Department of State (ny.gov)

NYSERDA NY Costal Floodplain Mapper- Home Page (ny.gov)

NYSDEC Coastal Erosion Hazards- Coastal Areas Regulated By The CEHA Permit Program - NYDEC

NYSDOH Heat Index- health.ny.gov/environmental/weather/vulnerability_index/county_maps.htm

APPENDIX E
Green and Sustainable Remediation Documentation

H & A OF NEW YORK ENGINEERING
AND GEOLOGY, LLP
213 W. 35th Street
7th Floor
New York, NY 10001
646.277.5685

August 14, 2026
File No. 0211545

New York State Department of Environmental Conservation
Division of Environmental Remediation, Region 2
47-40 21st Street
Long Island City, New York 11101

Attention: Robert Strang

Subject: Green Site Remediation
Former Corzo Maintenance Site
NYSDEC Site No. C224442
168 Banker Street
Brooklyn, New York

H & A of New York Engineering and Geology, LLP (Haley & Aldrich of New York) presents the following environmental footprint analysis[1] in accordance with U.S. Environmental Protection Agency (EPA) 542-R-12-002 for the remedial investigation associated with the Former Corzo Maintenance Site at 168 Banker Street, Brooklyn, New York (Site).

PROPOSED FORMER CORZO MAINTENANCE SITE – TOTALS

The estimated totals for all components of the installation and operation of the remedy are:

- 64.8 Metric Million British Thermal Units (MMBtus) of energy used;
- 4.7 tons of total greenhouse gas emissions (CO2e [includes consideration of carbon dioxide, methane, and nitrous oxide emissions]);
- 220.2 pounds (lbs) of nitrogen oxides (NOx) + sulfur oxides (SOx) + particulate matter (PM) emissions; and,
- 12.6 lbs of hazardous air pollutant (HAP) emissions.

Energy

- 6.21 MMBtus used for on-Site activities, such as excavation, drilling, and the use of air handlers to create a negative pressure enclosure.
- 0.04 MMBtus used for grid electricity generation.
- 30 MMBtus used for transportation of personnel, remedy materials, and waste disposal.

[1] *Spreadsheets for Environmental Footprint Analysis (SEFA) Version 3.0, November 2019.*

- 28.2 MMBtus used for off-Site activities.

Greenhouse Gas Emissions (CO2e)

- 0.5 tons of CO2e will be produced from on-Site activities, such as excavation and drilling.
- 0.00 tons of CO2e will be produced from grid electricity generation.
- 2.4 tons of CO2e will be produced from the transportation of personnel, remedy materials, and waste disposal.
- 1.7 tons will be produced from off-Site activities.

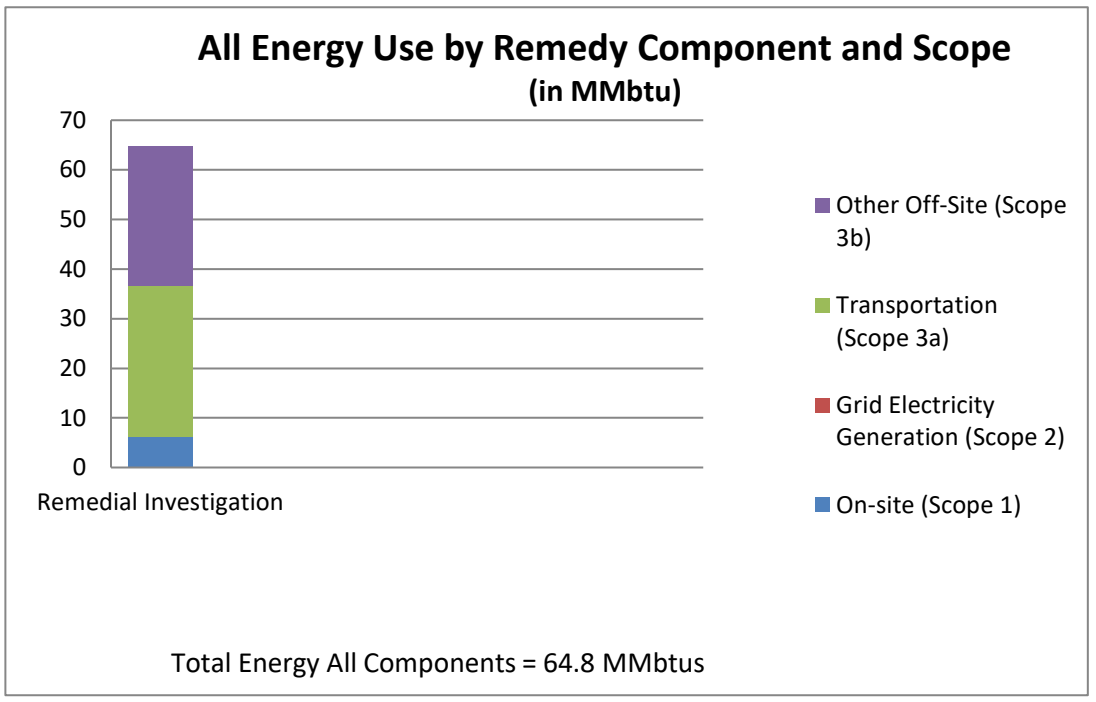
The majority of the remedial investigation footprint, including both energy use and CO2e generation, is from the off-Site activities. The on-Site activities are the smallest scope within the footprint and are primarily the result of drilling activities. Overall, the estimated footprint of the Site investigation is dominated by off-Site activities as well as transportation. Off-Site energy use is estimated to comprise 43.5 percent of all energy use, and off-Site greenhouse gas emissions are expected to comprise 36.8 percent of all emissions for the remedial investigation.

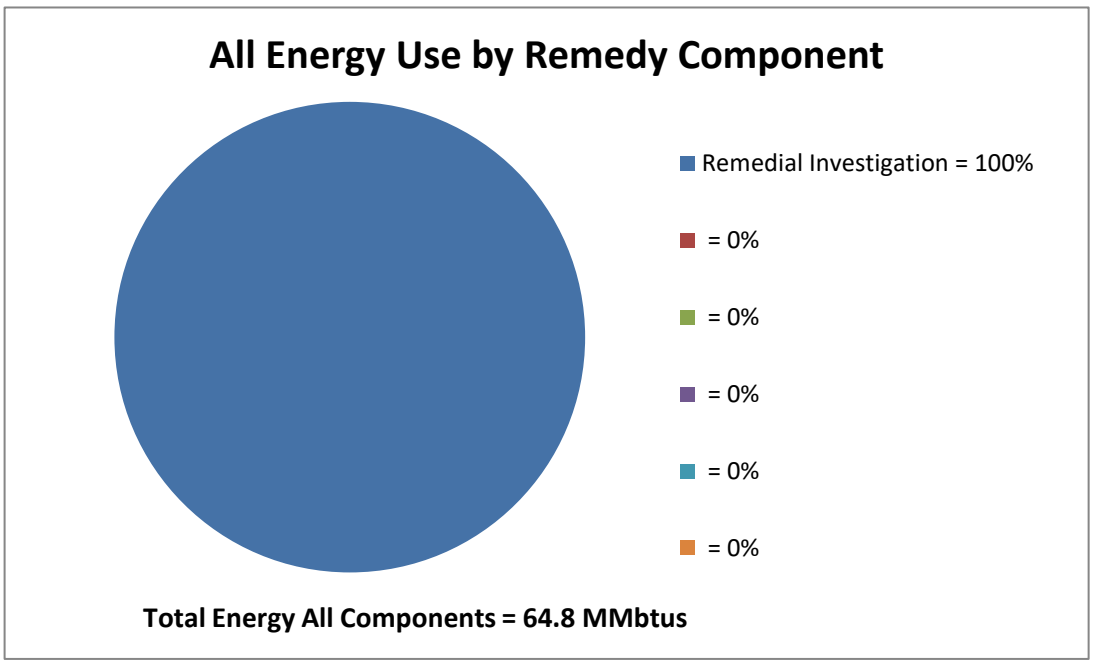
Sincerely yours,
H & A OF NEW YORK ENGINEERING AND GEOLOGY, LLP

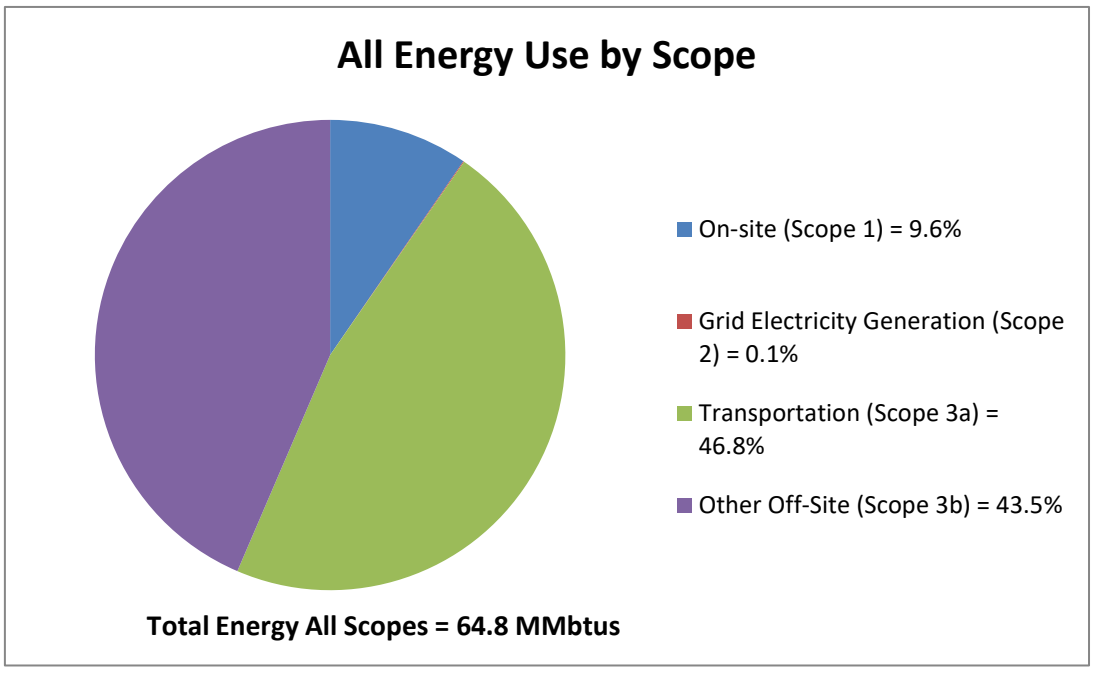
Zachary P. Simmel
Project Manager

James M. Bellew
Principal

\\haleyaldrich.com\share\CF\Projects\0211545\Deliverables\3. RIWP\Appendices\Appendix E- Green Sustainable Remediation Documentation\1. SEFA Summary Letter_FINAL.docx


All Energy Use by Remedy Component and Scope
(in MMbtu)
70
60
50
40
30
20
10
0
Remedial Investigation
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
Total Energy All Components = 64.8 MMbtus


All Energy Use by Remedy Component
Remedial Investigation = 100%
= 0%
= 0%
= 0%
= 0%
= 0%
Total Energy All Components = 64.8 MMbtus

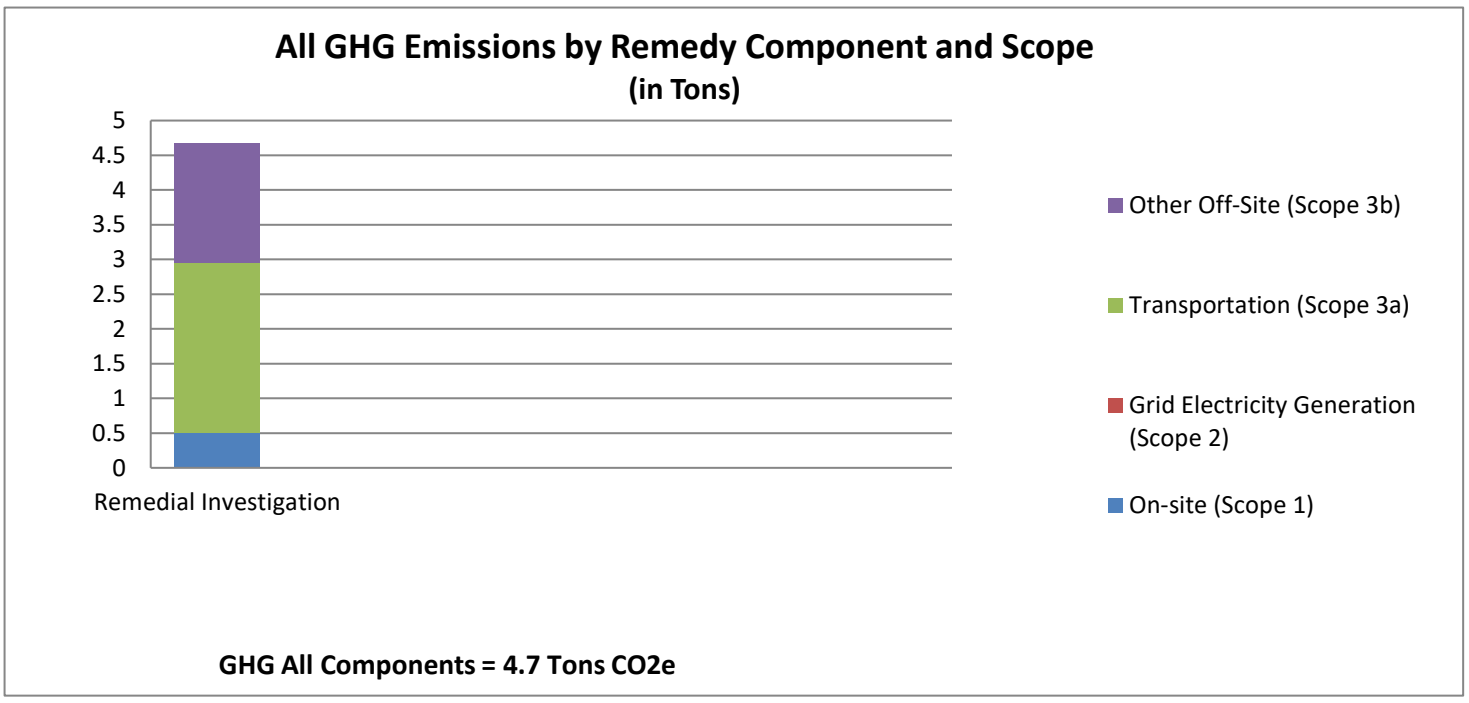

All Energy Use by Scope
On-site (Scope 1) = 9.6%
Grid Electricity Generation (Scope 2) = 0.1%
Transportation (Scope 3a) = 46.8%
Other Off-Site (Scope 3b) = 43.5%
Total Energy All Scopes = 64.8 MMbtus

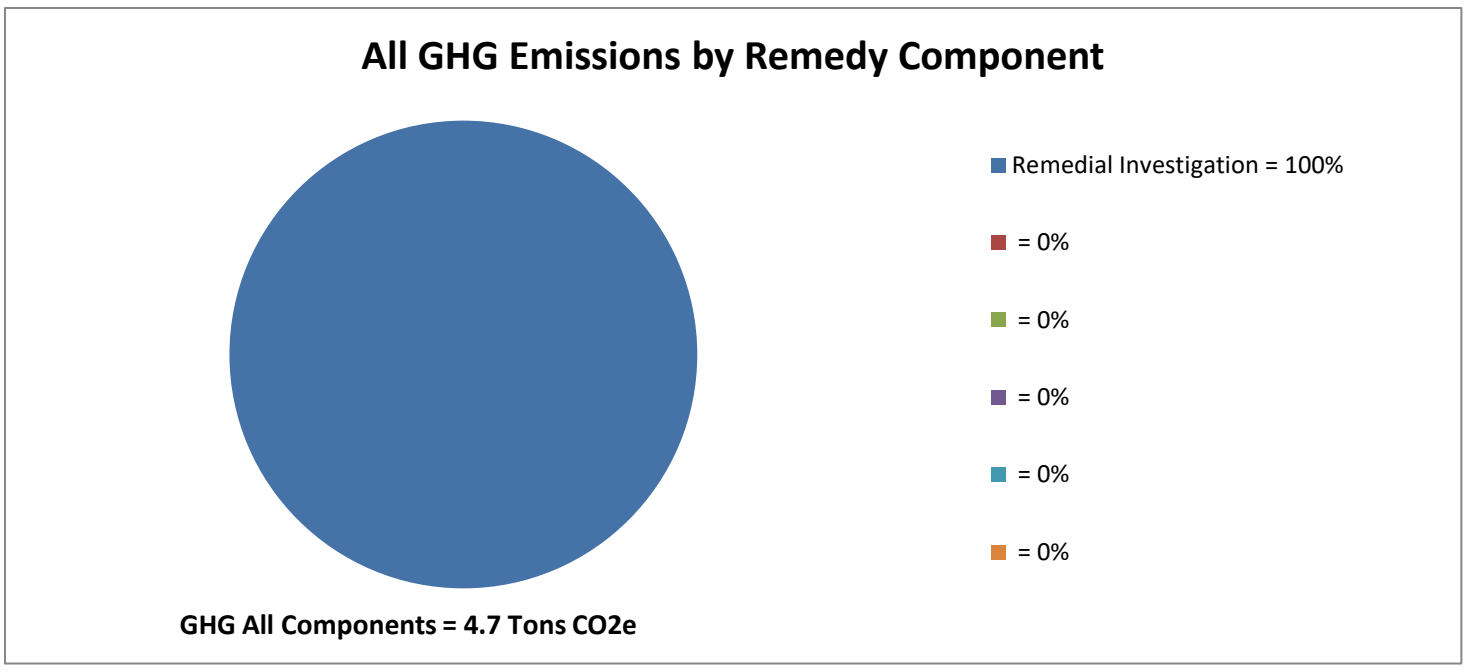
Total Energy MMbtus	Remedial Investigation						Total
On-site (Scope 1)	6.2	0.0	0.0	0.0	0.0	0.0	6.2
rid Electricity Generation (Scope 2)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Transportation (Scope 3a)	30.3	0.0	0.0	0.0	0.0	0.0	30.3
Other Off-Site (Scope 3b)	28.2	0.0	0.0	0.0	0.0	0.0	28.2
Total	64.8	0.0	0.0	0.0	0.0	0.0	64.8

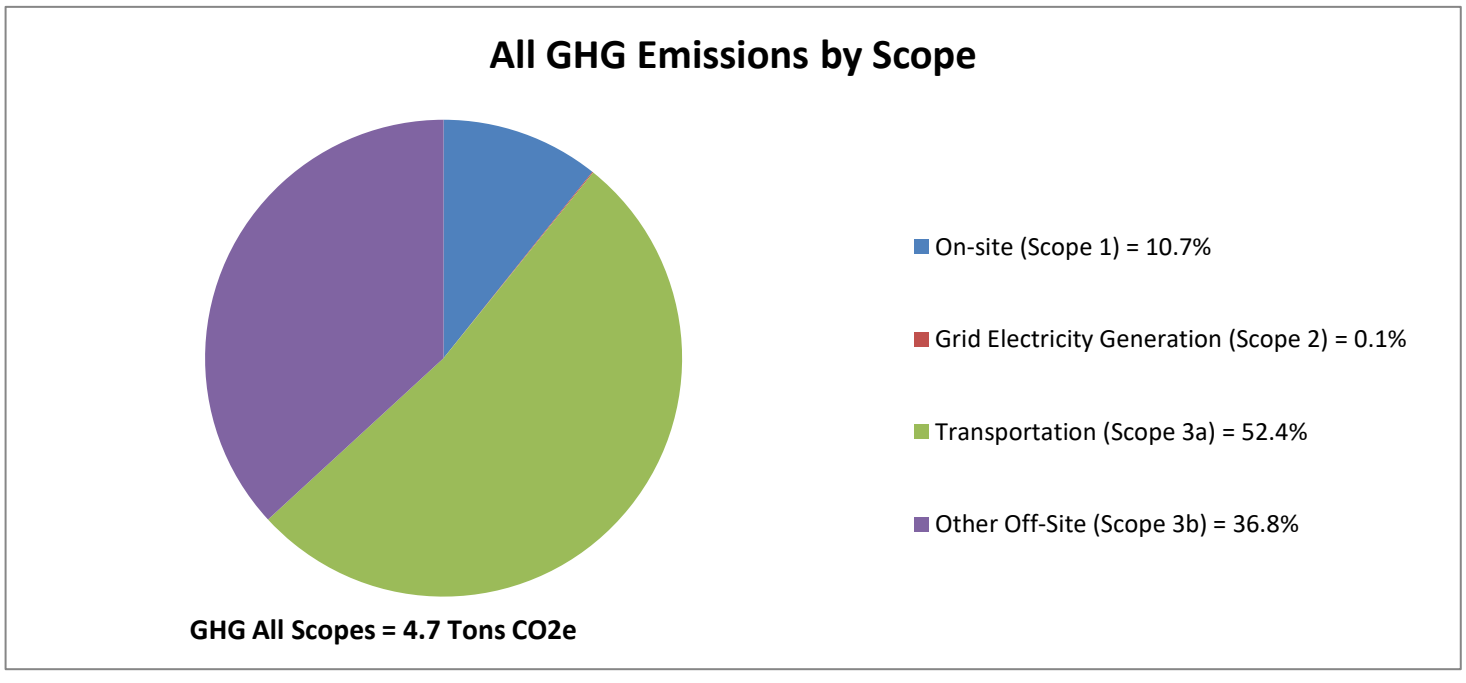
Remedial Investigation = 100%
= 0%
= 0%
= 0%
= 0%
= 0%

On-site (Scope 1) = 9.6%
Grid Electricity Generation (Scope 2) = 0.1%
Transportation (Scope 3a) = 46.8%
Other Off-Site (Scope 3b) = 43.5%

Total Energy All Components = 64.8 MMbtus
Total Energy All Scopes = 64.8 MMbtus


All GHG Emissions by Remedy Component and Scope
(in Tons)
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
Remedial Investigation
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
GHG All Components = 4.7 Tons CO2e


All GHG Emissions by Remedy Component
Remedial Investigation = 100%
= 0%
= 0%
= 0%
= 0%
= 0%
GHG All Components = 4.7 Tons CO2e

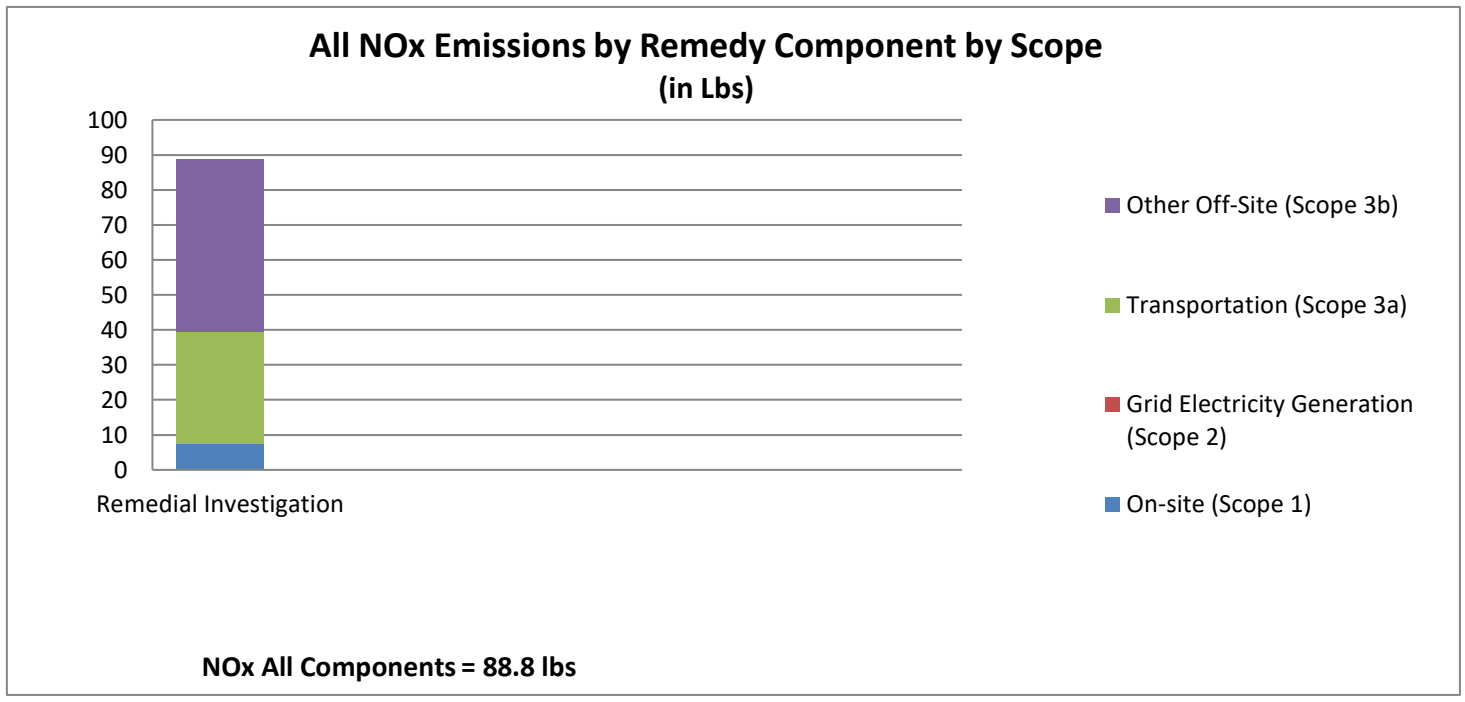

All GHG Emissions by Scope
On-site (Scope 1) = 10.7%
Grid Electricity Generation (Scope 2) = 0.1%
Transportation (Scope 3a) = 52.4%
Other Off-Site (Scope 3b) = 36.8%
GHG All Scopes = 4.7 Tons CO2e

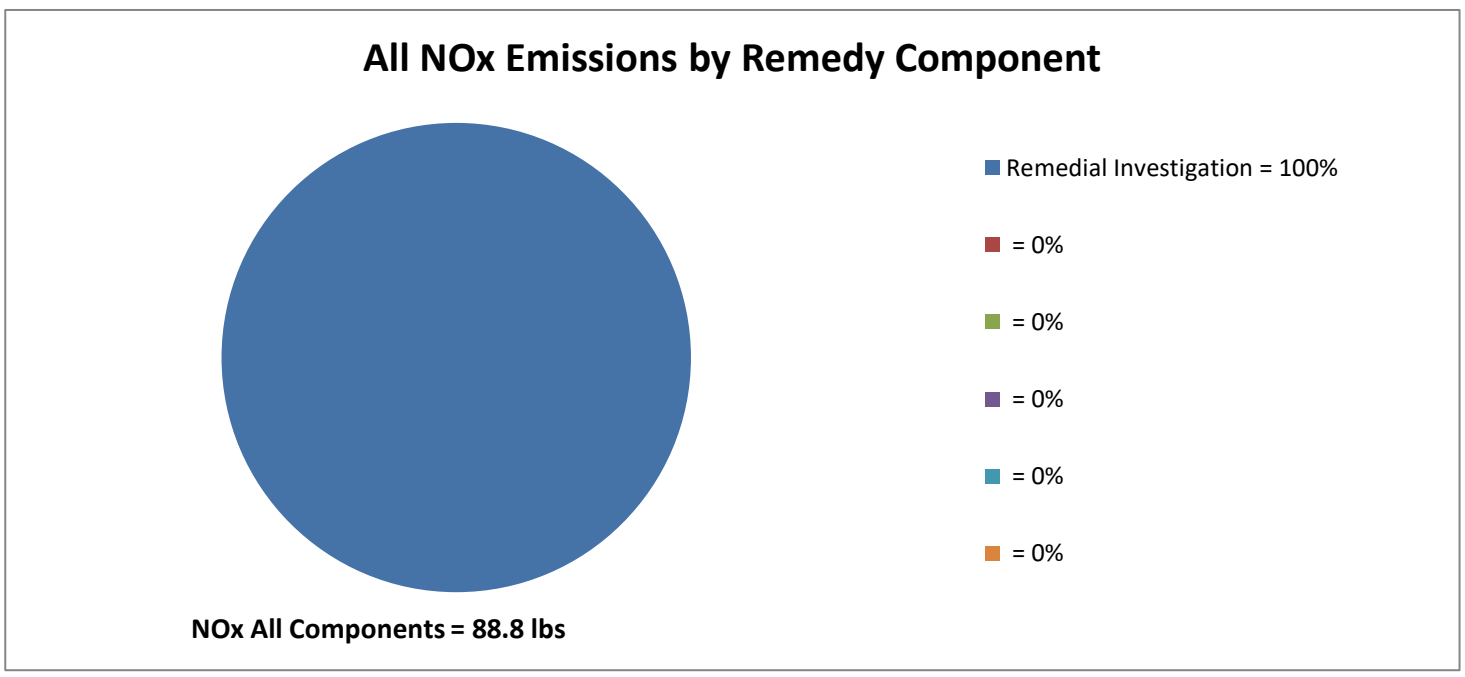
GHG Tons CO2e	Remedial Investigation						Total
On-site (Scope 1)	0.5	0.0	0.0	0.0	0.0	0.0	0.5
Grid Electricity Generation (Scope 2)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Transportation (Scope 3a)	2.4	0.0	0.0	0.0	0.0	0.0	2.4
Other Off-Site (Scope 3b)	1.7	0.0	0.0	0.0	0.0	0.0	1.7
Total	4.7	0.0	0.0	0.0	0.0	0.0	4.7

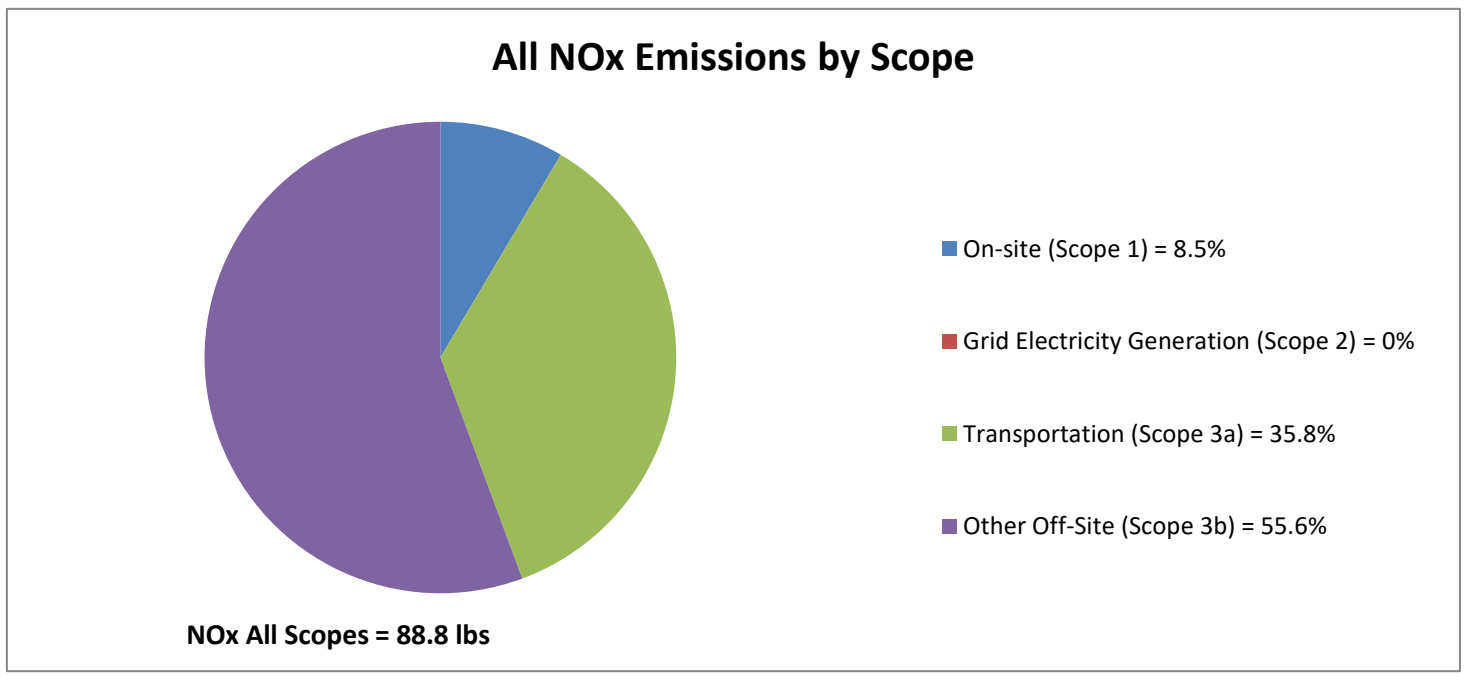
Remedial Investigation = 100%
= 0%
= 0%
= 0%
= 0%
= 0%

On-site (Scope 1) = 10.7%
Grid Electricity Generation (Scope 2) = 0.1%
Transportation (Scope 3a) = 52.4%
Other Off-Site (Scope 3b) = 36.8%

GHG All Components = 4.7 Tons CO2e
GHG All Scopes = 4.7 Tons CO2e


All NOx Emissions by Remedy Component by Scope
(in Lbs)
100
90
80
70
60
50
40
30
20
10
0
Remedial Investigation
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
NOx All Components = 88.8 lbs


All NOx Emissions by Remedy Component
Remedial Investigation = 100%
= 0%
= 0%
= 0%
= 0%
= 0%
NOx All Components = 88.8 lbs

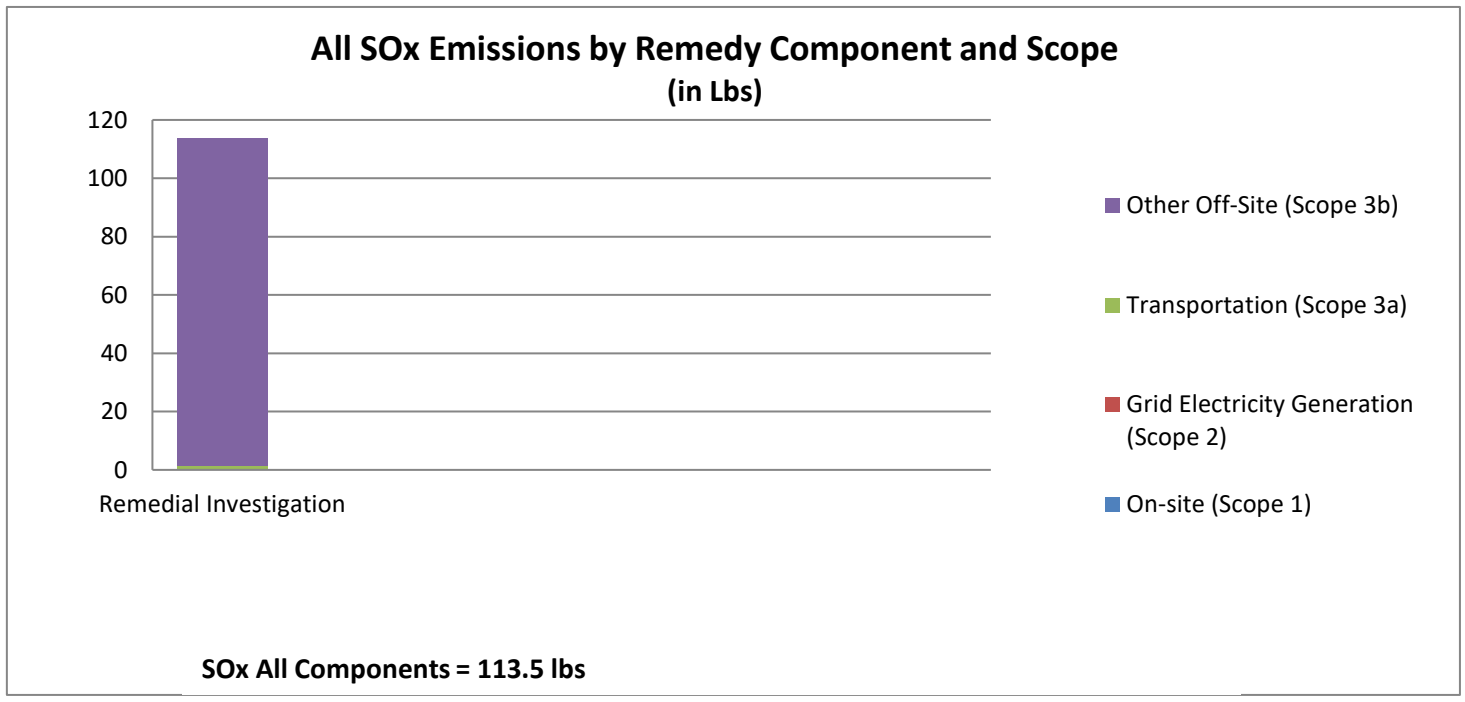

All NOx Emissions by Scope
On-site (Scope 1) = 8.5%
Grid Electricity Generation (Scope 2) = 0%
Transportation (Scope 3a) = 35.8%
Other Off-Site (Scope 3b) = 55.6%
NOx All Scopes = 88.8 lbs

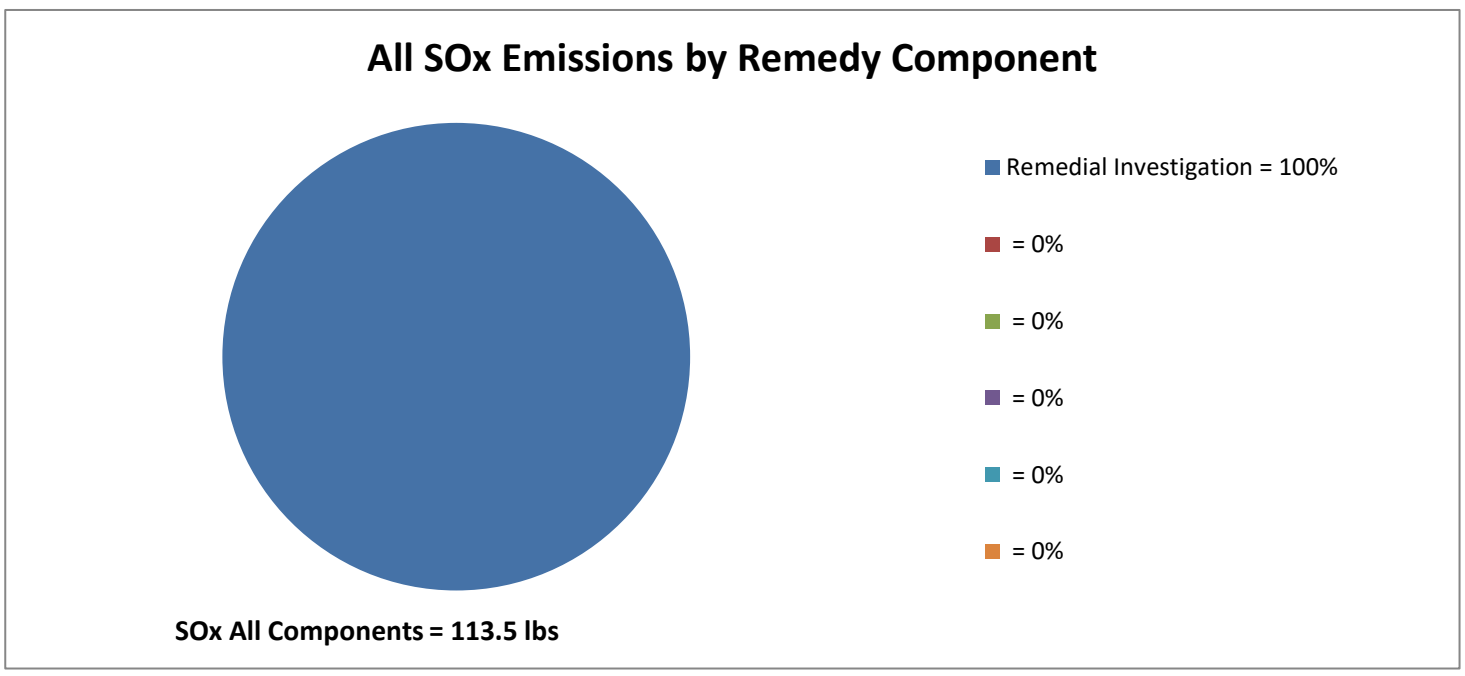
NOx lbs	Remedial Investigation						Total
On-site (Scope 1)	7.6	0.0	0.0	0.0	0.0	0.0	7.6
Grid Electricity Generation (Scope 2)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Transportation (Scope 3a)	31.8	0.0	0.0	0.0	0.0	0.0	31.8
Other Off-Site (Scope 3b)	49.4	0.0	0.0	0.0	0.0	0.0	49.4
Total	88.8	0.0	0.0	0.0	0.0	0.0	88.8

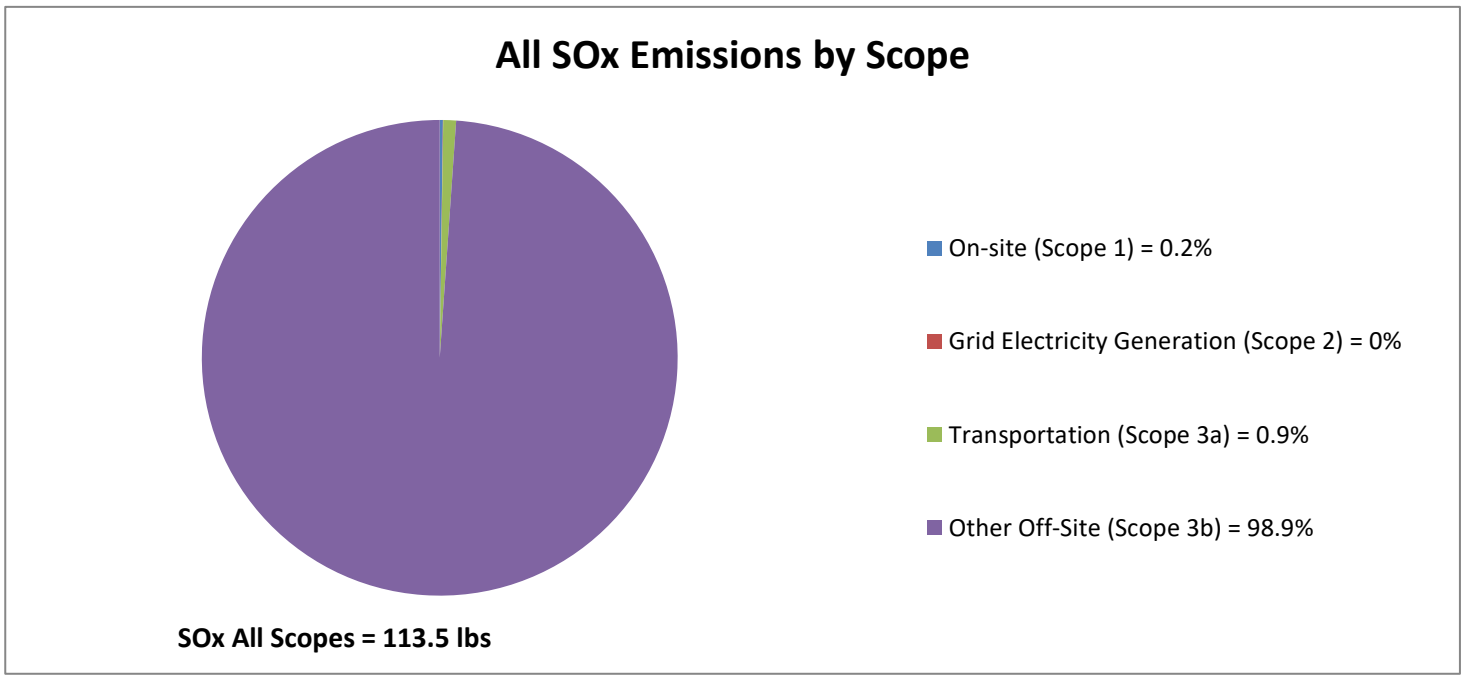
Remedial Investigation = 100%
= 0%
= 0%
= 0%
= 0%
= 0%

On-site (Scope 1) = 8.5%
Grid Electricity Generation (Scope 2) = 0%
Transportation (Scope 3a) = 35.8%
Other Off-Site (Scope 3b) = 55.6%

NOx All Components = 88.8 lbs
NOx All Scopes = 88.8 lbs


All SOx Emissions by Remedy Component and Scope
(in Lbs)
120
100
80
60
40
20
0
Remedial Investigation
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
SOx All Components = 113.5 lbs


All SOx Emissions by Remedy Component
Remedial Investigation = 100%
= 0%
= 0%
= 0%
= 0%
= 0%
SOx All Components = 113.5 lbs

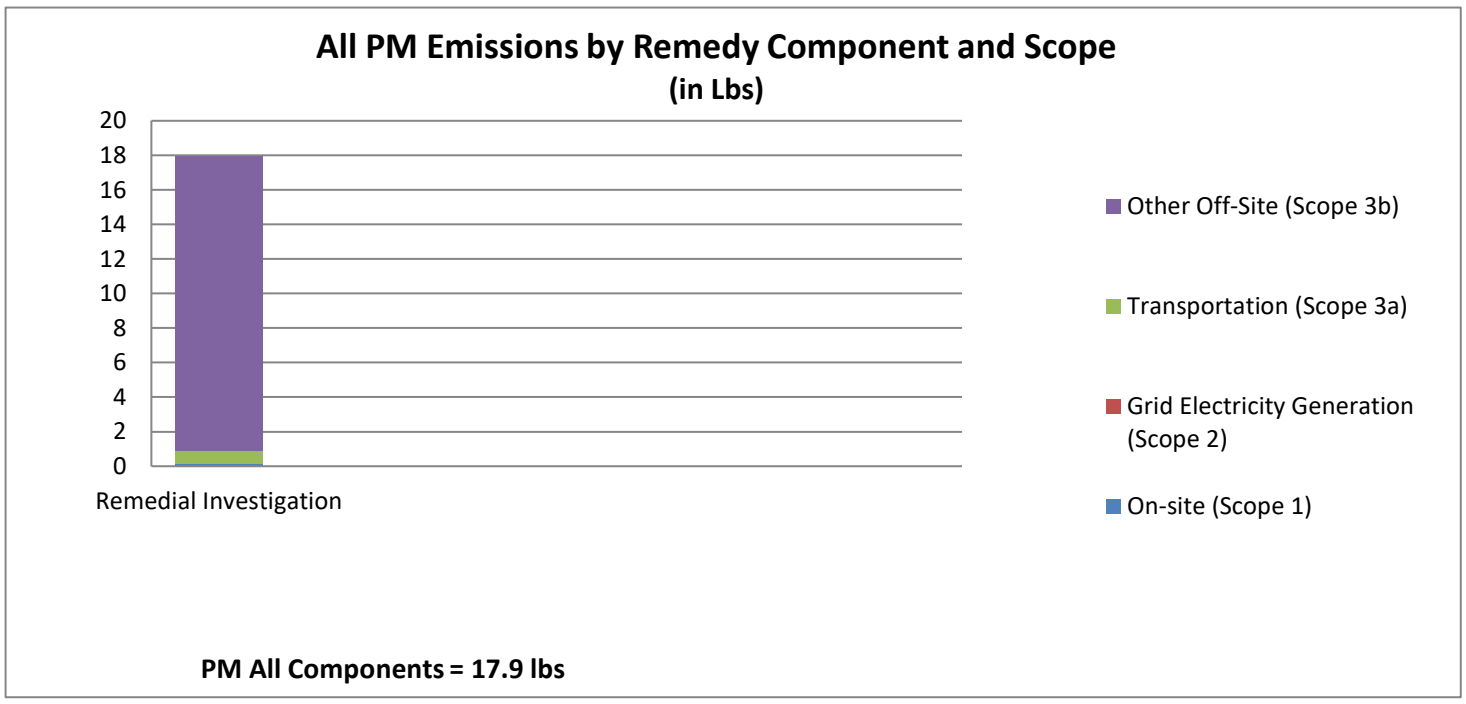

All SOx Emissions by Scope
On-site (Scope 1) = 0.2%
Grid Electricity Generation (Scope 2) = 0%
Transportation (Scope 3a) = 0.9%
Other Off-Site (Scope 3b) = 98.9%
SOx All Scopes = 113.5 lbs

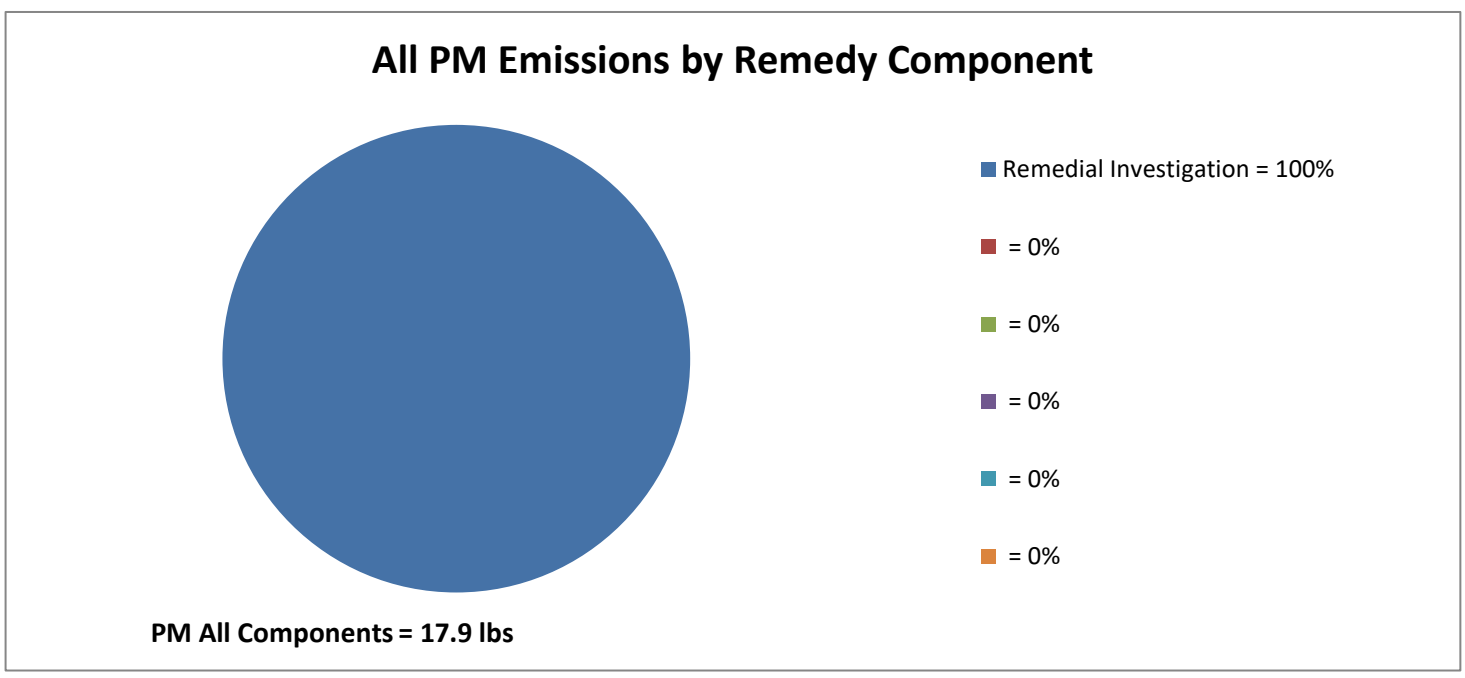
SOx lbs	Remedial Investigation						Total
On-site (Scope 1)	0.2	0.0	0.0	0.0	0.0	0.0	0.2
Grid Electricity Generation (Scope 2)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Transportation (Scope 3a)	1.0	0.0	0.0	0.0	0.0	0.0	1.0
Other Off-Site (Scope 3b)	112.3	0.0	0.0	0.0	0.0	0.0	112.3
Total	113.5	0.0	0.0	0.0	0.0	0.0	113.5

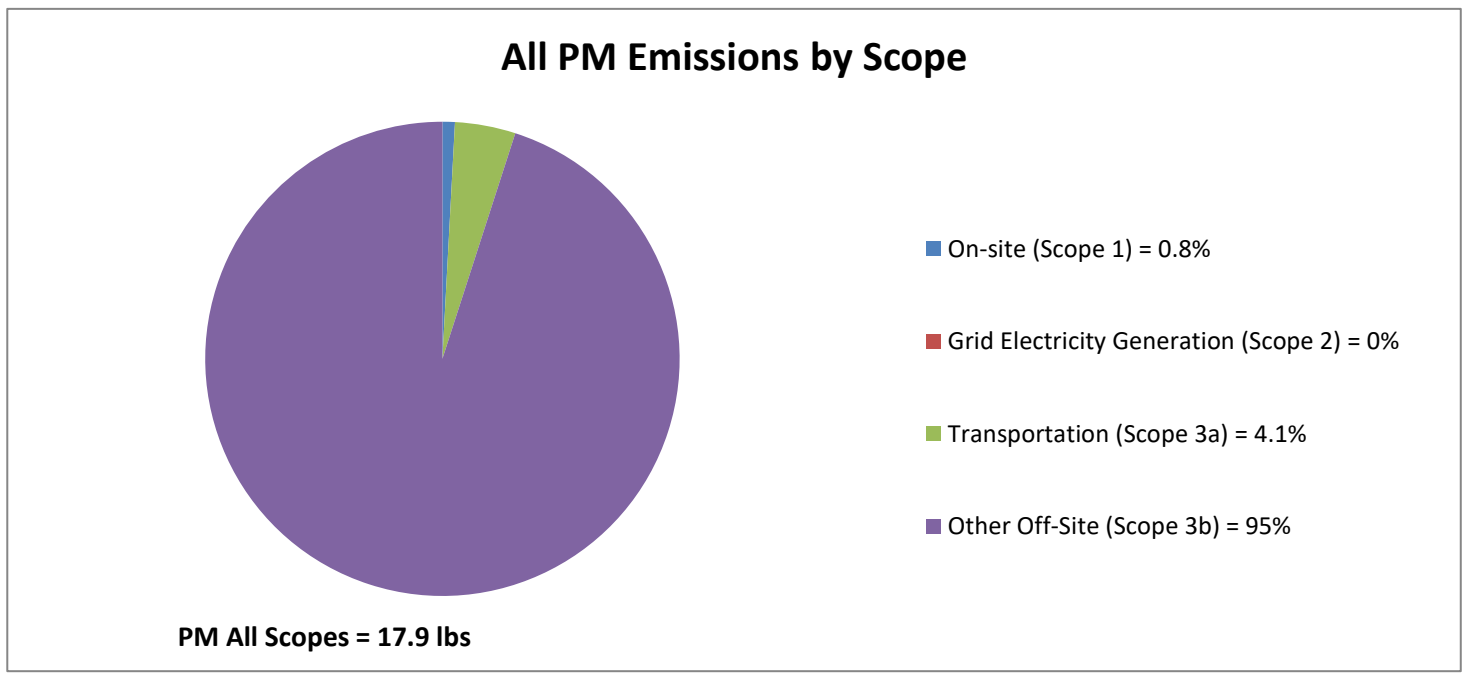
Remedial Investigation = 100%
= 0%
= 0%
= 0%
= 0%
= 0%

On-site (Scope 1) = 0.2%
Grid Electricity Generation (Scope 2) = 0%
Transportation (Scope 3a) = 0.9%
Other Off-Site (Scope 3b) = 98.9%

SOx All Components = 113.5 lbs
SOx All Scopes = 113.5 lbs


All PM Emissions by Remedy Component and Scope
(in Lbs)
20
18
16
14
12
10
8
6
4
2
0
Remedial Investigation
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
PM All Components = 17.9 lbs


All PM Emissions by Remedy Component
Remedial Investigation = 100%
= 0%
= 0%
= 0%
= 0%
= 0%
PM All Components = 17.9 lbs

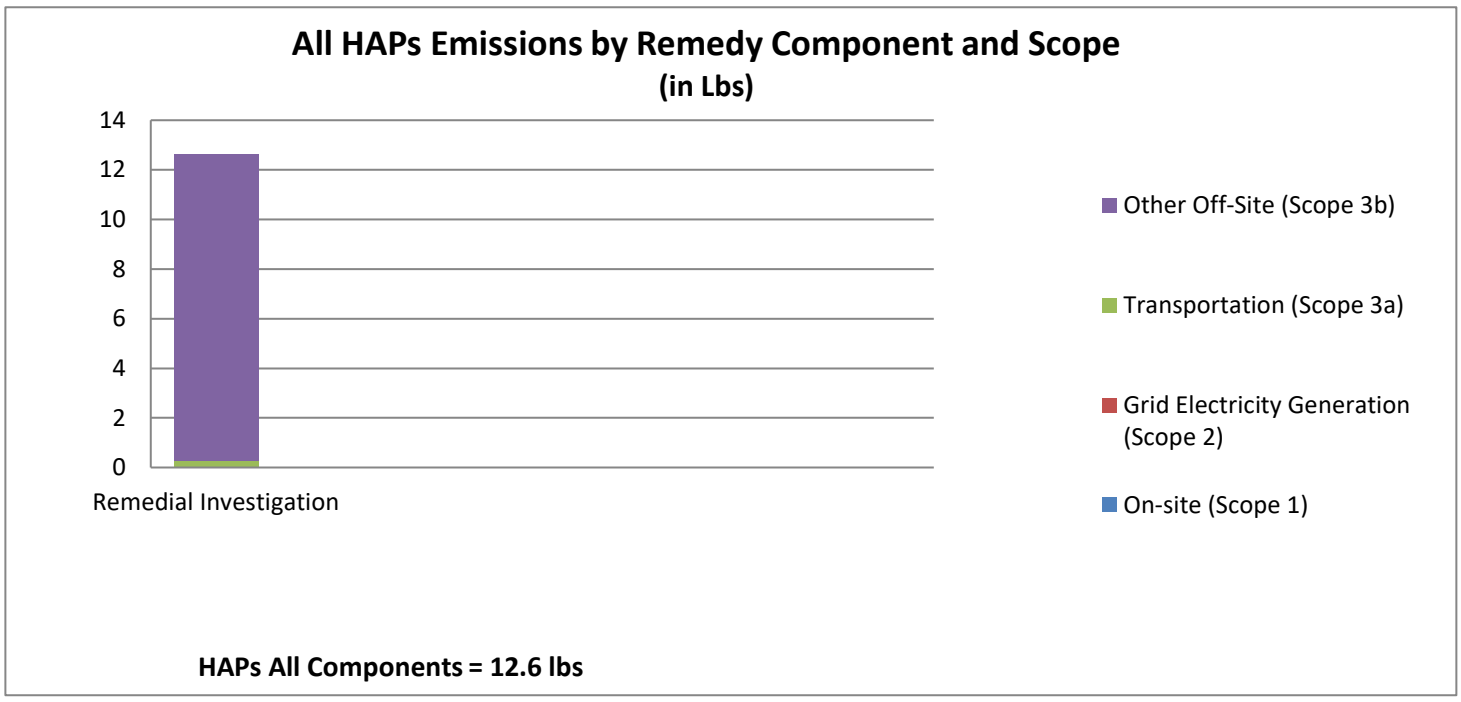

All PM Emissions by Scope
On-site (Scope 1) = 0.8%
Grid Electricity Generation (Scope 2) = 0%
Transportation (Scope 3a) = 4.1%
Other Off-Site (Scope 3b) = 95%
PM All Scopes = 17.9 lbs

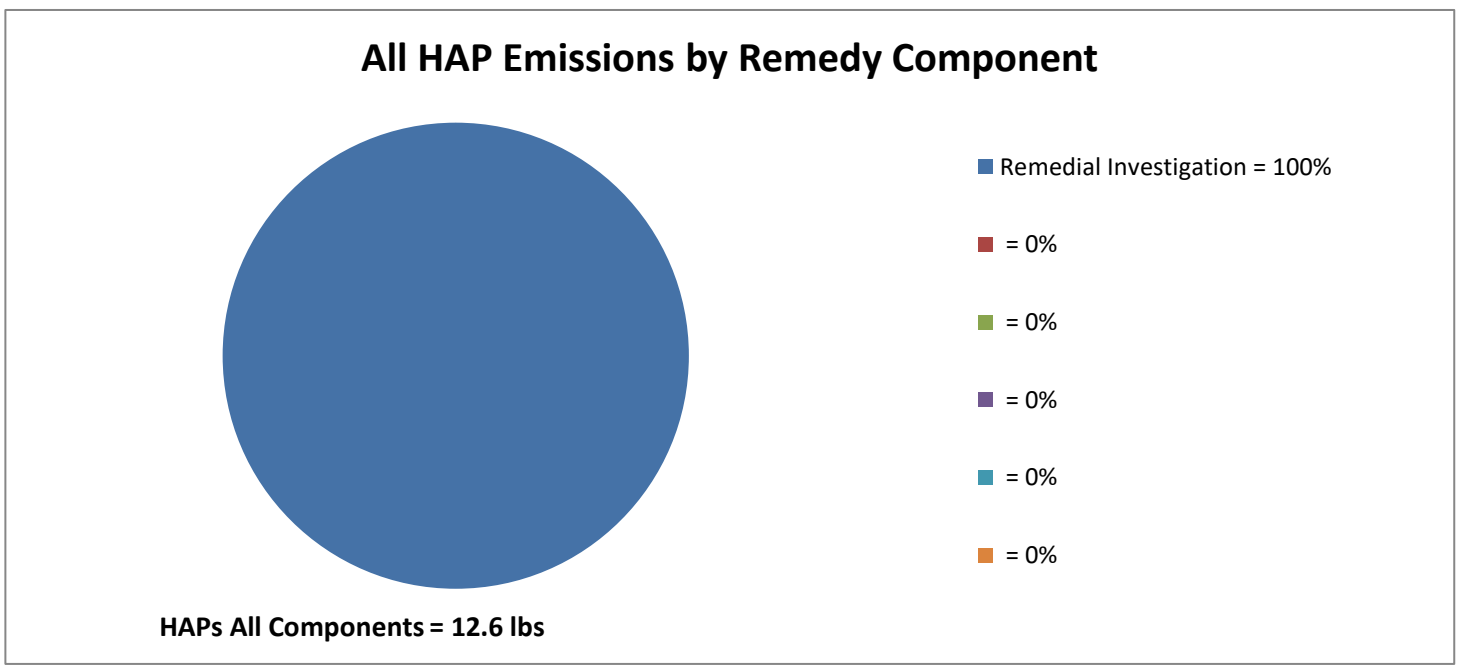
PM lbs	Remedial Investigation						Total
On-site (Scope 1)	0.2	0.0	0.0	0.0	0.0	0.0	0.2
Grid Electricity Generation (Scope 2)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Transportation (Scope 3a)	0.7	0.0	0.0	0.0	0.0	0.0	0.7
Other Off-Site (Scope 3b)	17.0	0.0	0.0	0.0	0.0	0.0	17.0
Total	17.9	0.0	0.0	0.0	0.0	0.0	17.9

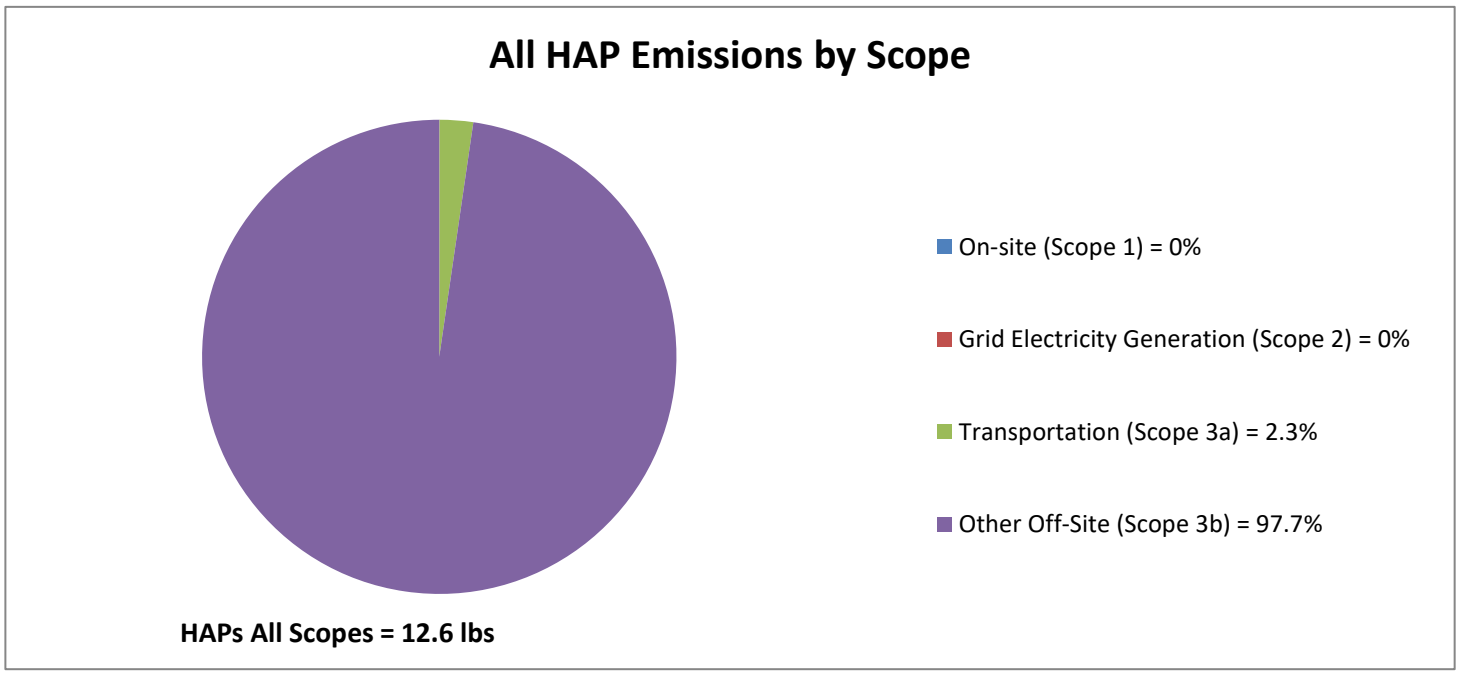
Remedial Investigation = 100%
= 0%
= 0%
= 0%
= 0%
= 0%

On-site (Scope 1) = 0.8%
Grid Electricity Generation (Scope 2) = 0%
Transportation (Scope 3a) = 4.1%
Other Off-Site (Scope 3b) = 95%

PM All Components = 17.9 lbs
PM All Scopes = 17.9 lbs


All HAPs Emissions by Remedy Component and Scope
(in Lbs)
14
12
10
8
6
4
2
0
Remedial Investigation
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
HAPs All Components = 12.6 lbs


All HAP Emissions by Remedy Component
Remedial Investigation = 100%
= 0%
= 0%
= 0%
= 0%
= 0%
HAPs All Components = 12.6 lbs


All HAP Emissions by Scope
On-site (Scope 1) = 0%
Grid Electricity Generation (Scope 2) = 0%
Transportation (Scope 3a) = 2.3%
Other Off-Site (Scope 3b) = 97.7%
HAPs All Scopes = 12.6 lbs

HAPs lbs	Remedial Investigation						Total
On-site (Scope 1)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Grid Electricity Generation (Scope 2)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Transportation (Scope 3a)	0.3	0.0	0.0	0.0	0.0	0.0	0.3
Other Off-Site (Scope 3b)	12.3	0.0	0.0	0.0	0.0	0.0	12.3
Total	12.6	0.0	0.0	0.0	0.0	0.0	12.6

Remedial Investigation = 100%
= 0%
= 0%
= 0%
= 0%
= 0%

On-site (Scope 1) = 0%
Grid Electricity Generation (Scope 2) = 0%
Transportation (Scope 3a) = 2.3%
Other Off-Site (Scope 3b) = 97.7%

HAPs All Components = 12.6 lbs
HAPs All Scopes = 12.6 lbs

Spreadsheets for Environmental Footprint Analysis (SEFA) Version 3.0, November 2019
168 Banker Street - BCP Remedial Investigation

Input Summary

Remedy Component Number →		1	2	3	4	5	6									Remedy Component Subtotals						
		Column headings in Row 6 must match the name of "Input" tabs in this workbook for Columns C - P in this table to be populated ("0" in Row 4 means "Input" tab is turned Off and will not be grouped to a Remedy Component (Columns Q - V) or used in subsequent calculations)																				
Item		Input Template	Input Template (2)	Input Template (3)	Input Template (4)	Input Template (5)	Input Template (6)	Input Template (7)	Input Template (8)	Input Template (9)	Input Template (10)	Input Template (11)	Input Template (12)	Input Template (13)	Input Template (14)	1	2	3	4	5	6	Total
On-Site																						
On-site Renewable Energy																						
Renewable electricity generated on-site	MWh	0														0	0	0	0	0	0	0
Landfill gas combusted on-site for energy use	ccf CH_4	0														0	0	0	0	0	0	0
On-site biodiesel use	gal	0														0	0	0	0	0	0	0
On-site biodiesel use - Other	gal	0														0	0	0	0	0	0	0
User-defined on-site renewable energy use #1	TBD	0														0	0	0	0	0	0	0
User-defined on-site renewable energy use #2	TBD	0														0	0	0	0	0	0	0
On-Site Conventional Energy																						
Grid electricity	MWh	0.0055814														0.0055814	0	0	0	0	0	0.0055814
On-site diesel use - Other	Gal	44.55														44.55	0	0	0	0	0	44.55
On-site diesel use <75 hp	Gal	0														0	0	0	0	0	0	0
On-site diesel use 75<hp<750	Gal	0														0	0	0	0	0	0	0
On-site diesel use >750 hp	Gal	0														0	0	0	0	0	0	0
On-site gasoline use - Other	Gal	0														0	0	0	0	0	0	0
On-site gasoline use <25 hp	Gal	0														0	0	0	0	0	0	0
On-site gasoline use >25 hp	Gal	0														0	0	0	0	0	0	0
On-site natural gas use	ccf	0														0	0	0	0	0	0	0
On-site compressed natural gas use - Other	ccf	0														0	0	0	0	0	0	0
On-site compressed natural gas use	ccf	0														0	0	0	0	0	0	0
On-site liquified petroleum gas use - Other	gal	0														0	0	0	0	0	0	0
On-site liquified petroleum gas use	gal	0														0	0	0	0	0	0	0
Other forms of on-site conventional energy use #1	TBD	0														0	0	0	0	0	0	0
Other forms of on-site conventional energy use #2	TBD	0														0	0	0	0	0	0	0
Other On-site Emissions																						
On-site HAP process emissions	Lbs	0														0	0	0	0	0	0	0
On-site GHG emissions	Lbs CO2e	0														0	0	0	0	0	0	0
On-site carbon storage	Lbs CO2e	0														0	0	0	0	0	0	0
GHG avoided by flaring on-site landfill methane	ccf CH4	0														0	0	0	0	0	0	0
Other on-site NOx emissions or reductions	Lbs	0														0	0	0	0	0	0	0
Other on-site SOx emissions or reductions	Lbs	0														0	0	0	0	0	0	0
Other on-site PM emissions or reductions	Lbs	0														0	0	0	0	0	0	0
Electricity Generation																						
Grid electricity	MWh	0.0055814														0.0055814	0	0	0	0	0	0.0055814
Voluntary purchase of renewable electricity	MWh	0														0	0	0	0	0	0	0
Voluntary purchase of RECs	MWh	0														0	0	0	0	0	0	0
Transportation																						
Transportation Fuel Use Breakdown																						
Biodiesel use - Personnel Transport	gal	0														0	0	0	0	0	0	0
Biodiesel use - Personnel Transport - User Defined	gal	0														0	0	0	0	0	0	0
Biodiesel use - Equipment Transport	gal	0														0	0	0	0	0	0	0
Biodiesel use - Equipment Transport - User Defined	gal	0														0	0	0	0	0	0	0
Biodiesel use - Material Transport	gal	0														0	0	0	0	0	0	0
Biodiesel use - Material Transport - User Defined	gal	0														0	0	0	0	0	0	0
Biodiesel use - Waste Transport	gal	0														0	0	0	0	0	0	0
Biodiesel use - Waste Transport - User Defined	gal	0														0	0	0	0	0	0	0
Diesel use - Personnel Transport - other vehicles	gal	38.9														38.9	0	0	0	0	0	38.9
Diesel use - Personnel Transport - car	gal	0														0	0	0	0	0	0	0
Diesel use - Personnel Transport - passenger truck	gal	0														0	0	0	0	0	0	0
Diesel use - Personnel Transport - User Defined	gal	0														0	0	0	0	0	0	0
Diesel use - Equipment Transport	gal	49														49	0	0	0	0	0	49
Diesel use - Equipment Transport - User Defined	gal	0														0	0	0	0	0	0	0
Diesel use - Material Transport	gal	91.667														91.667	0	0	0	0	0	91.667
Diesel use - Material Transport - User Defined	gal	0														0	0	0	0	0	0	0
Diesel use - Waste Transport	gal	0														0	0	0	0	0	0	0
Diesel use - Waste Transport - User Defined	gal	0														0	0	0	0	0	0	0
Gasoline use - Personnel Transport - other vehicles	gal	0														0	0	0	0	0	0	0
Gasoline use - Personnel Transport - car	gal	29.2														29.2	0	0	0	0	0	29.2
Gasoline use - Personnel Transport - passenger truck	gal	14														14	0	0	0	0	0	14
Gasoline use - Personnel Transport - User Defined	gal	0														0	0	0	0	0	0	0
Gasoline use - Equipment Transport	gal	0														0	0	0	0	0	0	0
Gasoline use - Equipment Transport - User Defined	gal	0														0	0	0	0	0	0	0
Natural Gas use - Personnel Transport	ccf	0														0	0	0	0	0	0	0
Natural Gas use - Personnel Transport - User Defined	ccf	0														0	0	0	0	0	0	0
Natural Gas use - Equipment Transport	ccf	0														0	0	0	0	0	0	0

Spreadsheets for Environmental Footprint Analysis (SEFA) Version 3.0, November 2019
168 Banker Street - BCP Remedial Investigation

Input Summary

Remedy Component Number →		1	2	3	4	5	6									Remedy Component Subtotals						
		Column headings in Row 6 must match the name of "Input" tabs in this workbook for Columns C - P in this table to be populated ("0" in Row 4 means "Input" tab is turned Off and will not be grouped to a Remedy Component (Columns Q - V) or used in subsequent calculations)																				
Item		Input Template	Input Template (2)	Input Template (3)	Input Template (4)	Input Template (5)	Input Template (6)	Input Template (7)	Input Template (8)	Input Template (9)	Input Template (10)	Input Template (11)	Input Template (12)	Input Template (13)	Input Template (14)	1	2	3	4	5	6	Total
Conventional Energy																						
Transportation diesel use	gal	179.567														179.567	0	0	0	0	0	179.567
Transportation gasoline use	gal	43.2														43.2	0	0	0	0	0	43.2
Transportation natural gas use	ccf	0														0	0	0	0	0	0	0
User-defined conventional energy transportation #1	TBD	0														0	0	0	0	0	0	0
User-defined conventional energy transportation #2	TBD	0														0	0	0	0	0	0	0
Renewable Energy																						
Transportation biodiesel use	gal	0														0	0	0	0	0	0	0
User-defined renewable energy transportation #1	TBD	0														0	0	0	0	0	0	0
User-defined renewable energy transportation #2	TBD	0														0	0	0	0	0	0	0
Off-Site																						
Construction Materials																						
Aluminum, Rolled Sheet	lb	0														0	0	0	0	0	0	0
Asphalt, mastic	lb	0														0	0	0	0	0	0	0
Asphalt, paving-grade	lb	0														0	0	0	0	0	0	0
Ethanol, Corn, 95%	lb	0														0	0	0	0	0	0	0
Ethanol, Corn, 99.7%	lb	0														0	0	0	0	0	0	0
Ethanol, Petroleum, 99.7%	lb	0														0	0	0	0	0	0	0
Gravel/Sand Mix, 65% Gravel	lb	1330														1330	0	0	0	0	0	1330
Gravel/sand/clay	lb	0														0	0	0	0	0	0	0
HDPE	lb	0														0	0	0	0	0	0	0
Photovoltaic system (installed)	W	0														0	0	0	0	0	0	0
PVC	lb	105														105	0	0	0	0	0	105
Portland cement, US average	lb	455																				
Ready-mixed concrete, 20 MPa	ft3	0														0	0	0	0	0	0	0
Round Gravel	lb	0														0	0	0	0	0	0	0
Sand	lb	0														0	0	0	0	0	0	0
Stainless Steel	lb	0														0	0	0	0	0	0	0
Steel	lb	0														0	0	0	0	0	0	0
Other refined construction materials	lb	0														0	0	0	0	0	0	0
Other unrefined construction materials	lb	0														0	0	0	0	0	0	0
Treatment Materials & Chemicals																						
Cheese Whey	lbs	0														0	0	0	0	0	0	0
Emulsified vegetable oil	lbs	0														0	0	0	0	0	0	0
Granular activated carbon, primary	lbs	0														0	0	0	0	0	0	0
Granular activated carbon, regenerated	lbs	0														0	0	0	0	0	0	0
Hydrogen Peroxide, 50% in H2O	lbs	0														0	0	0	0	0	0	0
Iron (II) Sulfate	lbs	0														0	0	0	0	0	0	0
Lime, Hydrated, Packed	lbs	0														0	0	0	0	0	0	0
Molasses	lbs	0														0	0	0	0	0	0	0
Phosphoric Acid, 70% in H2O	lbs	0														0	0	0	0	0	0	0
Potassium Permanganate	lbs	0														0	0	0	0	0	0	0
Sodium Hydroxide, 50% in H2O	lbs	0														0	0	0	0	0	0	0
Other Treatment Chemicals & Materials	lbs	0														0	0	0	0	0	0	0
Material Type																						
Total Virgin Refined Materials	tons	0.945														0.945	0	0	0	0	0	0.945
Total Recycled Refined Materials	tons	0														0	0	0	0	0	0	0
Total Reused Refined Materials	tons	0														0	0	0	0	0	0	0
Total Refined Material	tons	0.945														0.945	0	0	0	0	0	0.945
Total Virgin Unrefined Materials	tons	0														0	0	0	0	0	0	0
Total Recycled Unrefined Materials	tons	0														0	0	0	0	0	0	0
Total Reused Unrefined Materials	tons	0														0	0	0	0	0	0	0
Total Unrefined Material	tons	0														0	0	0	0	0	0	0
Fuel Processing																						
Biodiesel produced	gal	0														0	0	0	0	0	0	0
Diesel produced	gal	224.117														224.117	0	0	0	0	0	224.117
Gasoline produced	gal	43.2														43.2	0	0	0	0	0	43.2
Compressed natural gas produced	ccf	0														0	0	0	0	0	0	0
Liquified petroleum gas produced	gal	0														0	0	0	0	0	0	0
Natural gas produced	ccf	0														0	0	0	0	0	0	0
Water Use																						
Public Water Supply	gal x 1000	0.124														0.124	0	0	0	0	0	0.124
Extracted Groundwater	gal x 1000	0														0	0	0	0	0	0	0
Surface Water	gal x 1000	0														0	0	0	0	0	0	0
Reclaimed Water	gal x 1000	0														0	0	0	0	0	0	0
Collected/Diverted Storm Water	gal x 1000	0														0	0	0	0	0	0	0
User-defined water resource #1	gal x 1000	0														0	0	0	0	0	0	0
User-defined water resource #2	gal x 1000	0														0	0	0	0	0	0	0

Input Summary

Remedy Component Number →		1	2	3	4	5	6									Remedy Component Subtotals						
		Column headings in Row 6 must match the name of "Input" tabs in this workbook for Columns C - P in this table to be populated ("0" in Row 4 means "Input" tab is turned Off and will not be grouped to a Remedy Component (Columns Q - V) or used in subsequent calculations)																				
Item		Input Template	Input Template (2)	Input Template (3)	Input Template (4)	Input Template (5)	Input Template (6)	Input Template (7)	Input Template (8)	Input Template (9)	Input Template (10)	Input Template (11)	Input Template (12)	Input Template (13)	Input Template (14)	1	2	3	4	5	6	Total
Waste/Recycle Handling																						
Hazardous waste incineration	lbs	0														0	0	0	0	0	0	0
Off-site waste water treatment (POTW)	gal x 1000	0														0	0	0	0	0	0	0
Off-site non-hazardous waste landfill	tons	0														0	0	0	0	0	0	0
Off-site hazardous waste landfill	tons	0														0	0	0	0	0	0	0
Recycled/Reused On-Site	tons	0														0	0	0	0	0	0	0
Recycled/Reused Off-Site	tons	0														0	0	0	0	0	0	0
Solid Waste Totals																						
Total Non-Hazardous Waste	tons	0														0	0	0	0	0	0	0
Total Hazardous Waste	tons	0														0	0	0	0	0	0	0
Total Recycled/Reused	tons	0														0	0	0	0	0	0	0
Total Waste (all types)	tons	0														0	0	0	0	0	0	0
Lab Services																						
Off-site Laboratory Analysis - Other	sample	43														43	0	0	0	0	0	43
Off-site Laboratory Analysis - Metals	sample	43														43	0	0	0	0	0	43
Off-site Laboratory Analysis - Mercury	sample	0														0	0	0	0	0	0	0
Off-site Laboratory Analysis - Inorganic Anions	sample	0														0	0	0	0	0	0	0
Off-site Laboratory Analysis - Alkalinity	sample	0														0	0	0	0	0	0	0
Off-site Laboratory Analysis - Perchlorate	sample	0														0	0	0	0	0	0	0
Off-site Laboratory Analysis - Nitrogen/Nitrate	sample	0														0	0	0	0	0	0	0
Off-site Laboratory Analysis - Sulfate	sample	0														0	0	0	0	0	0	0
Off-site Laboratory Analysis - PCBs	sample	43														43	0	0	0	0	0	43
Off-site Laboratory Analysis - VOCs	sample	43														43	0	0	0	0	0	43
Off-site Laboratory Analysis - SVOCs	sample	43														43	0	0	0	0	0	43
Resource Extraction for Electricity																						
Coal extraction and processing	MWh	0.0017023														0.0017023	0	0	0	0	0	0.0017023
Natural gas extraction and processing	MWh	0.0018921														0.0018921	0	0	0	0	0	0.0018921
Nuclear fuel extraction and processing	MWh	0.0011051														0.0011051	0	0	0	0	0	0.0011051
Oil extraction and processing	MWh	3.907E-05														3.907E-05	0	0	0	0	0	3.907E-05
Other fuel extraction and processing	MWh	5.581E-06														5.581E-06	0	0	0	0	0	5.581E-06
Electricity Transmission																						
Transmission and distribution losses	MWh	0.0055814														0.0055814	0	0	0	0	0	0.0055814

Input Summary

Remedy Component Number →		1	2	3	4	5	6									Remedy Component Subtotals						
		Column headings in Row 6 must match the name of "Input" tabs in this workbook for Columns C - P in this table to be populated ("0" in Row 4 means "Input" tab is turned Off and will not be grouped to a Remedy Component (Columns Q - V) or used in subsequent calculations)																				
Item		Input Template	Input Template (2)	Input Template (3)	Input Template (4)	Input Template (5)	Input Template (6)	Input Template (7)	Input Template (8)	Input Template (9)	Input Template (10)	Input Template (11)	Input Template (12)	Input Template (13)	Input Template (14)	1	2	3	4	5	6	Total
Other																						
User-defined material #1	lb	0														0	0	0	0	0	0	0
User-defined material #2	TBD	0														0	0	0	0	0	0	0
User-defined material #3	TBD	0														0	0	0	0	0	0	0
User-defined material #4	TBD	0														0	0	0	0	0	0	0
User-defined material #5	TBD	0														0	0	0	0	0	0	0
User-defined material #6	TBD	0														0	0	0	0	0	0	0
User-defined material #7	TBD	0														0	0	0	0	0	0	0
User-defined material #8	TBD	0														0	0	0	0	0	0	0
User-defined material #9	TBD	0														0	0	0	0	0	0	0
User-defined material #10	TBD	0														0	0	0	0	0	0	0
User-defined material #11	TBD	0														0	0	0	0	0	0	0
User-defined material #12	TBD	0														0	0	0	0	0	0	0
User-defined material #13	TBD	0														0	0	0	0	0	0	0
User-defined material #14	TBD	0														0	0	0	0	0	0	0
User-defined material #15	TBD	0														0	0	0	0	0	0	0
User-defined material #16	TBD	0														0	0	0	0	0	0	0
User-defined material #17	TBD	0														0	0	0	0	0	0	0
User-defined material #18	TBD	0														0	0	0	0	0	0	0
User-defined material #19	TBD	0														0	0	0	0	0	0	0
User-defined material #20	TBD	0														0	0	0	0	0	0	0
User-defined Waste Destinations																						
User-defined recycled/reused on-site #1	TBD	0														0	0	0	0	0	0	0
User-defined recycled/reused on-site #2	TBD	0														0	0	0	0	0	0	0
User-defined recycled/reused on-site #3	TBD	0														0	0	0	0	0	0	0
User-defined recycled/reused off-site #1	TBD	0														0	0	0	0	0	0	0
User-defined recycled/reused off-site #2	TBD	0														0	0	0	0	0	0	0
User-defined recycled/reused off-site #3	TBD	0														0	0	0	0	0	0	0
User-defined non-hazardous waste destination #1	TBD	0														0	0	0	0	0	0	0
User-defined non-hazardous waste destination #2	TBD	0														0	0	0	0	0	0	0
User-defined non-hazardous waste destination #3	TBD	0														0	0	0	0	0	0	0
User-defined hazardous waste destination #1	TBD	0														0	0	0	0	0	0	0
User-defined hazardous waste destination #2	TBD	0														0	0	0	0	0	0	0
User-defined hazardous waste destination #3	TBD	0														0	0	0	0	0	0	0

Remedial Investigation - On-Site Footprint (Scope 1)

Contributors to Footprints	Units	Usage	Energy		GHG		NOx		SOx		PM		HAPs	
			Conv. Factor	MMBtus	Conv. Factor	lbs CO2e	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs
On-Site														
On-site Renewable Energy														
Renewable electricity generated on-site	MWh	0	3.413	0										
Landfill gas combusted on-site for energy use	ccf CH4	0	0.103	0	13.1	0	0.01	0	6.3E-06	0	0.00076	0	8.4E-06	0
On-site biodiesel use	gal	0	0.127	0	22.3	0	0.2	0	0	0	0.00099	0	NP	
On-site biodiesel use - User Defined	gal	0	0.127	0	22.3	0	0.2	0	0	0	0.00099	0	NP	
User-defined on-site renewable energy use #1	gal	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined on-site renewable energy use #2	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
On-site Renewable Energy Subtotals				**0**		**0**		**0**		**0**		**0**		**0**
Notes:														
On-site Conventional Energy														
On-site grid electricity	MWh	0.005581	3.413	0.019049										
On-site diesel use - Other	Gal	44.55	0.139	6.19245	22.5	1002.375	0.17	7.5735	0.0054	0.24057	0.0034	0.15147	5.2E-06	0.000232
On-site diesel use <75 hp	Gal	0	0.139	0	22.21	0	0.1565	0	0.000145	0	0.0145	0	0.00004	0
On-site diesel use 75<hp<750	Gal	0	0.139	0	22.24	0	0.101	0	0.00013	0	0.009	0	0.00004	0
On-site diesel use >750 hp	Gal	0	0.139	0	22.24	0	0.149	0	0.00013	0	0.006	0	0.00004	0
On-site gasoline use - Other	Gal	0	0.124	0	19.6	0	0.11	0	0.0045	0	0.00054	0	0.000039	0
On-site gasoline use <25 hp	Gal	0	0.124	0	17.48	0	0.037	0	0.00025	0	0.165	0	0.00008	0
On-site gasoline use >25 hp	Gal	0	0.124	0	19.93	0	0.032	0	0.00029	0	0.002	0	0.00009	0
On-site natural gas use	ccf	0	0.103	0	13.1	0	0.01	0	6.3E-06	0	0.00076	0	8.4E-06	0
On-site compressed natural gas use - Other	ccf	0	NP		1957.835	0	16.0325	0	0.023045	0	0.2775	0	0	0
On-site compressed natural gas use	ccf	0	NP		1957.835	0	16.0325	0	0.023045	0	0.2775	0	0	0
On-site liquified petroleum gas use - Other	gal	0	NP		12.69	0	0.021	0	0.00013	0	0.001	0	0	0
On-site liquified petroleum gas use	gal	0	NP		12.69	0	0.021	0	0.00013	0	0.001	0	0	0
Other forms of on-site conventional energy use #1	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
Other forms of on-site conventional energy use #2	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
On-site Conventional Energy Subtotals				**6**		**1,002**		**8**		**0**		**0**		**0**
Notes:														
Other On-site Emissions														
On-site HAP process emissions	lbs	0											1	0
On-site GHG emissions	lbs CO2e	0			1	0								
On-site carbon storage	lbs CO2e	0			1	0								
GHG avoided by flaring on-site landfill methane	Lbs	0			-262	0	0.01	0	6.3E-06	0	0.00076	0	8.4E-06	0
Other on-site NOx emissions or reductions	lbs	0					1	0						
Other on-site SOx emissions or reductions	lbs	0							1	0				
Other on-site PM emissions or reductions	lbs	0									1	0		
User-defined recycled/reused on-site #2	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined recycled/reused on-site #3	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined recycled/reused off-site #1	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
Notes:														
On-site Totals				**6.21**		**1,002**		**8**		**0**		**0**		**0**

Remedial Investigation - Electricity Generation Footprint (Scope 2)

Contributors to Footprints	Units	Usage	Energy		GHG		NOx		SOx		PM		HAPs	
			Conv. Factor	MMBtus	Conv. Factor	lbs CO2e	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs
Electricity Generation														
Grid electricity	MWh	0.005581	6.929	0.038674	1124.3	6.275213	2.2421	0.012514	4.607887	0.025719	0.057518	0.000321	0.210237	0.001173
Voluntary purchase of renewable electricity	MWh	0												
Voluntary purchase of RECs	MWh	0												
Notes:														

168 Banker Street
BCP Remedial Investigation
Remedial Investigation

Remedial Investigation - Transportation Footprint (Scope 3a)

Category	Units	Usage	Energy		Greenhouse Gas		NOx		SOx		PM		HAPs	
			Conv. Factor	MMBtus	Conv. Factor	lbs CO2e	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs
Conventional Energy														
Transportation diesel use	gal	179.567	0.139	24.95981	22.5	4040.258	0.17	30.52639	0.0054	0.969662	0.0034	0.610528	5.2E-06	0.000934
Transportation diesel use - car	gal	0	0.139	0	22.57	0	0.015	0	0.0002	0	0.003	0	0.00252	0
Transportation diesel use - passenger truck	gal	0	0.139	0	22.545	0	0.0585	0	0.0002	0	0.007	0	0.002605	0
Transportation diesel use - User Defined	gal	0	0.139	0	22.5	0	0.17	0	0.0054	0	0.0034	0	5.2E-06	0
Transportation gasoline use	gal	0	0.124	0	19.6	0	0.11	0	0.0045	0	0.00054	0	0.000039	0
Transportation gasoline use - car	gal	29.2	0.124	3.6208	19.77	577.284	0.027	0.7884	0.00036	0.010512	0.003	0.0876	0.0067	0.19564
Transportation gasoline use - passenger truck	gal	14	0.124	1.736	19.79	277.06	0.035	0.49	0.00036	0.00504	0.003	0.042	0.00661	0.09254
Transportation gasoline use - User Defined	gal	0	0.124	0	19.6	0	0.11	0	0.0045	0	0.00054	0	0.000039	0
Transportation natural gas use	ccf	0	0.103	0	13.1	0	0.01	0	6.3E-06	0	0.00076	0	8.4E-06	0
Transportation natural gas use - User Defined	ccf	0	0.103	0	13.1	0	0.01	0	6.3E-06	0	0.00076	0	8.4E-06	0
User-defined conventional energy transportation #1	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined conventional energy transportation #2	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
Conventional Energy Subtotals				**30**		**4,895**		**32**		**1**		**1**		**0**
Notes:														
Renewable Energy														
Transportation biodiesel use	gal	0	0.127	0	22.3	0	0.2	0	0	0	0.00099	0	NP	
Transportation biodiesel use - User Defined	gal	0	0.127	0	22.3	0	0.2	0	0	0	0.00099	0	NP	
User-defined renewable energy transportation #1	TBD	0	Biodiesel		0	0	0	0	0	0	0	0	Ref.	
User-defined renewable energy transportation #2	TBD	0	mpg or pmp		0	0	0	0	0	0	0	0	0	0
Renewable Energy Subtotals				**0**		**0**		**0**		**0**		**0**		**0**
Notes:														
Transportation Totals				**30**		**4895**		**32**		**1**		**1**		**0**

Remedial Investigation - Off-Site Footprint (Scope 3b)

Category	Units	Usage	Energy		Greenhouse Gas		NOx		SOx		PM		HAPs	
			Conv. Factor	MMBtus	Conv. Factor	lbs CO2e	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs
Construction Materials														
Aluminum, Rolled Sheet	lb	0	0.0633	0	9.15	0	0.0148	0	0.0283	0	0.0088	0	0.00102	0
Asphalt, mastic	lb	0	0.0412	0	0.85	0	0.00271	0	0.00798	0	0.000766	0	0.00107	0
Asphalt, paving-grade	lb	0	0.5	0	8.58	0	0.0299	0	0.0969	0	0.0091	0	0.0133	0
Ethanol, Corn, 95%	lb	0	0.0318	0	-0.0199	0	0.00425	0	0.00303	0	0.000469	0	8.46E-05	0
Ethanol, Corn, 99.7%	lb	0	0.0324	0	0.0591	0	0.00431	0	0.0031	0	0.000472	0	0.000087	0
Ethanol, Petroleum, 99.7%	lb	0	0.0205	0	1.25	0	0.00199	0	0.00214	0	0.000277	0	5.89E-05	0
Gravel/Sand Mix, 65% Gravel	lb	1330	2.48E-05	0.032984	0.0024	3.192	0.000018	0.02394	4.52E-06	0.006012	2.61E-06	0.003471	3.08E-07	0.00041
Gravel/sand/clay	lb	0	0.000028	0	0.00335	0	1.65E-05	0	0.000015	0	0.000002	0	2.05E-10	0
HDPE	lb	0	0.0332	0	1.94	0	0.00325	0	0.00409	0	0.000439	0	6.41E-05	0
Photovoltaic system (installed)	W	0	0.0336	0	4.47	0	0.015	0	0.032	0	0.00063	0	2.9E-06	0
PVC	lb	105	0.0262	2.751	2.02	212.1	0.004	0.42	0.00274	0.2877	0.000372	0.03906	0.000375	0.039375
Portland cement, US average	lb	0	0.0139	0	1.34	0	0.00654	0	0.0104	0	0.00378	0	0.00097	0
Ready-mixed concrete, 20 MPa	ft3	0	0.217	0	19.5	0	0.0975	0	0.154	0	0.057	0	0.0141	0
Round Gravel	lb	0	2.48E-05	0	0.0024	0	0.000018	0	4.52E-06	0	2.61E-06	0	3.08E-07	0
Sand	lb	0	2.48E-05	0	0.0024	0	0.000018	0	4.52E-06	0	2.61E-06	0	3.08E-07	0
Stainless Steel	lb	0	0.0116	0	3.4	0	0.0075	0	0.012	0	0.0044	0	0.000144	0
Steel	lb	0	0.0044	0	1.1	0	0.0014	0	0.0017	0	0.00056	0	0.000067	0
Other refined construction materials	lb	0	0.01885	0	2.115	0	0.004038	0	0.005133	0	0.001443	0	0.000163	0
Other unrefined construction materials	lb	0	0.000028	0	0.00335	0	1.65E-05	0	0.000015	0	0.000002	0	2.05E-10	0

Notes:

Remedial Investigation - Off-Site Footprint (Scope 3b)

Category	Units	Usage	Energy		Greenhouse Gas		NOx		SOx		PM		HAPs	
			Conv. Factor	MMBtus	Conv. Factor	lbs CO2e	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs
Treatment Materials & Chemicals														
Cheese Whey	lbs	0	0.0025	0	0.031	0	0.000062	0	0.000033	0	0.000002	0	NP	
Emulsified vegetable oil	lbs	0	0.0077	0	3.44	0	0.0066	0	0.0019	0	0.000033	0	NP	
Granular activated carbon, primary	lbs	0	0.0356	0	4.82	0	0.0793	0	0.128	0	0.000987	0	0.000657	0
Granular activated carbon, regenerated	lbs	0	0.00873	0	1.7	0	0.00733	0	0.0129	0	0.000886	0	0.000671	0
Hydrogen Peroxide, 50% in H2O	lbs	0	0.00979	0	1.19	0	0.00142	0	0.0024	0	0.000308	0	6.29E-05	0
Iron (II) Sulfate	lbs	0	0.00147	0	0.167	0	0.000316	0	0.000589	0	0.000103	0	0.000023	0
Lime, Hydrated, Packed	lbs	0	0.00206	0	0.762	0	0.000513	0	0.000358	0	0.00013	0	6.57E-06	0
Molasses	lbs	0	0.0044	0	0.48	0	0.0011	0	0.00024	0	4.1E-06	0	NP	
Phosphoric Acid, 70% in H2O	lbs	0	0.0067	0	0.882	0	0.00282	0	0.0294	0	0.00171	0	0.000163	0
Potassium Permanganate	lbs	0	0.00981	0	1.16	0	0.00234	0	0.0032	0	0.000422	0	0.000122	0
Sodium Hydroxide, 50% in H2O	lbs	0	0.00977	0	1.09	0	0.00194	0	0.00352	0	0.000403	0	0.000129	0
Other Treatment Chemicals & Materials	lbs	0	0.015	0	1.67	0	0.003	0	0.0065	0	0.00061	0	0.000016	0
Notes:														
Fuel Processing														
Biodiesel produced	gal	0	0.029	0	-16.8	0	0.018	0	0.033	0	0.00082	0	NP	
Diesel produced	gal	224.117	0.017	3.809989	3.02	676.8333	0.0051	1.142997	0.0062	1.389525	0.0017	0.380999	0.0011	0.246529
Gasoline produced	gal	43.2	0.033	1.4256	2.8	120.96	0.0046	0.19872	0.005	0.216	0.0015	0.0648	0.001	0.0432
Liquefied Petroleum Gas Produced	gal	0	0.088	0	1.47	0	0.0016	0	0.0024	0	0.0007	0	0.0003	0
Natural Gas - Compressed Produced	ccf	0	19.983	0	343.92	0	0.4732	0	2.1651	0	0.1846	0	0.2895	0
Natural Gas Produced	ccf	0	0.0052	0	2.2	0	0.0037	0	0.0046	0	0.000072	0	6.1E-06	0
Fuel Processing Subtotals				**5.235589**		**797.7933**		**1.341717**		**1.605525**		**0.445799**		**0.289729**
Notes:														
Public water	gal x 1000	0.124	0.0092	0.001141	5	0.62	0.0097	0.001203	0.0059	0.000732	0.016	0.001984	0.000015	1.86E-06
User-defined water resource #1	gal x 1000	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined water resource #2	gal x 1000	0	0	0	0	0	0	0	0	0	0	0	0	0
Notes:														

Remedial Investigation - Off-Site Footprint (Scope 3b)

Category	Units	Usage	Energy		Greenhouse Gas		NOx		SOx		PM		HAPs	
			Conv. Factor	MMBtus	Conv. Factor	lbs CO2e	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs
Off-Site Services														
Hazardous waste incineration	lb	0	0.00609	0	2.43	0	0.0016	0	0.00167	0	0.000209	0	0.000087	0
Off-site waste water treatment (POTW)	gal x 1000	0	0.015	0	4.4	0	0.016	0	0.015	0	NP		NP	
Off-site non-hazardous waste landfill	ton	0	0.16	0	25	0	0.14	0	0.075	0	0.4	0	0.0014	0
Off-site hazardous waste landfill	ton	0	0.18	0	27.5	0	0.154	0	0.0825	0	0.44	0	0.00154	0
Off-site Laboratory Analysis - Other	sample	43	0.058071	2.497054	6.853438	294.6979	0.131402	5.650284	0.303876	13.06666	0.04557	1.959502	0.033017	1.419711
Off-site Laboratory Analysis - Metals	sample	43	0.212	9.116	27.4693	1181.18	0.6423	27.6189	1.5072	64.8096	0.2264	9.7352	0.1643	7.0649
Off-site Laboratory Analysis - Mercury	sample	0	0.073171	0	9.325458	0	0.212744	0	0.49824	0	0.074736	0	0.054233	0
Off-site Laboratory Analysis - Inorganic Anions	sample	0	0.007402	0	0.645948	0	0.006768	0	0.014793	0	0.002202	0	0.001554	0
Off-site Laboratory Analysis - Alkalinity	sample	0	0.01744	0	1.338192	0	0.007011	0	0.01325	0	0.00194	0	0.001283	0
Off-site Laboratory Analysis - Perchlorate	sample	0	0.023885	0	1.871705	0	0.007981	0	0.014154	0	0.002055	0	0.001287	0
Off-site Laboratory Analysis - Nitrogen/Nitrate	sample	0	0.033648	0	4.29897	0	0.095459	0	0.222665	0	0.03351	0	0.024251	0
Off-site Laboratory Analysis - Sulfate	sample	0	0.014122	0	1.472673	0	0.007981	0	0.013602	0	0.00198	0	0.001202	0
Off-site Laboratory Analysis - PCBs	sample	43	0.051277	2.204907	5.224902	224.6708	0.083334	3.583357	0.190477	8.19053	0.028439	1.222892	0.021208	0.911955
Off-site Laboratory Analysis - VOCs	sample	43	0.076204	3.276793	9.016814	387.723	0.104498	4.493416	0.227074	9.764173	0.033951	1.459886	0.023589	1.014336
Off-site Laboratory Analysis - SVOCs	sample	43	0.07156	3.077088	7.870422	338.4281	0.145945	6.275614	0.337304	14.50406	0.050485	2.17087	0.037258	1.602083
Notes:														
Resource Extraction for Electricity														
Coal extraction and processing	MWh	0.001702	3.1	0.005199	180.0	0.306421	0.8	0.001311	0.2	0.000255	0.0	3.06E-05	NP	
Natural gas extraction and processing	MWh	0.001892	1.6	0.003088	270.0	0.510869	0.2	0.000341	13.0	0.024597	0.0	1.34E-05	NP	
Nuclear fuel extraction and processing	MWh	0.001105	0.2	0.000172	25.0	0.027628	0.2	0.000166	0.5	0.000553	0.0	1.66E-06	NP	
Oil extraction and processing	MWh	3.91E-05	2.3	8.97E-05	270.0	0.010549	1.7	6.64E-05	0.1	2.7E-06	0.0	1.64E-06	NP	
Other fuel extraction and processing	MWh	5.58E-06	0	0	0	0	0	0	0	0	0	0	0	0
Resource Extraction Subtotals				**0.008548**		**0.855467**		**0.001884**		**0.025408**		**4.74E-05**		**0**
Notes:														
Electricity Transmission														
Transmission and distribution losses	MWh	0.005581	1.0342	0.005772	112.43	0.627521	0.22421	0.001251	0.460789	0.002572	0.005752	3.21E-05	0.021024	0.000117
Notes:														

Remedial Investigation - Off-Site Footprint (Scope 3b)

Category	Units	Usage	Energy		Greenhouse Gas		NOx		SOx		PM		HAPs	
			Conv. Factor	MMBtus	Conv. Factor	lbs CO2e	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs
User-defined Materials														
User-defined material #1	lb	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #2	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #3	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #4	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #5	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #6	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #7	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #8	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #9	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #10	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #11	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #12	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #13	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #14	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #15	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #16	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #17	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #18	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #19	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #20	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
Notes:														
User-defined Waste Destinations														
User-defined recycled/reused off-site #1	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined recycled/reused off-site #2	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined recycled/reused off-site #3	TBD	0	y(MMBtu/u		{lbs CO2e/u		Ox(lbs/unit		Ox(lbs/unit)		M(lbs/unit)		APs(lbs/unit	
User-defined non-hazardous waste destination #1	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined non-hazardous waste destination #2	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined non-hazardous waste destination #3	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined hazardous waste destination #1	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined hazardous waste destination #2	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined hazardous waste destination #3	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
Notes:														
Off-site Totals				**28.20688**		**3441.888**		**49.41157**		**112.263**		**17.03874**		**12.34262**

Remedial Investigation - Intermediate Totals

Category	Units	Usage	Energy		Greenhouse Gas		NOx		SOx		PM		HAPs	
			Conv. Factor	MMBtus	Conv. Factor	lbs CO2e	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs
Total Grid Electricity Footprint														
On-site grid electricity	MWh	0.005581	3.413	0.019049										
Electricity Generation														
Grid electricity	MWh	0.005581	6.929	0.038674	1124.3	6.275213	2.2421	0.012514	4.607887	0.025719	0.057518	0.000321	0.210237	0.001173
Resource Extraction for Electricity														
Coal extraction and processing	MWh	0.001702	3.1	0.005199	180.0	0.306421	0.8	0.001311	0.2	0.000255	0.0	3.06E-05	NP	
Natural gas extraction and processing	MWh	0.001892	1.6	0.003088	270.0	0.510869	0.2	0.000341	13.0	0.024597	0.0	1.34E-05	NP	
Nuclear fuel extraction and processing	MWh	0.001105	0.2	0.000172	25.0	0.027628	0.2	0.000166	0.5	0.000553	0.0	1.66E-06	NP	
Oil extraction and processing	MWh	3.91E-05	2.3	8.97E-05	270.0	0.010549	1.7	6.64E-05	0.1	2.7E-06	0.0	1.64E-06	NP	
Other fuel extraction and processing	MWh	5.58E-06	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Electricity Transmission														
Transmission and distribution losses	MWh	0.005581	1.0342	0.005772	112.43	0.627521	0.22421	0.001251	0.460789	0.002572	0.005752	3.21E-05	0.021024	0.000117
Total Grid Electricity Footprint				**0**		**8**		**0**		**0**		**0**		**0**
Total Fuel Footprints														
Total Gasoline Footprint														
On-site gasoline use - Other	gal	0	0.124	0	19.6	0	0.11	0	0.0045	0	0.00054	0	0.000039	0
On-site gasoline use <25 hp	gal	0	0.124	0	17.48	0	0.037	0	0.00025	0	0.165	0	0.00008	0
On-site gasoline use >25 hp	gal	0	0.124	0	19.93	0	0.032	0	0.00029	0	0.002	0	0.00009	0
Transportation gasoline use	gal	0	0.124	0	19.6	0	0.11	0	0.0045	0	0.00054	0	0.000039	0
Transportation gasoline use - car	gal	29.2	0.124	3.6208	19.77	577.284	0.027	0.7884	0.00036	0.010512	0.003	0.0876	0.0067	0.19564
Transportation gasoline use - passenger truck	gal	14	0.124	1.736	19.79	277.06	0.035	0.49	0.00036	0.00504	0.003	0.042	0.00661	0.09254
Transportation gasoline use - User Defined	gal	0	0.124	0	19.6	0	0.11	0	0.0045	0	0.00054	0	0.000039	0
Gasoline produced	gal	43.2	0.033	1.4256	2.8	120.96	0.0046	0.19872	0.005	0.216	0.0015	0.0648	0.001	0.0432
Total Gasoline Footprint		**43.2**		**6.7824**		**975.304**		**1.47712**		**0.231552**		**0.1944**		**0.33138**
Total Diesel Footprint														
On-site diesel use - Other	gal	44.55	0.139	6.19245	22.5	1002.375	0.17	7.5735	0.0054	0.24057	0.0034	0.15147	5.2E-06	0.000232
On-site diesel use <75 hp	gal	0	0.139	0	22.21	0	0.1565	0	0.000145	0	0.0145	0	0.00004	0
On-site diesel use 75<hp<750	gal	0	0.139	0	22.24	0	0.101	0	0.00013	0	0.009	0	0.00004	0
On-site diesel use >750 hp	gal	0	0.139	0	22.24	0	0.149	0	0.00013	0	0.006	0	0.00004	0
Transportation diesel use	gal	179.567	0.139	24.95981	22.5	4040.258	0.17	30.52639	0.0054	0.969662	0.0034	0.610528	5.2E-06	0.000934
Transportation diesel use - car	gal	0	0.139	0	22.57	0	0.015	0	0.0002	0	0.003	0	0.00252	0
Transportation diesel use - passenger truck	gal	0	0.139	0	22.545	0	0.0585	0	0.0002	0	0.007	0	0.002605	0
Transportation diesel use - User Defined	gal	0	0.139	0	22.5	0	0.17	0	0.0054	0	0.0034	0	5.2E-06	0
Diesel produced	gal	224.117	0.017	3.809989	3.02	676.8333	0.0051	1.142997	0.0062	1.389525	0.0017	0.380999	0.0011	0.246529
Total Diesel Footprint		**224.117**		**34.96225**		**5719.466**		**39.24289**		**2.599757**		**1.142997**		**0.247694**
Total Biodiesel Footprint														
On-site biodiesel use	gal	0	0.127	0	22.3	0	0.2	0	0	0	0.00099	0	NP	
On-site biodiesel use - User Defined	gal	0	0.127	0	22.3	0	0.2	0	0	0	0.00099	0	NP	
Transportation biodiesel use	gal	0	0.127	0	22.3	0	0.2	0	0	0	0.00099	0	NP	
Transportation biodiesel use - User Defined	gal	0	0.127	0	22.3	0	0.2	0	0	0	0.00099	0	NP	
Biodiesel produced	gal	0	0.029	0	-16.8	0	0.018	0	0.033	0	0.00082	0	NP	
Total Biodiesel Footprint		**0**		**0**		**0**		**0**		**0**		**0**		**0**
Total Natural Gas Footprint														
On-site natural gas use	ccf	0	0.103	0	13.1	0	0.01	0	6.3E-06	0	0.00076	0	8.4E-06	0
Transportation natural gas use	ccf	0	0.103	0	13.1	0	0.01	0	6.3E-06	0	0.00076	0	8.4E-06	0
Transportation natural gas use - User Defined	ccf	0	0.103	0	13.1	0	0.01	0	6.3E-06	0	0.00076	0	8.4E-06	0
Natural gas produced	ccf	0	0.0052	0	2.2	0	0.0037	0	0.0046	0	0.000072	0	6.1E-06	0
Total Natural Gas Footprint		**0**		**0**		**0**		**0**		**0**		**0**		**0**
Total Liquified Petroleum Gas Footprint														
On-site liquified petroleum gas use - Other	ccf	0	NP		12.69	0	0.021	0	0.00013	0	0.001	0	0	0
On-site liquified petroleum gas use	ccf	0	NP		12.69	0	0.021	0	0.00013	0	0.001	0	0	0
Liquified petroleum gas produced	ccf	0	0.088	0	1.47	0	0.0016	0	0.0024	0	0.0007	0	0.0003	0
Total Natural Gas Footprint		**0**		**0**		**0**		**0**		**0**		**0**		**0**
Total Compressed Gas Footprint														
On-site compressed gas use - Other	ccf	0	NP		1957.835	0	16.0325	0	0.023045	0	0.2775	0	0	0
On-site compressed gas use	ccf	0	NP		1957.835	0	16.0325	0	0.023045	0	0.2775	0	0	0
Compressed gas produced	ccf	0	19.983	0	343.92	0	0.4732	0	2.1651	0	0.1846	0	0.2895	0
Total Natural Gas Footprint		**0**		**0**		**0**		**0**		**0**		**0**		**0**

Notes:

Note: Please refer to the "Default Conversions" tab for references for the default conversion factors used on this calculation sheet.

Space below available for notes and calculations:

APPENDIX F
Health and Safety Plan

HALEY & ALDRICH, INC.
SITE-SPECIFIC SAFETY PLAN

FOR

Proposed Former Corzo Maintenance Site

168 Banker Street, Brooklyn, New York 11222

Project/File No. 0211545

Gensuite EZ Scan®

BI - Developers

Prepared By: Siara Greco	**Date: 6/26/2025**
Approvals: The following signatures constitute approval of this Health & Safety Plan.	
Insert Field Safety Managers electronic signature.	
Field Safety Manager: Choose an item.	**Date:** Click or tap to enter a date.
Insert Project Manager's electronic signature.	
Project Manager: Sarah Commisso	**Date:** Click or tap to enter a date.
HASP Valid Through: 12/31/2025	

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Note: This HASP is developed for Haley & Aldrich purposes only and not for use by others.

STOP WORK AUTHORITY

In accordance with Haley & Aldrich (Haley & Aldrich) Stop Work Authority Operating Procedure (OP1035), any individual has the right to refuse to perform work that he or she believes to be unsafe without fear of retaliation. He or she also has the authority, obligation, and responsibility to stop others from working in an unsafe manner.

STOP Work Authority is the stop work policy for all personnel and subcontractors on the Site. When work has been stopped due to an unsafe condition, Haley & Aldrich site management (e.g., Project Manager [PM], Site Health & Safety Officer [SHSO], etc.) and the Haley & Aldrich Senior Project Manager (SPM) will be notified immediately.

Reasons for issuing a stop work order include, but are not limited to:

- The belief/perception that injury to personnel or an accident causing significant damage to property or equipment is imminent.
- A Haley & Aldrich subcontractor is in breach of site safety requirements and/or their own site Health and Safety Plan (HASP).
- Identifying a substandard condition (e.g., severe weather) or activity that creates an unacceptable safety risk as determined by a qualified person.

Work will not resume until the unsafe act has been stopped OR sufficient safety precautions have been taken to remove or mitigate the risk to an acceptable degree. Stop work orders will be documented as part of an on-site stop work log, on daily field reports to include the activity/activities stopped, the duration, person stopping work, person in-charge of stopped activity/activities, and the corrective action agreed to and/or taken. Once work has been stopped, only the Haley & Aldrich SPM or SHSO can give the order to resume work. Haley & Aldrich senior management is committed to supporting anyone who exercises his or her “Stop Work” authority.

Note: This HASP has been developed for Haley & Aldrich purposes only and is not for use by others.

ISSUANCE AND COMPLIANCE

This HASP has been prepared in accordance with Occupational Safety and Health Administration (OSHA) regulations (CFR 29, Parts 1904, 1910, and 1926) if such are applicable.

The specific requirements of this HASP include precautions for hazards that exist during this project and may be revised as new information is received or as site conditions change.

- This HASP must be signed by all Haley & Aldrich personnel involved in the implementation of the SOW (Section 2 of this HASP).
- This HASP, or a current signed copy, must be retained at all times when Haley & Aldrich staff are present.
- Revisions to this HASP must be outlined within the contents of the HASP. If immediate or minor changes are necessary, the Field Safety Manager (FSM), Haley & Aldrich, SHSO, and/or PM may use Attachment 1 (HASP Amendment Form), presented at the end of this HASP. Any revision to the HASP requires employees and subcontractors to be informed of the changes so that they understand the requirements of the change.
- Deviations from this HASP are permitted with approval from the Haley & Aldrich FSM, PM, or Senior Health & Safety Manager (SHSM). Unauthorized deviations may constitute a violation of Haley & Aldrich company procedures/policies and may result in disciplinary action.
- This HASP will be relied upon by Haley & Aldrich's subcontractors and visitors to the site. Haley & Aldrich's subcontractors must have their own HASP, which will address hazards specific to their trade that are not included in this HASP. This HASP will be made available for review to Haley & Aldrich's subcontractors and other interested parties (e.g. Facility personnel and regulatory agencies) to ensure that Haley & Aldrich has properly informed our subcontractors and others of the potential hazards associated with the implementation of the SOW to the extent that Haley &Aldrich is aware.

This site-specific HASP provides only site-specific descriptions and work procedures. General safety and health compliance programs in support of this HASP (e.g., injury reporting, medical surveillance, personal protective equipment [PPE] selection, etc.) are described in detail in the Haley &Aldrich Corporate Health and Safety Program Manual and within Haley & Aldrich's Standard Operating Procedures (SOPs). Both the manual and SOPs can be located on Haley & Aldrich's Company Intranet. When appropriate, users of this HASP should always refer to these resources and incorporate them to the extent possible. The manual and SOPs are available to clients and regulators upon request.

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EMERGENCY EVENT PROCEDURES

1 - ASSESS THE SCENE

- **STOP WORK**
- Review the situation and ascertain if it's safe to enter the area.
- Evacuate the site if the conditions are unsafe.

2 - EVALUATE THE EMERGENCY

- **Call 911, or designated emergency number, if required.**
- **Provide first aid for the victim if qualified and safe to do so.**
  - First aid will be addressed using the on-site first aid kit. *
    - If providing first aid, remember to use proper first aid universal precautions if blood or bodily fluids are present.
- **If exposure to hazardous substance is suspected, immediately vacate the contaminated area.**
  - Remove any contaminated clothing and/or equipment.
  - Wash any affected dermal/ocular area(s) with water for at least 15 minutes.
  - Seek immediate medical assistance if any exposure symptoms are present.

** Note: Haley & Aldrich employees are not required or expected to administer first aid / CPR to any Haley & Aldrich staff member, Contractor, or Civilian personnel at any time; it is Haley & Aldrich´s position that those who do are doing so on their own behalf and not as a function of their job.*

3 - SECURE THE AREA

- **Cordon off the incident area, if possible.**
  - Notify any security personnel, if required.
  - Escort all non-essential personnel out of the area, if able.

4 - REPORT ON-SITE ACCIDENTS / INCIDENTS TO PM / SSO

- **Notify the PM and SSO as soon as it is safe to do so.**
  - Assist PM and SSO in completing any additional tasks, as required.

5 - INVESTIGATE / REPORT THE INCIDENT

- **Record details of the incident for input to the Gensuite.**
  - Complete any additional forms as requested by the PM and SSO.

6 - TAKE CORRECTIVE ACTION

- **Implement corrective actions per the PM following root cause analysis.**
  - Complete Lessons Learned form.

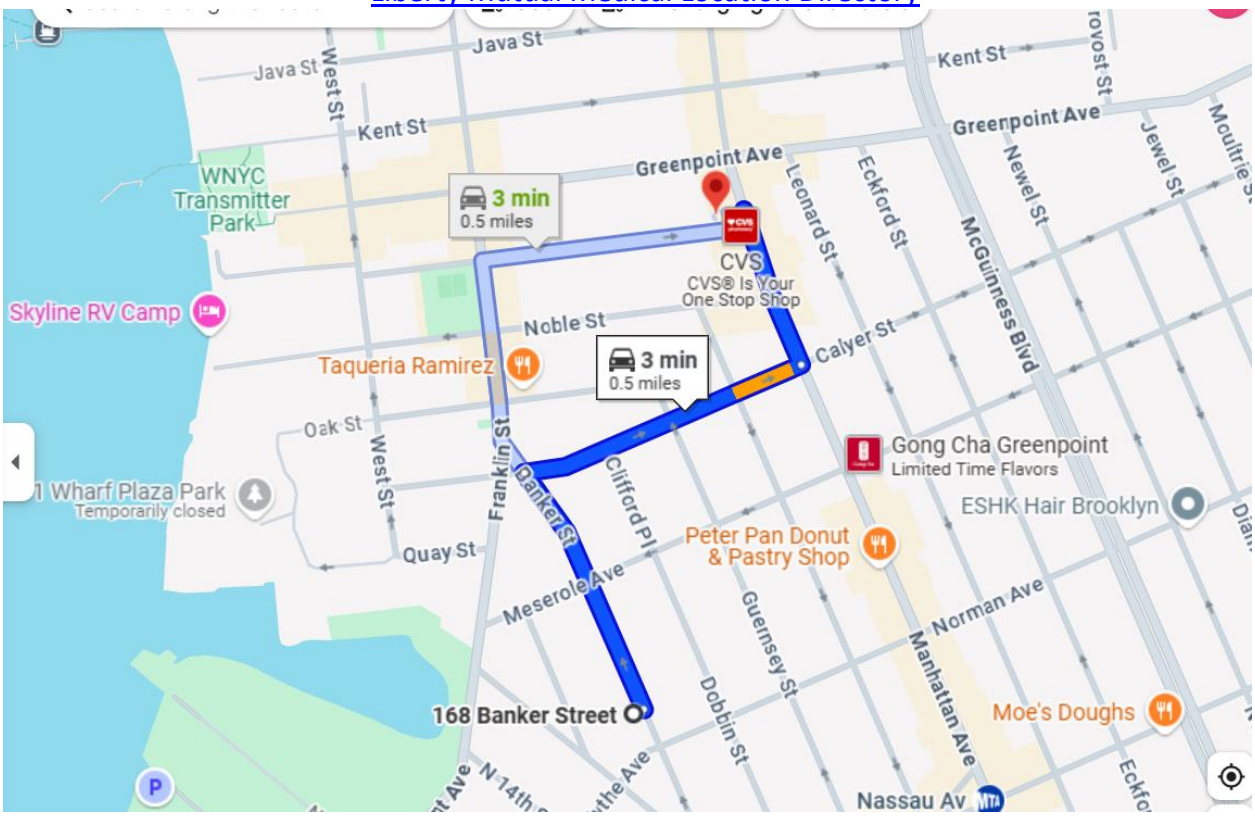
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PROJECT INFORMATION AND CONTACTS	
Project Name: Proposed Former Corzo Maintenance Site	**Haley & Aldrich File No.:** 0211545
Location: Brooklyn, New York	
Client/Site Contact: Phone Number:	Louis Handler (718) 302-7005 Extension 103
Haley & Aldrich Field Representative: Phone Number: Emergency Phone Number:	Calvin Jackson (646) 568-9393 (929) 729-1243
Haley & Aldrich Project Manager: Phone Number: Emergency Phone Number:	**Sarah Commisso** (646) 277-5693 (516) 317-9861
Field Safety Manager: Phone Number: Emergency Phone Number:	Luke McCartney (646) 568-9357 (551) 655-7720
Subcontractor Project Manager: Phone Number:	Tim Kelly (631) 257-5321
Nearest Hospital: Address: (see map on next page) Phone Number:	NYC Health + Hospitals/ Gotham Health, Greenpoint 875 Manhattan Ave, Brooklyn, NY 11222 (844) 692-4692
Nearest Occ. Health Clinic: http://www.talispoint.com/liberty/ext/ Address: (see map on next page) Phone Number:	CityMD Greenpoint Urgent Care-Brooklyn 795 Manhattan Ave, Brooklyn, NY 11222 (718)489-3549
Liberty Mutual Claim Policy	**WC6Z11254100033**
Emergency Response Number:	**911**
Other Local Emergency Response Number:	N/A
Other Ambulance, Fire, Police, or Environmental Emergency Resources:	

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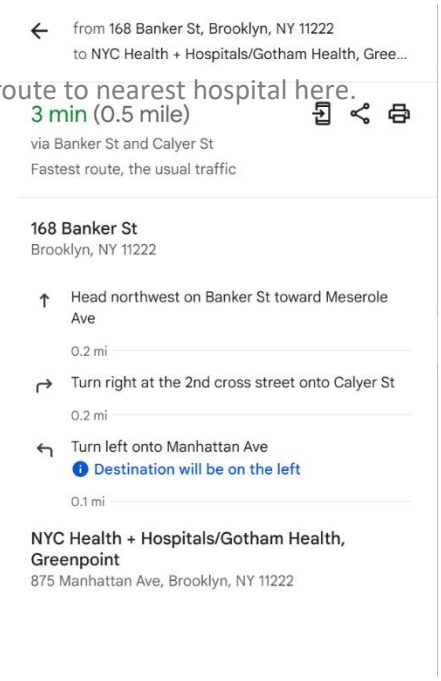
DIRECTIONS TO THE NEAREST HOSPITAL

Liberty Mutual Medical Location Directory



Directions to the Nearest Hospital:

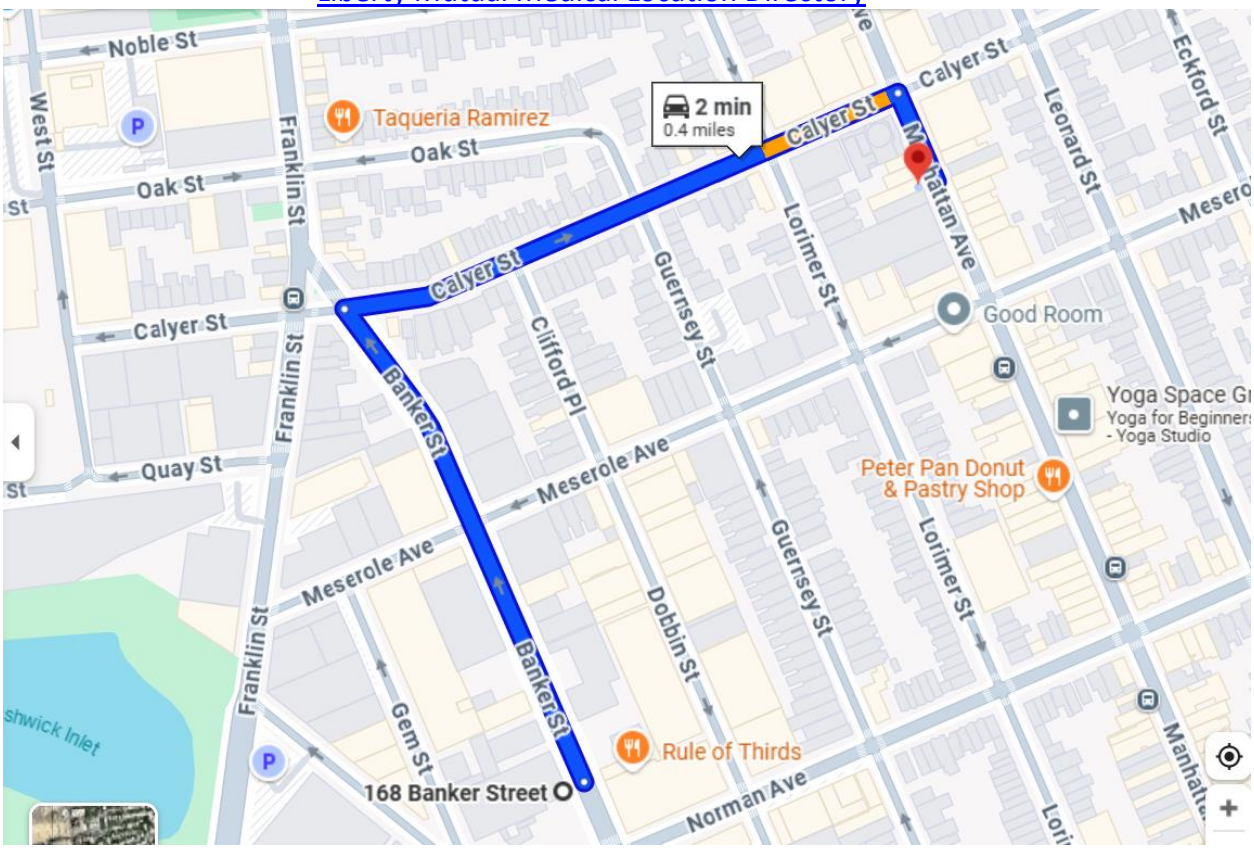
Paste map and directions showing route to nearest hospital here.



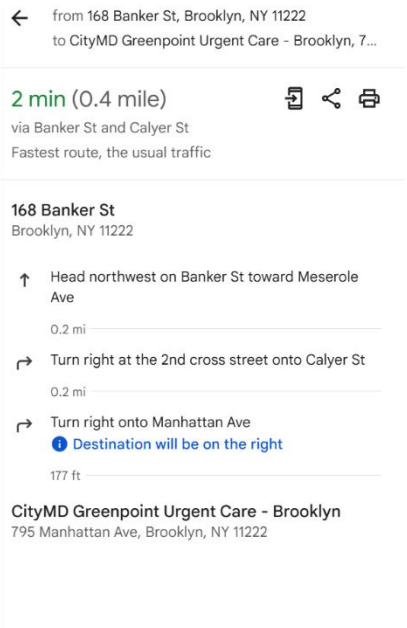
Note: This HASP is developed for Haley & Aldrich purposes only and not for use by others.

DIRECTIONS TO THE NEAREST URGENT CARE

Liberty Mutual Medical Location Directory



Directions to the Nearest Occupational Clinic:



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1. WORK SCOPE

This Site-Specific Health and Safety Plan (HASP) addresses the health and safety practices and procedures that will be exercised by all Haley & Aldrich employees participating in all work on the Project Site. This plan is based on an assessment of the site-specific health and safety risks available to Haley & Aldrich and Haley & Aldrich's experience with other similar project sites. The scope of work includes the following:

Enter a complete description of the project work scope and breakdown the types of activities involved. For construction monitoring projects, specify the types of field control activities to be performed. Summarize general work activities and testing, sampling and handling requirements and intensity of contact with site media.)

Project Task Breakdown

Task No.	Task Description	Employee(s) Assigned	Work Date(s) or Duration
1	Geophysical Survey	Calvin Jackson	1 Day Anticipated
2	Drilling	Calvin Jackson	3 Days Anticipated
3	Soil, Soil Vapor, Groundwater Sampling	Calvin Jackson	5 Days Anticipated

Subcontractor(s) Tasks

Firm Name	Work Activity	Work Date(s) or Duration
Lakewood Environmental Services Corp.	Drilling	3 Days

Projected Start Date: 9/8/2025

Projected Completion Date: 9/12/2025

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2. SITE OVERVIEW / DESCRIPTION

Site Classification

Commercial

Site Description

The site, identified as Block 2615 Lot 125 on the New York City tax map in a M1-5 zoning area, is approximately 21,730 square feet (sq ft) and is vacant with no permanent structures.

Background and Historic Site Usage

Based on a Phase I Environmental Site Assessment (ESA) completed by Roux Environmental Engineering and Geology, D.P.C. (Roux) in March 2022, the Site was historically located in a marsh/wetland area adjoining the East River, located to the west of the Site. This area was filled by the early 1900s. The 1905 Sanborn Fire Insurance Map shows the subject property divided into eight tax lots with no structures. The Site remained relatively unchanged until 1942, when the Site was developed with a small one-story storage structure in the central eastern portion of the Site. By 1951, the former storage structure was no longer present, and two structures indicated as sand blasting and a wash house were present in the northeast and northwest corners of the subject property, respectively. Sanborn Fire Insurance Maps from 1965 to 1996 show the Site as a vacant lot with no structures. The Site was identified as “parking” on Sanborn Fire Insurance Maps from 2001 to 2007. The Phase I ESA indicates that Corzo Contracting, a subsurface utility installation contractor, utilized the Site as a storage yard for materials and vehicles from the mid-1990s through at least 2022. The Site is currently vacant with no structures present.

Site Status

Indicate current activity status and describe operations at the site:

Inactive

Site is currently inactive and is surrounded by construction fencing.

Site Plan

Is a site plan or sketch available? Yes

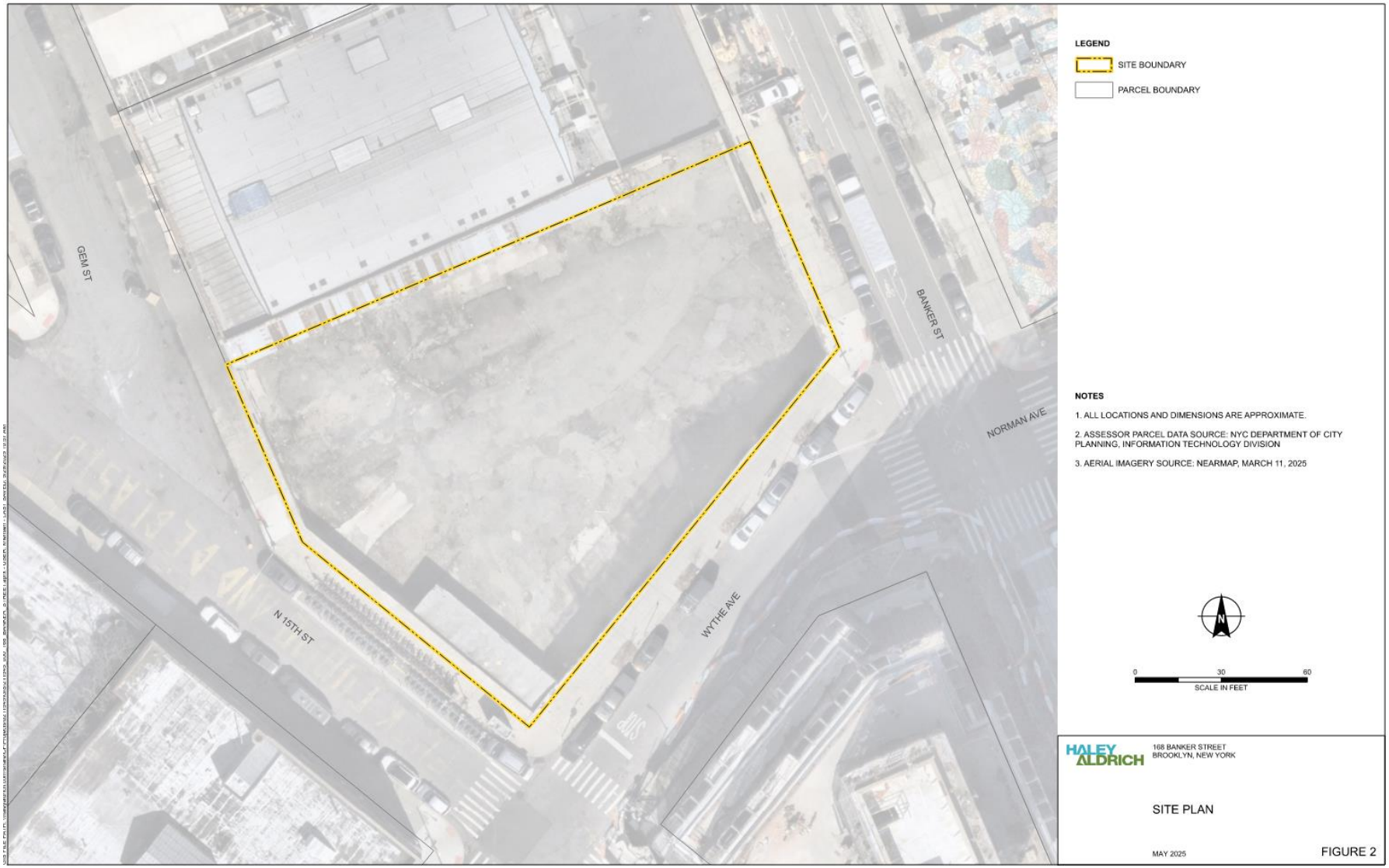
Work Areas

List and identify each specific work areas(s) on the job site and indicate its location(s) on the site plan:

Entire Site

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Site Plan



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3. HAZARD ASSESSMENT

Indicate all hazards that may be present at the site and for each task. If any of these potential hazards are checked, it is the Project Manager's responsibility to determine how to eliminate / minimize the hazard to protect onsite personnel.

Site Chemical Hazards

Is this Site impacted with chemical contamination? Yes

Source of information about contaminants: Previous Investigation

Contaminant of Concern	Location/Media	Concentration	Units
Benzo(a)anthracene	**Soil**	**130**	**mg/kg**
Benzo(a)pyrene	**Soil**	**150**	**mg/kg**
Benzo(b)fluoranthene	**Soil**	**160**	**mg/kg**
Chrysene	**Soil**	**120**	**mg/kg**
Dibenzo(a,h)anthracene	**Soil**	**15**	**mg/kg**
Indeno(1,2,3-cd)pyrene	**Soil**	**140**	**mg/kg**
Arsenic	**Soil**	**118**	**mg/kg**
Lead	**Soil**	**2,280**	**mg/kg**
Mercury	**Soil**	**6.7**	**mg/kg**
Copper	**Soil**	**487**	**mg/kg**
Naphthalene	**Groundwater**	**97**	**ug/L**
Polycyclic aromatic hydrocarbons (PAHs)	**Groundwater**	**1.4**	**ug/L**
BTEX/VOCs	**Soil Vapor**	**101**	**ug/m3**
Volatile Organic Compounds (VOCs)	**Soil Vapor**	**328,903**	**ug/m3**
Tetrachloroethylene	**Soil Vapor**	**94**	**ug/m3**
Trichloroethylene	**Soil Vapor**	**313,000**	**ug/m3**
Cis- 1,2-Dichloroethylene	**Soil Vapor**	**9,870**	**ug/m3**

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Arsenic: The Occupational Safety and Health Administration has set limits of 10 microgram arsenic per cubic meter of workplace air (10 µg/m3) for 8 hour shifts and 40 hour work weeks. Several studies have shown that inorganic arsenic can increase the risk of lung cancer, skin cancer, bladder cancer, liver cancer, kidney cancer, and prostate cancer. The World Health Organization (WHO), the Department of Health and Human Services (DHHS), and the EPA have determined that inorganic arsenic is a human carcinogen.

Breathing high levels of inorganic arsenic can give you a sore throat or irritated lungs. Ingesting high levels of inorganic arsenic can result in death. Lower levels of arsenic can cause nausea and vomiting, decreased production of red and white blood cells, abnormal heart rhythm, damage to blood vessels, and a sensation of "pins and needles" in hands and feet.

Lead: The effects of lead are the same whether it enters the body through breathing or swallowing. Lead can affect almost every organ and system in your body. The main target for lead toxicity is the nervous system. Long-term exposure to lead can result in decreased performance in some tests measuring functions of the nervous system in adults. It may also cause weakness in fingers, wrists, or ankles. Lead exposure also causes small increases in blood pressure, particularly in middle-aged and older people and can cause anemia. Exposure to high lead levels can severely damage the brain and kidneys and ultimately cause death.

Mercury: is an odorless, silver metallic liquid. It can be inhaled or absorbed through the skin. Contact may cause irritation to the skin or eyes. Toxic if ingested. Fume inhalation may cause irritation in the nose, throat or lungs. This is a corrosive chemical. Symptoms of poisoning include, muscle tremors, loss of appetite, and nausea. Long-term exposure may have effects on the central nervous system and kidneys. The PEL is 0.1 mg/m^3 averaged over an 8 hour shift.

Cis- 1,2-Dichloroethylene: is a clear, colorless liquid and has an ether like odor. It is utilized to produce many types of pharmaceuticals, solvents, resins and has been used to help extract oils and fats from fish and other meat. Cis-1,2-Dichloroethylene has also been utilized as a refrigerant.

VOCs: include all organic compounds (substances made up of predominantly carbon and hydrogen) with boiling temperatures in the range of 50-260 degrees C, excluding pesticides. This means that they are likely to be present as a vapor or gas in normal ambient temperatures. Substances which are included in the VOC category include aliphatic hydrocarbons (such as hexane), aldehydes, aromatic hydrocarbons (such as benzene, toluene, and the xylenes or BTEX), and oxygenated compounds (such as acetone and similar ketones). The term VOC often is used in a legal or regulatory context and in such cases the precise definition is a matter of law.

VOCs are released from oil and gasoline refining, storage and combustion as well as from a wide range of industrial processes. Processes involving fuels, solvents, paints or the use of chemicals are the most significant sources. VOCs may also be emitted from cleaning products, degreasing products, fabrics, carpets, plastic products, glues, printed material, varnishes, wax, disinfectants, and cosmetics.

Typically, VOCs are present in gas or vapor and will enter the body by breathing contaminated air. Higher concentrations of VOCs may occur in areas of poor ventilation.

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BTEX/VOCs: BTEX is an acronym for benzene, toluene, ethylbenzene and xylenes. These compounds are VOCs, are common in petroleum-related products (e.g., oil, gasoline, coal-tar DNAPL, etc.), and frequently co-occur at hazardous waste sites. Benzene, toluene, ethylbenzene, and xylenes have acute and chronic harmful effects on the central nervous system. Benzene is classified as a carcinogen. Short-term health effects of low-level BTEX exposure include drowsiness, dizziness, accelerated heart rate, headaches, tremors, confusion, and unconsciousness.

Trichloroethylene: is a nonflammable colorless liquid with a sweet odor. Trichloroethylene vapor is heavier than air and is found in low lying areas.

Tetrachloroethylene: is a colorless liquid with a sharp sweet odor. Tetrachloroethylene vapor is heavier than air and will be found in low lying areas.

Site Hazards Checklist

Weather

Hot Temperatures	Lightning Storms	High Winds	Select Hazard

Hot Temperatures

Heat stress may occur at any time work is being performed at elevated ambient temperatures. Because heat stress is one of the most common and potentially serious illnesses associated with outdoor work during hot seasons, regular monitoring and other preventative measures are vital. Site workers must learn to recognize and treat the various forms of heat stress. The best approach is preventative heat stress management.

H&A employees and their subcontractors should be aware of potential health effects and/or physical hazards of working when there are hot temperatures or a high heat index. Refer OP1015-Heat Stress for a discussion on hot weather hazards.

Lightning Storms

Where the threat of electrical storms and the hazard of lightning exist staff shall ensure site procedures exist to: (1) detect when lightning is in the near vicinity and when there is a potential for lightning and (2) to notify appropriate site personnel of these conditions and (3) implement protocols to stop work and seek shelter.

The 30-30 Rule states that if time between seeing the lightning and hearing the thunder is less than 30 seconds, you are in danger and must seek shelter. You must also stay indoors for more than 30 minutes after hearing the last clap of thunder.

High Winds

While high winds are commonly associated with severe thunderstorms and hurricanes they may also occur as a result of differences in air pressures, such as when a cold front passes across the area. They

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can cause downed trees and power lines, and flying debris (such as dust or larger debris), which adds additional risks and could lead to power outages, transportation disruptions, damage to buildings and vehicles, and serious injury.

Wind Advisory are issued for sustained winds 25 to 39 mph and/or gusts to 57 mph. High Wind warnings are issued by the National Weather Service when high wind speeds may pose a hazard or is life threatening. The criteria for this warning will varies by state. The Beaufort Wind Scale is a helpful tool to when dealing with high winds.

Biological			
Stinging Insects	Large/Small Mammals	Wildlife Droppings	Choose an item.

Stinging Insects

Stinging Insects fall into two major groups: Apidae (honeybees and bumblebees) and vespids (wasps, yellow jackets, and hornets). Apidae are docile and usually do not sting unless provoked. The stinger of the honeybee has multiple barbs, which usually detach after a sting. Vespids have few barbs and can inflict multiple stings.

There are several kinds of stinging insects that might be encountered on the project site. Most stings will only result in a temporary injury. However, sometimes the effects can be more severe, even life-threatening depending on where you are stung and what allergies you have. Being stung in the throat area of the neck may cause edema (swelling caused by fluid build-up in the tissues) around the throat and may make breathing difficult.

In rare cases, a severe allergic reaction can occur. This can cause "anaphylaxis" or anaphylactic shock with symptoms appearing immediately or up to 30 minutes later. Symptoms include; Hives, itching and swelling in areas other than the sting site, swollen eyes/eyelids, wheezing, chest tightness, difficulty breathing, hoarse voice, swelling of the tongue, dizziness or sharp drop in blood pressure, shock, unconsciousness or cardiac arrest. Reactions can occur the first time you are stung or with subsequent stings. If you see any signs of reaction, or are unsure, call or have a co-worker call emergency medical services (e.g., 911) right away. Get medical help for stings near the eyes, nose or throat. Stay with the person who has been stung to monitor their reaction.

Staff who are allergic to bee stings are encouraged to inform their staff/project manager. If staff member carries an Epi-pen (i.e., epinephrine autoinjector) they are encouraged to inform their colleagues in case they are stung and are incapable of administering the injection. Examine site for any signs of activity or a hive/nest. If you see several insects flying around, see if they are entering/exiting from the same place. Most will not sting unless startled or attacked. Do not swat, let insects fly away on their own. If you must, walk away slowly or gently "blow" them away. If a nest is disturbed and you hear "wild" buzzing, protect your face with your hands and run from the area immediately. Wear long sleeves, long pants, and closed-toed boots. Wear light colored clothes such as khakis. Avoid brightly colored, patterned, or black clothing. Tie back long hair to avoid bees or wasps from entanglement. Do not wear perfumes, colognes or scented soaps as they contain fragrances that are attractive. If bee or wasp is found in your car, stop and leave windows open.

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Large Mammals

When working in remote locations staff may come near wild or stray dogs, coyotes, foxes or other large animals. It is important that staff avoid contact with these animals.

There are increasing reports of wild dog attacks on household pets, attacks on human are uncommon and rare or infrequent at best. However, attacks by individual or small groups of domestic dogs occur frequently resulting in injury or a fatality on rare occasion. Wild dogs may become skilled at hunting in groups for small game and large game from rabbits and hares to deer and moose. The impact of wild dogs, on livestock and wildlife, varies by location and is influenced by factors such as availability of other food, number of dogs, and competition by other predators. Wild dogs kill house cats and may injure or kill domestic dogs. Areas where people have not hunted and trapped wild dogs, a fear of humans may not have developed and in such dogs may attack people and children. This can be a serious problem in areas where feral dogs feed at and live around garbage dumps near human dwellings. Such situations occur most frequently around small remote towns. In urban settings domestic dogs can be territorial and exhibit aggressive behavior such as barking and snarling when their area is encroached. It is not uncommon for domestic dogs to travel in small packs.

If the pack displays aggressive behavior and charges do not run or turn your back. When confronted by one or more dog it is important not to run or exhibit any behavior that may be construed as a challenge (e.g., looking the dog in the eyes, showing your teeth, or attempting to pet the dog).Stand still and place your work bag between you and the dog and then begin to move slowly away from the dog(s) while not turning your back. If you see a stray dog approaching from a distance, look for a place that's secure. Step inside a fenced area, enter a place of business, or knock on a neighbor's door. It is always better to be safe than risk a potentially dangerous situation.

Small Mammals

Rodents, are the most abundant order of mammals. There are hundreds of species of rats; the most common are the black and brown rat. Other rodents you may encounter are mice, beavers, squirrels, guinea pigs, capybaras and coypu.

The Brown Rat has small ears, blunt nose, and short hair. It is approximately 14-18” long (with tail). They frequently infest garbage/rubbish, slaughterhouses, domestic dwellings, warehouses, and supermarkets. They also frequent any space with an easy meal and potential nesting sites. The Black Rat is identified by its tail, that is always longer than the length from the head to the body. It is also slimmer and more agile than the Brown rat. Its size varies according to its environment and food supply.

The House Mouse has the amazing ability to adapt and can frequently be found in human dwellings. In buildings, mice will live anywhere and difficult to keep out. Mice are omnivorous, they will eat anything. Rats and mice often become a serious problem in cold winter months when they seek food and warmth inside buildings. They may suddenly appear in large numbers when excavation work disturbs their in-ground nesting locations or their food source is changed.

Some major problems caused by rats and mice are contaminating the food they eat with urine and excrement. Gnawing into materials such as paper, wood, or upholstery, to use as nest material. Also

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gnawing plastic, cement, soft metals such as lead and aluminum, and wiring, which may cause a fire hazard. Occasionally biting people and may kill small animals. They, or the parasites they carry, like fleas, mites and worms, spread many diseases such as salmonella, trichinosis, rat bite fever, hantavirus, Weil's disease, and bubonic plague. They damage ornamental plants by burrowing among the roots or feeding on new growth. They also eat garden vegetables, such as corn and squash. These rodents have been a problem for centuries, because of their incredible ability to survive and are so difficult to eliminate. In addition, they are extremely compatible with human behavior and needs.

Avoid contact with rodents, if possible. Avoid contact with rodent excrement. Do not eat food or water that may have encountered rodent excrement. If exposed, wash hands and avoid touching your face with your hands.

Wildlife Droppings

Project sites involving abandoned buildings may bring staff into contact with animal droppings. There are many diseases that one can be exposed to from a variety of animals.

Mice and Rats
Hantavirus is transmitted to humans from dried droppings, urine, or saliva of mice and rats. The disease begins as a flu-like illness with fever, chills, and muscle aches, but can rapidly progress to a life-threatening condition marked by respiratory failure as fluids fill the lungs. Persons working in infested buildings are at increased risk to this disease, particularly during dusty clean-up activities.

Birds and Bats
Large populations of roosting birds may present a disease risk. The most serious health risks arise from disease organisms that grow in the nutrient-rich accumulations of bird droppings, feathers and debris under a roost, particularly if roosts have been active for years.

Histoplasmosis and Cryptococcosis are the most common fungal diseases associated with bird and bat dropping. Infection occurs when spores, carried by the air, are inhaled, especially after a roost has been disturbed. The active and inactive roosts of blackbirds, starlings and cowbirds have also been found to be heavily contaminated with fungus spores. Most infections are mild and produce either no symptoms or a minor influenza-like illness. Occasionally the disease can cause high fever, blood abnormalities, pneumonia and even death.

Do not touch droppings with unprotected hands. Avoid disturbing the droppings and generating dust. Employee work practices and dust control measures that eliminate or reduce dust generation during removal of manure from a building will also reduce risks of infection and development of disease. Use an industrial vacuum cleaner with a high-efficiency (HEPA) filter to bag contaminated material.

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Location/Terrain			
Economically Depressed	SIMOPS	Slip/Trip/Falls	Choose an item.

Economically Depressed Areas

Economically depressed areas may have high crime rates. Projects involving work in and around inactive industrial sites may bring staff into contact with indigent and homeless persons. Staff could be subjected to crime that includes but may not be limited to thievery, vandalism, and violence. Prior to the start of work staff need to understand the work locations and the potential for exposure to low level crime.

Staff members should never work alone in these areas. A buddy system is required. Conduct during daylight hours. Secure equipment and vehicles. If warranted, contact the local police department for a security detail. Leave the work area immediately and contact the local authorities if staff members feel threatened or are threatened.

SIMOPS

SIMOPS are described as the potential class of activities which could bring about an undesired event or set of circumstances, e.g., safety, environment, damage to assets, schedule, commercial, financial, etc. SIMOPS are defined as performing two or more operations concurrently.

SIMOPS should be identified at an early stage before operations commence to understand issues such as schedule and physical clashes, maintenance activities, failure impacts, interferences between vessels, contracts and third part interfaces and environmental impacts.

Coordinate project with site activities. Identify and understand the hazards associated with the host and client's activities. Integrate site emergency response protocols where appropriate and communicate to all project staff. Integrate site communication protocols and communicate to all project staff.

Slips, Trips & Falls

Slip and trip injuries are the most frequent injuries to workers. Statistics show most falls happen on the same level resulting from slips and trips. Both slips and trips result from unintended or unexpected change in the contact between the feet and the ground or walking surface. Good housekeeping, quality of walking surfaces (flooring), awareness of surroundings, selection of proper footwear, and appropriate pace of walking are critical for preventing fall accidents.

Site workers will be walking on a variety of irregular surfaces, that may affect their balance. Extra care must be taken to walk cautiously near rivers because the bottom of the riverbed maybe slick and may not be visible. Rocks, gradient changes, sandy bottoms, and debris may be present but not observable.

Take your time and pay attention to where you are going. Adjust your stride to a pace that is suitable for the walking surface and the tasks you are doing. Check the work area to identify hazards - beware of

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trip hazards such as wet floors, slippery floors, and uneven surfaces or terrain. Establish and utilize a pathway free of slip and trip hazards. Choose a safer walking route. Carry loads you can see over. Keep work areas clean and free of clutter. Communicate hazards to on-site personnel and remove hazards as appropriate.

Miscellaneous			
Extended Shift	Choose an item.	Choose an item.	Choose an item.

Extended Shift

An extended shift can include extending a workday beyond eight hours. Extended or unusual work shifts may be more stressful physically, mentally, and emotionally. Non-traditional shifts and extended work hours may disrupt the body's regular schedule, leading to increased fatigue, stress, and lack of concentration. This leads to an increased risk of operator error, injuries and/or accidents. The degree to which an individual is exposed to fatigue risk factors depends upon the work schedule. As both the duration of the workday and the number of days worked increase so does the fatigue risk factors. Staff Managers need to be aware of the fatigue risk factors and ensure projects are structured to mitigate these factors. Staff Members also have a responsibility to manage the personal fatigue risk factors that they can control outside of work (e.g, duration and quality of sleep, diet, drugs, and alcohol)

Fatigue is a message to the body to rest and can be eliminated with proper rest. However, if rest is not possible, fatigue can increase and becomes distressing and eventually debilitating. Fatigue symptoms, both mental and physical, vary and depend on the person and degree of overexertion. Examples include: weariness, sleepiness, irritability, reduced alertness, lack of memory, concentration and motivation, increased susceptibility to illness, depression, headache, loss of appetite, and digestive problems.

When possible, managers should limit use of extended shifts and increase the number of days worked. Working shifts longer than 8 hours generally result in reduced productivity and alertness. Additional breaks and meals should be provided when working extended shift periods. Tasks requiring heavy physical labor or intense concentration should be performed at the beginning of the shift if possible. This is an important consideration for pre-emergency planning.

Make efforts, when feasible, to ensure that unavoidable extended work shifts and shift changes allow affected employees time for adequate rest and recovery. Project Managers need to plan to have an adequate number of personnel available to enable workers to take breaks, eat meals, relax, and sleep.

Plan for regular and frequent breaks throughout the work shift. If at remote sites, ensure if possible, that there is a quiet, secluded area designated for rest and recuperation. In addition to formal breaks such as lunch or dinner, encourage use of micro breaks to change positions, move about, and shift concentration. Personnel should look to obtain an adequate quantity and quality of sleep.

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Task Hazard Summary

Task 1 – Geophysical Survey

Surveying presents many challenges regarding safety given that the survey location is typically dynamic and can be at large construction sites, roadways, or in the woods. Before beginning a survey, determine potential hazards that might arise from the natural environment, the public, and the contractor's operations and plan the survey accordingly.

Work on a construction site will expose staff to heavy equipment, SIMOPs, and the hazards associated with the type of construction being conducted. Coordination with the site GC is critical. Work on a road way will expose staff to vehicular traffic and potentially foot traffic. The safety measures employed must be consistent with the MUTCD or equivalent state requirements. Staff need to maintain at least six feet of space between moving traffic and the work area. This includes work on shoulders as well as on the traveled way. Survey at the maximum space possible between moving traffic and the work area. Whenever feasible, each staff member must face moving traffic at all times. If it is not possible to face traffic, a lookout should be used. Work in remote areas may expose staff to wildlife, insects and poor communication. Equipment shall be carried properly so that pinch points are avoided and staff are not overloaded when moving from one location to another.

Use of proper PPE (e.g., High Visibility Vests) is an important component of conducting the work safely. Suspend survey operations when uncontrollable hazards develop. Resume work only when safe working conditions have been restored.

Task 2 – Drilling

Drilling is conducted for a range of services that can include but are not limited to: soil characterization, environmental investigation, well installation, and ore exploration. Familiarity with basic drilling safety is an essential component of all drilling projects. Potential hazards related to drilling operations include, but are not limited to encountering underground or overhead utilities, traffic and heavy equipment, hoisting heavy tools, steel impacts, open rotation entanglement, and the planned or unexpected encountering of toxic or hazardous substances. While staff members do not operate drilling equipment, they may work in close proximity to operating drilling equipment and may be exposed to many of the same hazards as the drilling subcontractor. It is imperative that staff are aware of emergency stops and establish communication protocols with the drillers prior to the start of work.

See OP 1002 Drilling Safety for more information.

Ground disturbance activities such as excavating or drilling have the potential to contact underground utilities and may be considered a hazardous activity and a permit to work may be required. Once the H&A Project Manager has identified the work zone and the areas designated for ground disturbance the PM or designee is required to delineate the area with either white paint or flags so that the appropriate agencies know which area to check for their respective utilities. Haley & Aldrich staff members must ensure that permission has been gained from the property owner to access the property prior to site entry and before marking any proposed exploration or drilling locations.

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The Project Manager shall verify that the proposed dig or drill zones are adequately marked or staked prior to the locators site visit, and that the appropriate Line Location Organization/ Contractor has been notified (a minimum of 72 business hours in advance) of all planned ground disturbance activities and a request for line location has been registered with the applicable One Call or dial Before You Dig organization when applicable. Personnel that are required to mark the area need to identify and understand the hazards associated with the project area which can range from a public roadway to a greenspace in a remote location.

See OP1020 Work Near Utilities.

Task 3A – Soil Sampling

Soil sampling by H&A staff on active construction sites can be conducted in conjunction with a wide range activities such as building construction, earthwork and soil management related activities. These activities can include, but are not limited to: drill spoil characterization and management during building foundation element installation, characterization of excavated soils for management/disposal/reuse during earthwork activities, and as part of environmental remedial activities such as delineation and confirmation sampling. Familiarity with basic heavy construction safety, site conditions (geotechnical and environmental), and potential soil contaminants are essential components of soil sampling performed on active sites. Potential hazards related to soil sampling at construction sites include, but are not limited to: encountering site vehicle traffic and heavy equipment operations, manual lifting, generated waste, contact or exposure to impacted soil, and encountering unknown toxic or hazardous substances. Although soil sampling is commonly performed within active excavations, from stockpiles, or within trench excavations, sampling locations and situations will vary depending on site conditions. Care should be taken while entering and exiting excavations or trenches, and when accessing (climbing up or down) soil stockpiles, ensuring that the sampling area is not being actively accessed by construction equipment. Care should also be taken with handling of potentially environmentally impacted soil during sampling, with appropriate PPE identified and used. At no time during classification activities are personnel to reach for debris near machinery that is in operation, place any samples in their mouth, or come in contact with the soils without the use of gloves. Staff will have to carry and use a variety of sampling tools, equipment, containers, and potentially heavy sample bags. It is imperative that staff are aware of emergency / communication protocols with the Contractor prior to the start of work.

Task 3B – Soil Vapor Sampling

Soil gas sampling is employed as an indirect indicator of contamination in soil or groundwater particularly over and around landfill waste sites, or groundwater plumes. Soil gas sampling points can be installed manually using a slam bar or power driven mechanical devices (e.g., demolition hammer or Geoprobe) may be used based on site conditions (i.e., pavement, frozen ground, very dense clays, etc.). Soil gas samples can be drawn through the probe itself, or through Teflon tubing inserted through the probe and attached to the probe point. Samples are collected and analyzed as described below. Other field air monitoring devices, such as the Combustible Gas Indicator (CGI) and the Organic Vapor Analyzer (OVA), can also be used, depending on specific site conditions.

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Because the sample is being drawn from underground, and no contamination is introduced into the breathing zone, soil gas sampling usually occurs in Level D. Nevertheless, ambient air should be constantly monitored to obtain background and breathing zone readings during the sampling procedure in the event the seal around the sampling point is breached. As long as the levels in ambient air do not rise above background, no upgrade of the level of protection is needed. Also, an underground utility search must be performed prior to sampling.

Task 3C – Water Sampling

Environmental water sampling could include activities such as groundwater sampling from permanent or temporary wells, or surface water sampling from streams, rivers, lakes, ponds, lagoons, and surface impoundments.

Sampling tasks could involve uncapping, purging (pumping water out of the well), and sampling, and/or monitoring, new or existing monitoring wells. A mechanical pump may be used to purge the wells and can be hand-, gas-, or electric-operated. Water samples taken from the wells are then placed in containers and shipped to an analytical laboratory for analysis. The physical hazards of these operations are primarily associated with the collection methods and procedures used.

When sampling bodies of water containing known or suspected hazardous substances, adequate precautions must be taken to ensure the safety of sampling personnel. The sampling team member collecting the sample should not get too close to the edge, where ground failure or slips, trips or falls may cause him/her to lose his/her balance. The person performing the sampling should have fall restraint or protection for the task. When conducting sampling from a boat in an impoundment or flowing waters, appropriate vessel safety procedures should be followed. Avoid lifting heavy coolers with back muscles; instead, use ergonomic lifting techniques, team lift or mechanical lifts. Wear proper gloves, such as when handling sample containers to avoid contacting any materials that may have spilled out of the sample containers.

Inhalation and absorption of COCs are the primary routes of entry associated with water sampling, due to the manipulation of sample media and equipment, manual transfer of media into sample containers, and proximity of operations to the breathing zone. During this project, several different groundwater sampling methodologies may be used based on equipment accessibility and the types of materials to be sampled. These sampling methods may include hand or mechanical bailing. The primary hazards associated with these specific sampling procedures are not potentially serious; however, other operations in the area or the conditions under which samples must be collected may present chemical and physical hazards. The hazards directly associated with groundwater sampling procedures are generally limited to strains or sprains from hand bailing, and potential eye hazards. Exposure to water containing COCs is also possible. All tools and equipment that will be used at the site must be intrinsically safe (electronics and electrical equipment) and non-sparking or explosion-proof (hand tools).

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Task Physical Hazards Checklist			
Potential Task Hazards	**Task 1** **Geophysical Survey**	**Task 2** **Drilling**	**Task 3** **Soil, Soil Vapor, Groundwater Sampling**
Ergonomics	☒	☒	☒
Generated Wastes	☐	☒	☒
Ground Disturbance	☐	☒	☒
Hand/Power Tools	☐	☒	☒
Heavy Equipment	☐	☒	☐
Line of Fire	☐	☒	☐
Manual Lifting	☐	☒	☒
Noise	☐	☒	☐
Overhead Utilities	☐	☒	☐
Repetitive Motion	☐	☒	☒
Slippery Surfaces	☒	☒	☒
Sharp Objects	☐	☒	☒
Underground Utilities	☒	☒	☒
Other: Specify	☐	☐	☐

Summary of Physical Hazards & Controls

Ergonomics

Most Work-related Musculoskeletal Disorders (WMSDs) are caused by Ergonomic Stressors. Ergonomic Stressors are caused by poor workplace practices and/or insufficient design, which may present ergonomic risk factors. These stressors include, but not limited to, repetition, force, extreme postures, static postures, quick motions, contact pressure, vibration, and cold temperatures.

WMSDs are injuries to the musculoskeletal system, which involves bones, muscles, tendons, ligaments, and other tissues in the system. Symptoms may include numbness, tightness, tingling, swelling, pain, stiffness, fatigue, and/or redness. WMSD are usually caused by one or more Ergonomic Stressors. There may be individual differences in susceptibility and symptoms among employees performing similar tasks. Any symptoms are to be taken seriously and reported immediately.

See OP1053 Ergonomics for more information.

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Controls

- Ensure workstations are ergonomically correct so bad posture is not required to complete tasks.
- Take periodic breaks over the course of the day.
- Stretch during break times.
- Break up tasks that require repetitive motion.
- Contact Corporate H&S with any ergonomic concerns

Generated Waste

Activities on environmental sites may generate waste that requires regulated handling and disposal. Excess sample solids, decontamination materials, poly sheeting, used PPE, etc. that are determined to be free of contamination through field or laboratory screening can usually be disposed into client-approved, on-site trash receptacles. Uncontaminated wash water may be discarded onto the ground surface away from surface water bodies in areas where infiltration can occur. Contaminated materials must be segregated into liquids or solids and drummed separately for off-site disposal.

Controls

- Manage waste properly through good work practices.
- Collect, store, containerize waste, and dispose of it properly.
- All wastes generated shall be containerized in an appropriate container (i.e. open or closed top 55-gallon drum, roll-off container, poly tote, cardboard box, etc.) as directed by the PM.
- Containers should be inspected for damages or defects
- Waste containers should be appropriately labeled indicating the contents, date the container was filled, owner of the material (including address) and any unique identification number, if necessary.
- Upon completion of filling the waste container, the container should be inspected for leaks and an appropriate seal.

Ground Disturbance

Ground disturbance is defined as any activity disturbing the ground. Ground disturbance activities include, but are not limited to, excavating, trenching, drilling (either mechanically or by hand), digging, plowing, grading, tunneling and pounding posts or stakes.

Because of the potential hazards associated with striking an underground utility or structure, the operating procedure for underground utility clearance shall be followed prior to performing any ground disturbance activities.

See OP1020 Working Near Utilities

Controls

Prior to performing ground disturbance activities, the following requirements should be applied:

- Confirm all approvals and agreements (as applicable) either verbal or written have been obtained.
- Request for line location has been registered with the applicable One-Call or Dial Before You Dig organization, when applicable.
    - Whenever possible, ground disturbance areas should be adequately marked or staked prior to the utility locators site visit.

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- Notification to underground facility operator/owner(s) that may not be associated with any known public notification systems such as the One-Call Program regarding the intent to cause ground disturbance within the search zone.
- Notifications to landowners and/or tenant, where deemed reasonable and practicable.
- Proximity and Common Right of Way Agreements shall be checked if the line locator information is inconclusive.

Hand and Power Tools

Hand and power tools can expose staff to a wide range of hazards depending upon the tool used. Hazards can include but are not limited to: falling, flying, abrasive, and splashing objects, or harmful dusts, fumes, mists, vapors, or gases.

Serious accidents often occur before steps are taken to evaluate and avoid or eliminate tool-related hazards. Staff must recognize the hazards associated with the different types of tools and the safety precautions necessary to prevent those hazards.

See OP 1026 Hand and Power Tools for more information.

Controls

- Keep all tools in good condition with regular maintenance.
- Use the right tool for the job. Do not use a tool for a task which it was not designed for.
- Examine each tool for damage before use and do not use damaged tools.
- For tools that are damaged or defective, red tag the tool and take out of service.
- Operate tools per the manufacturers' instructions.
- Use the appropriate personal protective equipment.
- All electrically powered tools will be connected through a ground fault circuit interrupter (GFCI).
- All personnel must be trained on the use of the tool they are utilizing.

Heavy Equipment

Staff must be careful and alert when working around heavy equipment, failure or breakage and limited visibility can lead to accidents and worker injury. Heavy equipment such as cranes, drills, haul trucks, or other can fail during operation increasing chances of worker injury. Equipment of this nature shall be visually inspected and checked for proper working order prior to commencement of field work. Those operating heavy equipment must meet all requirements to operate the equipment. Haley & Aldrich, Inc. staff that supervise projects or are associated with high risk projects that involve digging or drilling should use due diligence when working with a construction firm.

See OP1052 Heavy Equipment for additional information.

Controls

- Only approach equipment once you have confirmed contact with the operator (e.g., operator places the bucket on the ground).
- Always maintain visual contact with operators and keep out of the strike zone whenever possible.
- Always be alert to the position of the equipment around you.
- Always approach heavy equipment with an awareness of the swing radius and traffic routes of all equipment and never go beneath a hoisted load.

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- Avoid fumes created by heavy equipment exhaust.

Manual Lifting/Moving

Most materials associated with investigation, remedial, or construction-related activities are moved by hand. The human body is subject to damage in the forms of back injury, muscle strains, and hernia if caution is not observed in the handling process.

Controls

- Under no circumstances should any one person lift more than 49 pounds unassisted.
- Always push, not pull, the object when possible.
- Size up the load before lifting. If it is heavy or clumsy, get a mechanical aid or help from a worker.
- Bend the knees; it is the single most important aspect of lifting.
- When performing the lift:
    - Place your feet close to the object and center yourself over the load.
    - Get a good handhold.
    - Lift straight up, smoothly and let your legs do the work, not your back!
    - Avoid overreaching or stretching to pick up or set down a load.
    - Do not twist or turn your body once you have made the lift.
    - Make sure beforehand that you have a clear path to carry the load.
    - Set the load down properly.

Noise

Working around heavy equipment (drill rigs, excavators, etc.) often creates excessive noise. The effects of noise include physical damage to the ear, pain, and temporary and/or permanent hearing loss. Workers can also be startled, annoyed, or distracted by noise during critical activities. Noise monitoring data that indicates that working within 25 feet of operating heavy equipment result in exposure to hazardous levels of noise (levels greater than 85 dBA).

See OP 1031 Hearing Conservation for additional information.

Controls

- Personnel are required to use hearing protection (earplugs or earmuffs) within 25 feet of any operating piece of heavy equipment.
- Limit the amount of time spent at a noise source.
- Move to a quiet area to gain relief from hazardous noise sources.
- Increase the distance from the noise source to reduce exposure.

Overhead Utilities

When work is undertaken near overhead electrical lines, the distance maintained from those lines shall also meet the minimum distances for electrical hazards as defined in Table 1 below. Note: utilities other than overhead electrical utilities need to be considered when performing work.

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Table 1 Minimal Radial Clearance Distances *

Normal System Voltage Kilovolts (kV)	Required Minimal Radial Clearance Distance (feet/meters)
0 – 50	10/3.05
51 – 100	12/3.66
101 – 200	15/4.57
201 – 300	10/6.1
301 – 500	25/7.62
501 – 750	35/10.67
750 - 1000	45/13.72

* For those locations where the utility has specified more stringent safe distances, those distances shall be observed.

Controls

- To prevent damage, guy wires shall be visibly marked and work barriers or spotters provided in those areas where work is being conducted.
    - When working around guy wires, the minimum radial clearance distances for electrical power shall be observed.
- The PM shall research and determine if the local, responsible utility or client has more restrictive requirements than those stated in Table 1.
- If equipment cannot be positioned in accordance with the requirements established in Table 1 the lines need to be de-energized.

Repetitive Motion

Repetitive Motion or Strain Injuries are injuries effecting muscles, nerves, and tendons by repetitive movement and overuse. Almost any kind of awkward or repetitive motion you make could lead to an injury over time. Actions like bending or twisting of the wrists, reaching for materials, working with your hands above shoulder level, or grasping objects can increase wear and tear on the body. The condition mostly effects the upper body.

Controls

- Arrange your work zone, supplies and tools as much as possible to avoid reaching, leaning, bending and twisting your waist or wrists.
- During rest breaks, use stretches to loosen up your body.
- Vary tasks if you can so that you are not making the same movement repeatedly over for a long period.

Sharp Objects

Workers who handle sharp edged objects like sheets of steel or glass are at risk of cuts. Workers who handle sharp edged objects are also at risk of cuts. Injuries may occur to hands, fingers, or legs when they are in the way of the blade, when the blade slips, or if an open blade is handled unexpectedly. Other hazards at job sites include stepping on sharp objects (e.g. wooden boards with protruding nails, sharp work-tools, chisels, etc.) and colliding with sharp and/or protruding objects.

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Controls

Always be alert when handling sharps. Never look away or become distracted while handling sharp objects. Use caution when working with tools; use right tool for the job. Keep tools sharp, dull blades are a safety hazard, requiring more force to make cuts which can lead to tool slippage. Wear appropriate PPE and do not handle sharp objects (i.e., broken glass) with bare hands. Use mechanical devices, when possible. Stay away from building debris; avoid handling site debris or placing your hand where you cannot see. Watch out for barbed wire and electrical fences; cover with a car mat or equivalent to cross or walk around; use the buddy system to avoid entanglement; wear gloves. Do not leave unprotected sharps unattended. Use protective shields, cases, styrofoam blocks, etc. Pass a sharp by handing it over carefully by the handle with the blade down or retracted. Fixed open blades are prohibited. Always cut away from the body, making several passes when cutting thicker materials. Make sure blades are fitted properly into the knife. Never cut items with a blade or other sharp object on your lap. Never try to catch a blade or cutting tool that is falling.

Slippery Surfaces

Both slips and trips result from unintended or unexpected change in the contact between the feet and ground or walking surface. Good housekeeping, quality of walking surfaces, selection of proper footwear, and appropriate pace of walking are critical for preventing fall accidents. Slips happen where there is too little friction or traction between the footwear and walking surface.

Common causes of slips are wet or oily surfaces, spills, weather hazards, loose unanchored rugs or mats and flooring or other walking surfaces that do not have same degree of traction in all areas.

Weather-related slips and falls become a serious hazard as winter conditions often make for wet or icy surfaces outdoors. Even wet organic material or mud can create hazardous walking conditions. Spills and leaks can also lead to slips and falls.

Controls

- Evaluate the work area to identify any conditions that may pose a slip hazard.
- Address any spills, drips or leaks immediately.
- Mark areas where slippery conditions exist.
- Select proper footwear or enhance traction with additional PPE.
- Where conditions are uncertain or environmental conditions result in slippery surfaces walk slowly, take small steps, and slide feet on wet or slippery surfaces.

Underground Utilities

Various forms of underground/overhead utility lines or conveyance pipes may be encountered during site activities. Prior to the start of intrusive operations, utility clearance is mandated, as well as obtaining authorization from all concerned public utility department offices. Should intrusive operations cause equipment to come into contact with utility lines, the SHSO, Project Manager, and Regional H&S Manager shall be notified immediately. Work will be suspended until the client and applicable utility agency is contacted and the appropriate actions for the situation can be addressed.

See OP1020 Work Near Utilities for complete information.

Controls

- Obtain as-built drawings for the areas being investigated from the property owner;

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- Visually review each proposed soil boring locations with the property owner or knowledgeable site representative;
- Perform a geophysical survey to locate utilities;
- Hire a private line locating firm to determine location of utility lines that are present at the property;
- Identifying a no-drill or dig zone;
- Hand dig or use vacuum excavation in the proposed ground disturbance locations if insufficient data is unavailable to accurately determine the location of the utility lines.

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4. PROTECTIVE MEASURES

The personal protective equipment and safety equipment (if listed) is specific to the associated task. The required PPE and equipment listed must be onsite during the task being performed. Work shall not commence unless the required PPE or Safety Equipment is present.

Required Safety & Personal Protective Equipment			
Required Personal Protective Equipment (PPE)	**Task 1**	**Task 2**	**Task 3**
	Geophysical Survey	Drilling	Soil, Soil Vapor, Groundwater Sampling
Hard hat	☒	☒	☒
Safety Glasses	☒	☒	☒
Safety Toed Shoes	☒	☒	☒
Class 2 Safety Vest	☒	☒	☒
Hearing Protection	☐	☒	☐
Nitrile Gloves	☐	☒	☒
Cut-Resistant Gloves (A4)	☒	☒	☒
Level of protection required	D	D	D
Required Safety Equipment			
Fire Extinguisher	☐	☐	☐
First Aid Kit	☒	☒	☒

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5. TRAINING REQUIREMENTS

The table below lists the training requirements staff must have respective to their assigned tasks and that are required to access the Site.

Site Specific Training Requirements
HAZWOPER - 40 Hour (Initial)
HAZWOPER - 8 Hour (Annual Refresher)

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6. AIR MONITORING PLAN AND EQUIPMENT

Exposures to airborne substances shall be fully characterized throughout project operations to ensure that exposure controls are effectively selected and modified as needed.

Is air/exposure monitoring required at this work site for personal protection? Yes

Is perimeter monitoring required for community protection? No

Air monitoring plan not applicable No

Air Monitoring/Screening Equipment Requirements

Photo-Ionization Detector (PID) 10.6eV

The required equipment listed above must be on site. Work shall not commence unless the equipment is present and in working order.

Monitoring Plans

Select Monitoring Plan

***If chemical does not have an action level use TLV or REL, whichever is lowest, to be used as an action level. If TLV or REL are the same as PEL, cut the PEL in half for an action level.**

Parameter/ Contaminant	Equipment	Action Level*	Response Activity
VOCs	PID 10.6 eV	<10 ppm >10 ppm for 5 minutes >10 ppm for >5 minutes	Continue work and monitoring. Clear Instrument and Re-Monitor the Area. Implement PPE upgrades Evacuate the area and call RHSM and/or PM for further guidance. Implement engineering controls.

Zone Location		Monitoring Interval
Breathing Zone	Edge of Exclusion Zone	Choose an item.

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7. DECONTAMINATION & DISPOSAL METHODS

All possible and necessary steps shall be taken to reduce or minimize contact with chemicals and contaminated/impacted materials while performing field activities (e.g., avoid sitting or leaning on, walking through, dragging equipment through or over, tracking, or splashing potential or known contaminated/impacted materials.)

Personal Hygiene Safeguards

The following minimum personal hygiene safeguards shall be adhered to:

1. No smoking or tobacco products in any project work areas.
2. No eating or drinking in the exclusion zone.
3. It is required that personnel present on site wash hands before eating, smoking, taking medication, chewing gum/tobacco, using the restroom, or applying cosmetics and before leaving the site for the day.

It is recommended that personnel present on site shower or bathe at home at the end of each day of working on the site.

Decontamination Supplies

All decontamination should be conducted at the project site in designated zones or as dictated by Client requirements. Decontamination should not be performed on Haley & Aldrich owned or leased premises.

☐ Acetone	☒ Distilled Water	☐ Polyethylene Sheeting
☒ Alconox Soap	☒ Drums	☐ Pressure/Steam Cleaner
☒ Brushes	☐ Hexane	☒ Tap Water
☒ Disposal Bags	☐ Methanol	☐ Wash tubs
☒ 5 Gallon Buckets	☒ Paper Towels	☐ Other: Specify

Location of Decontamination Station

Decontamination station location to be coordinated by field lead in a safe area, away from vehicular and pedestrian traffic.

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Standard Personal Decontamination Procedures

Outer gloves and boots should be decontaminated periodically as necessary and at the end of the day. Brush off solids with a hard brush and clean with soap and water or other appropriate cleaner whenever possible. Remove inner gloves carefully by turning them inside out during removal. Wash hands and forearms frequently. It is good practice to wear work-designated clothing while on-site which can be removed as soon as possible. Non-disposable overalls and outer work clothing should be bagged onsite prior to laundering. If gross contamination is encountered on-site contact the Project Manager and Field Safety Manager to discuss proper decontamination procedures.

The steps required for decontamination will depend upon the degree and type of contamination but will generally follow the sequence below.

1. Remove and wipe clean hard hat
2. Rinse boots and gloves of gross contamination
3. Scrub boots and gloves clean
4. Rinse boots and gloves
5. Remove outer boots (if applicable)
6. Remove outer gloves (if applicable)
7. Remove Tyvek coverall (if applicable)
8. Remove respirator, wipe clean and store (if applicable)
9. Remove inner gloves (if outer gloves were used)

PPE that is not grossly contaminated can be bagged and disposed in regular trash receptacles.

Small Equipment Decontamination

Pretreatment of heavily contaminated equipment may be conducted as necessary:

1. Remove gross contamination using a brush or wiping with a paper towel
2. Soak in a solution of Alconox and water (if possible)
3. Wipe off excess contamination with a paper towel

Standard decontamination procedure:

4. Wash using a solution of Alconox and water
5. Rinse with potable water
6. Rinse with methanol (or equivalent)
7. Rinse with distilled/deionized water

Inspect the equipment for any remaining contamination and repeat as necessary.

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Disposal Methods

Procedures for disposal of contaminated materials, decontamination waste, and single use personal protective equipment shall meet applicable client, locate, State, and Federal requirements.

Disposal of Single Use Personal Protective Equipment

PPE that is not grossly contaminated can be bagged and disposed in regular trash receptacles. PPE that is grossly contaminated must be bagged (sealed and field personnel should communicate with the Project Manager to determine proper disposal.

Standard Disposal Methods for Contaminated Materials

- Excess sample solids, decontamination materials, rags, brushes, poly-sheeting, etc. that are determined to be free of contamination through field screening can usually be disposed into client-approved, on-site trash receptacles.
- Uncontaminated wash water may be discarded onto the ground surface away from surface water bodies in areas where infiltration can occur.
- Contaminated materials must be segregated into liquids or solids and containerized separately for offsite disposal.

Disposal Method for Contaminated Soil

- Contaminated soil cuttings and spoils must be containerized for disposal off-site unless otherwise specifically directed.
- Soil cuttings and spoils determined to be free of contamination through field screening can usually be returned to the boreholes or excavations from which they came.

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8. SITE CONTROL

The overall purpose of site control is to minimize potential contamination of workers, protect the public from the site's hazards, and prevent vandalism. Site control is especially important in emergency situations. The degree of site control necessary depends on site characteristics, site size, and the surrounding community. The following information identifies the elements used to control the activities and movements of people and equipment at the project site.

Communication

Internal
Haley & Aldrich site personnel will communicate with other Haley & Aldrich staff member and/or subcontractors or contractors with:

Face to Face Communication

External
H&S site personnel will use the following means to communicate with off-site personnel or emergency services.

Cellular Phones

Visitors

Project Site
Will visitors be required to check-in prior to accessing the project site?

Yes

Visitor Access
Authorized visitors that require access to the project site need to be provided with known information with respect to the site operations and hazards as applicable to the purpose of their site visit. Authorized visitors must have the required PPE and appropriate training to access the project site.

Site Safety Officer or Field Safety Manager are responsible for facilitating authorized visitor access.

Zoning

Work Zone
The work zone will be clearly delineated to ensure that the general public or unauthorized worker access is prevented. The following will be used:

Cones
Flagging Tape

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9. SITE SPECIFIC EMERGENCY RESPONSE PLAN

The Emergency Response Plan addresses potential emergencies at this site, procedures for responding to these emergencies, roles, responsibilities during emergency response, and training. This section also describes the provisions this project has made to coordinate its emergency response with other contractors onsite and with offsite emergency response organizations (as applicable).

During the development of this emergency response plan, local, state, and federal agency disaster, fire, and emergency response organizations were consulted (if required) to ensure that this plan is compatible and integrated with plans of those organizations. Documentation of the dates of these consultations are the names of individuals contacted is kept on file and available upon request.

The site has been evaluated for potential emergency occurrences, based on site hazards, and the major categories of emergencies that could occur during project work are:

- Fire(s)/Combustion
- Hazardous Material Event
- Medical Emergency
- Natural Disaster

A detailed list of emergency types and response actions are summarized in Table X below. Prior to the start of work, the SSO will update the table with any additional site-specific information regarding evacuations, muster points, or additional emergency procedures. The SSO will establish evacuation routes and assembly areas for the Site. All personnel entering the Site will be informed of these routes and assembly areas.

Pre-Emergency Planning

Before the start of field activities, the Project Manager will ensure preparation has been made in anticipation of emergencies. Preparatory actions include the following:

Meeting with the subcontractor/and or client concerning the emergency procedures in the event a person is injured. Appropriate actions for specific scenarios will be reviewed. These scenarios will be discussed, and responses determined before the sampling event commences. A form of emergency communication (i.e.; Cell phone, Air horn, etc.) between the Project Manager and subcontractor and/or client will be agreed on before the work commences.

A training session (i.e., “safety meeting”) given by the Project Manager or their designee informing all field personnel of emergency procedures, locations of emergency equipment and their use, and proper evacuation procedures.

Ensuring field personnel are aware of the existence of the emergency response HASP and ensuring a copy of the HASP accompanies the field team(s).

Onsite Emergency Response Equipment

Emergency procedures may require specialized equipment to facilitate work rescue, contamination control and reduction or post-emergency cleanup. Emergency response equipment stocked

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Table 9.1 Emergency Equipment and Emergency PPE			
Emergency Equipment	**Specific Type**	**Quantity Stocked**	**Location Stored**
First Aid Kit	General First Aid Kit	1	With H&A Personnel
Emergency PPE	**Specific Type**	**Quantity Stocked**	**Location Stored**
Gloves- "Nitrile"	General Nitrile Gloves	1 Box +	With H&A Personnel

EVACUATION ALARM
Verbal Communication (Site Personnel are adjacent in work zone)
EVACUATION ROUTES
See Figure 2- Site Plan (page 9) for Evacuation Routes
EVACUATION MUSTER POINT(S)/ SHELTER AREA(S)
See Figure 2- Site for Muster Point and Shelter Area
EVACUTION RESPONSE DRILLS
The Site relies on outside emergency responders and a drill is not required.

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Table 9-2 – Emergency Planning

Emergency Type	Notification	Response Action	Evacuation Plan/Route
Chemical Exposure	Report event to SSO immediately	Refer to Safety Data Sheet for required actions	Remove personnel from work zone
Fire - Small	Notify SSO and contact 911	Use fire extinguisher if safe and qualified to do so	Mobilize to *Muster Point*
Fire – Large/Explosion	Notify SSO and contact 911	Evacuate immediately	Mobilize to *Muster Point*
Hazardous Material – Spill/Release	Notify SSO; SSO will contact PM to determine if additional agency notification is	If practicable don PPE and use spill kit and applicable procedures to contain the release	See Evacuation Map for route, move at least 100 ft upwind of spill location
Medical – Bloodborne Pathogen	Notify SSO	If qualified dispose in container or call client or city to notify for further instruction.	None Anticipated
Medical – First Aid	Notify SSO	If qualified perform first aid duties	None Anticipated
Medical – Trauma	If life threatening or transport is required call 911, immediately	Wait at site entrance for ambulance	Noe Anticipated
Security Threat	Notify SSO who will call 911 as warranted	Keep all valuables out of site and work zones delineated.	None Anticipated
Weather – Earthquake/Tsunami's	STOP WORK and evacuate Site upon any earthquake	Turn off equipment and evacuate as soon as is safe to do so	Mobilize to *Shelter Location*
Weather – Lightning Storm	STOP WORK	Work may resume 30 minutes after the last observed lightning.	None Anticipated
Weather – Tornadoes/Hurricanes	Monitor weather conditions STOP WORK and evacuate the site	Evacuate to shelter location or shelter in place immediately	Mobilize to *Shelter Location*
MUSTER POINT Will be communicated during the Onsite Kickoff Meeting		*SHELTER LOCATION* Will be communicated during the Onsite Kickoff Meeting	
In case of site emergencies, site personnel shall be evacuated per this table and will not participate in emergency response activities. Site emergencies shall be reported to local, state, and federal governmental agencies as required.			

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10. HASP ACKNOWLEDGEMENT FORM

All Haley & Aldrich employees onsite must sign this form prior to entering the site.

I hereby acknowledge receipt of, and briefing on, this HASP prior to the start of on-site work. I declare that I understand and agree to follow the provisions, processes, and procedures set forth herein at all times while working on this site.

Printed Name	Signature	Date

Note: This HASP has been developed for Haley & Aldrich purposes only and is not for use by others.

ATTACHMENT A
HASP AMENDMENT FORM

Note: This HASP has been developed for Haley & Aldrich purposes only and is not for use by others.

HASP AMENDMENT FORM

This form is to be used whenever there is an immediate change in the project scope that will require an amendment to the HASP. For project scope changes associated with "add-on" tasks, the changes must be made in the body of the HASP. Before changes can be made, a review of the potential hazards must be initiated by the Haley & Aldrich Project Manager.

This original form must remain on site with the original HASP. If additional copies of this HASP have been distributed, it is the Project Manager's responsibility to forward a signed copy of this amendment to those who have copies.

Amendment No.	
Site Name	
Work Assignment No.	
Date	
Type of Amendment	
Reason for Amendment	
Alternate Safeguard Procedures	
Required Changes in PPE	

Project Manager Name (Print)	Project Manager Signature	Date

Health & Safety Approver Name (Print)	Health & Safety Approver Signature	Date

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ATTACHMENT B
TRAINING REQUIREMENTS

Note: This HASP has been developed for Haley & Aldrich purposes only and is not for use by others.

TRAINING REQUIREMENTS

Health and Safety Training Requirements

Personnel will not be permitted to supervise or participate in field activities until they have been trained to a level required by their job function and responsibility. Haley & Aldrich staff members, contractors, subcontractors, and consultants who have the potential to be exposed to contaminated materials or physical hazards must complete the training described in the following sections.

The Haley & Aldrich Project Manager/FSM will be responsible for maintaining and providing to the client/site manager documentation of Haley & Aldrich staff members' compliance with required training as requested. Records shall be maintained per OSHA requirements.

40-Hour Health and Safety Training

The 40-Hour Health and Safety Training course provides instruction on the nature of hazardous waste work, protective measures, proper use of personal protective equipment, recognition of signs and symptoms which might indicate exposure to hazardous substances, and decontamination procedures. It is required for all personnel working on-site, such as equipment operators, general laborers, and supervisors, who may be potentially exposed to hazardous substances, health hazards, or safety hazards consistent with 29 CFR 1910.120.

8-hour Annual Refresher Training

Personnel who complete the 40-hour health and safety training are subsequently required to attend an annual 8-hour refresher course to remain current in their training. When required, site personnel must be able to show proof of completion (i.e., certification) at an 8-hour refresher training course within the past 12 months.

8-Hour Supervisor Training

On-site managers and supervisors directly responsible for, or who supervise staff members engaged in hazardous waste operations, should have eight additional hours of Supervisor training in accordance with 29 CFR 1910.120. Supervisor Training includes, but is not limited to, accident reporting/investigation, regulatory compliance, work practice observations, auditing, and emergency response procedures.

Additional Training for Specific Projects

Haley & Aldrich personnel will ensure their personnel have received additional training on specific instrumentation, equipment, confined space entry, construction hazards, etc., as necessary to perform their duties. This specialized training will be provided to personnel before engaging in the specific work activities including:

- Client specific training or orientation
- Competent person excavations
- Confined space entry (entrant, supervisor, and attendant)
- Heavy equipment including aerial lifts and forklifts
- First aid/ CPR
- Use of fall protection
- Use of nuclear density gauges
- Asbestos awareness

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ATTACHMENT C
ROLES AND RESPONSIBILITIES

Note: This HASP has been developed for Haley & Aldrich purposes only and is not for use by others.

SITE ROLES AND RESPONSIBILITIES

Haley & Aldrich Personnel

Field Safety Manager (FSM)

The Haley & Aldrich FSM is a full-time Haley & Aldrich staff member, trained as a safety and health professional, who is responsible for the interpretation and approval of this Safety Plan. Modifications to this Safety Plan cannot be undertaken by the PM or the SSO without the approval of the FSM.

Specific duties of the FSM include:

- Approving and amending the Safety Plan for this project
- Advising the PM and SHSOs on matter relating to health and safety
- Recommending appropriate personal protective equipment (PPE) and air monitoring instrumentation
- Maintaining regular contact with the PM and SSO to evaluate the conditions at the property and new information which might require modifications to the HASP and
- Reviewing and approving JSAs developed for the site-specific hazards.

Project Manager (PM)

The Haley & Aldrich PM is responsible for ensuring that the requirements of this HASP are implemented at that project location. Some of the PM´s specific responsibilities include:

- Assuring that all personnel to whom this HASP applies have received a copy of it;
- Providing the FSM with updated information regarding environmental conditions at the site and the scope of site work;
- Providing adequate authority and resources to the on-site SHSO to allow for the successful implementation of all necessary safety procedures;
- Supporting the decisions made by the SHSO;
- Maintaining regular communications with the SHSO and, if necessary, the FSM;
- Coordinating the activities of all subcontractors and ensuring that they are aware of the pertinent health and safety requirements for this project;
- Providing project scheduling and planning activities; and
- Providing guidance to field personnel in the development of appropriate Job Safety Analysis (JSA) relative to the site conditions and hazard assessment.

Site Health & Safety Officer (SHSO)

The SHSO is responsible for field implementation of this HASP and enforcement of safety rules and regulations. SHSO functions may include some or all of the following:

- Act as Haley & Aldrich´s liaison for health and safety issues with client, staff, subcontractors, and agencies.
- Verify that utility clearance has been performed by Haley & Aldrich subcontractors.
- Oversee day-to-day implementation of the Safety Plan by Haley & Aldrich personnel on site.

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- Interact with subcontractor project personnel on health and safety matters.
- Verify use of required PPE as outlined in the safety plan.
- Inspect and maintain Haley & Aldrich safety equipment, including calibration of air monitoring instrumentation used by Haley & Aldrich.
- Perform changes to HASP and document in Appendix A of the HASP as needed and notify appropriate persons of changes.
- Investigate and report on-site accidents and incidents involving Haley & Aldrich and its subcontractors.
- Verify that site personnel are familiar with site safety requirements (e.g., the hospital route and emergency contact numbers).
- Report accidents, injuries, and near misses to the Haley & Aldrich PM and FSM as needed.

The SHSO will conduct initial site safety orientations with site personnel (including subcontractors) and conduct toolbox and safety meetings thereafter with Haley & Aldrich employees and Haley & Aldrich subcontractors at regular intervals and in accordance with Haley & Aldrich policy and contractual obligations. The SHSO will track the attendance of site personnel at Haley & Aldrich orientations, toolbox talks, and safety meetings.

Field Personnel

Haley & Aldrich personnel are responsible for following the health and safety procedures specified in this HASP and for performing their work in a safe and responsible manner. Some of the specific responsibilities of the field personnel are as follows:

- Reading the HASP in its entirety prior to the start of on-site work;
- Submitting a completed Safety Plan Acceptance Form and documentation of medical surveillance and training to the SHSO prior to the start of work;
- Attending the pre-entry briefing prior to beginning on-site work;
- Bringing forth any questions or concerns regarding the content of the Safety Plan to the PM or the SHSO prior to the start of work;
- Stopping work when it is not believed it can be performed safely;
- Reporting all accidents, injuries and illnesses, regardless of their severity, to the SHSO;
- Complying with the requirements of this safety plan and the requests of the SHSO; and
- Reviewing the established JSAs for the site-specific hazards on a daily basis and prior to each shift change, if applicable.

Visitors

Authorized visitors (e.g., Client Representatives, Regulators, Haley & Aldrich management staff, etc.) requiring entry to any work location on the site will be briefed by the Site Supervisor on the hazards present at that location. Visitors will be escorted at all times at the work location and will be responsible for compliance with their employer´s health and safety policies. In addition, this safety plan specifies the minimum acceptable qualifications, training and personal protective equipment which are required for entry to any controlled work area; visitors must comply with these

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requirements at all times. Unauthorized visitors, and visitors not meeting the specified qualifications, will not be permitted within established controlled work areas.

SUBCONTRACTOR PERSONNEL

Subcontractor Site Representative

Each contractor and subcontractor shall designate a Contractor Site Representative. The Contractor Site Representative will interface directly with Insert Staff Name Here, the Subcontractor Site Safety Manager, with regards to all areas that relate to this safety plan and safety performance of work conducted by the contractor and/or subcontractor workforce. Contractor Site Representatives for this site are listed in the Contact Summary Table at the beginning of the Safety Plan.

Subcontractor Site Safety Manager

Each contractor / subcontractor will provide a qualified representative who will act as their Site Safety Manager (Sub-SSM). This person will be responsible for the planning, coordination, and safe execution of subcontractor tasks, including preparation of job hazard analyses (JHA), performing daily safety planning, and coordinating directly with the Haley & Aldrich SHSO for other site safety activities. This person will play a lead role in safety planning for Subcontractor tasks, and in ensuring that all their employees and lower tier subcontractors are in adherence with applicable local, state, and/or federal regulations, and/or industry and project specific safety standards or best management practices.

General contractors / subcontractors are responsible for preparing a site-specific HASP and/or other task specific safety documents (e.g., JHAs), which are, at a minimum, in compliance with local, state, and/or federal other regulations, and/or industry and project specific safety standards or best management practices. The contractor(s)/subcontractor(s) safety documentation will be at least as stringent as the health and safety requirements of the Haley & Aldrich Project specific HASP.

Safety requirements include, but are not limited to: legal requirements, contractual obligations and industry best practices. Contractors/subcontractors will identify a site safety representative during times when contractor/subcontractor personnel are on the Site. All contractor/subcontractor personnel will undergo a field safety orientation conducted by the Haley & Aldrich SHSO and/or PM prior to commencing site work activities. All contractors / subcontractors will participate in Haley & Aldrich site safety meetings and their personnel will be subject to training and monitoring requirements identified in this Safety Plan. If the contractors / subcontractors means and methods deviate from the scope of work described in Section 1 of this Safety Plan, the alternate means and methods must be submitted, reviewed and approved by the Haley & Aldrich SHSO and/or PM prior to the commencement of the work task. Once approved by the Haley & Aldrich SHSO and/or PM, the alternate means and methods submittal will be attached to this Safety Plan as an Addendum.

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ATTACHMENT D
JOB SAFETY ANALYSES

Note: This HASP has been developed for Haley & Aldrich purposes only and is not for use by others.



PROPOSED FORMER CORZO MAINTENANCE SITE

KEY TASK ENTER TASK NUMBER.: ENTER TASK NAME.

Subtask Category	Potential Hazards	Controls
Enter subtask information.	Choose category.	• Enter control(s) for each hazard.
Enter subtask information.	Choose category.	• Enter control(s) for each hazard.
Enter subtask information.	Choose category.	• Enter control(s) for each hazard.
Enter subtask information.	Choose category.	• Enter control(s) for each hazard.
Enter subtask information.	Choose category.	• Enter control(s) for each hazard.
Enter subtask information.	Choose category.	• Enter control(s) for each hazard.
Enter subtask information.	Choose category.	• Enter control(s) for each hazard.
Enter subtask information.	Choose category.	• Enter control(s) for each hazard.
Enter subtask information.	Choose category.	• Enter control(s) for each hazard.
Enter subtask information.	Choose category.	• Enter control(s) for each hazard.
Enter subtask information.	Choose category.	• Enter control(s) for each hazard.
Enter subtask information.	Choose category.	• Enter control(s) for each hazard.
Enter subtask information.	Choose category.	• Enter control(s) for each hazard.

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Enter subtask information.	Choose category.	• Enter control(s) for each hazard.

Note: This HASP is developed for Haley & Aldrich purposes only and not for use by others.

ATTACHMENT E
PROJECT SITE FORM

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Subsurface Clearance Field Checklist

PROJECT INFORMATION

Site Name:		Project Manager:	
Location:		Client Leader/LSRP:	
Client Name:		Scope of Work:	
Project Number:		Date of SSC Event:	

PROJECT BASICS (Completed prior to the start of field activities)

Site Contact Person Identified? Circle one: Yes No			
Contact Person/Company Name/Phone Number:			
Subcontractor & On-Site Representatives:			
Have the subsurface activities been explained to the subcontractor? Circle one: Yes No			
Public utility mark-out completed? Circle one: Yes No			
Public Mark-out/called in by Company/Representative:		Date:	
Ticket Number:		Utilities Notified and Response received:	

PRE-CLEARANCE (Completed prior to breaking ground or determining final locations)

Private Utility Mark-out completed? Circle one: Yes No		Date:	
Work area and each intrusive location scanned for all utilities? Circle one: Yes No			
Private Mark-out completed by Subcontractor & Representative:			
Depth of accuracy (feet):		Limitations:	
Type of equipment used:			

Utility Identified & Marked-out	Depth (ft)	Yes	No	Utility Identified & Marked-out	Depth (ft)	Yes	No
Electricity (Red)				Sewer (Green)			
Gas (Yellow)				Telephone Data (Orange)			
Water (Blue)				Fuel/Oil			
Reclaimed H_2O/Irrigation (Purple)				Proposed excavation (white)			

SCOPE OF WORK

Scope of Work provided to subcontractors? Circle one: Yes No					
Number of intrusive locations:		Targeted depth (feet):		Diameter of Borehole (inches):	
Proposed intrusive locations within 10 feet of marked and/or known utility? Circle one: Yes No					
Final locations confirmed at least 10 feet away from all utilities? Circle one: Yes No					

FIELD OBSERVATIONS

Other Utilities & Visual Clues Observed	Yes	No	Other Utilities & Visual Clues Observed	Yes	No
Natural gas meters			Fire suppression		
Water meters			Fire hydrants		
Cable markers			Fire sprinkler lines		
Sewer drains/cleanouts			Sprinkler/irrigation systems		
Overhead lines (give 15' x 15' of clearance)			Utility poles with conduit leading to the ground		
Pipeline and pipeline markers			Utility boxes		
Underground storage tank (UST)			Manholes		
UST fill ports and vent pipes			Pavement scarring		
Lights			Remote buildings with no visible utilities		
Signage			Other (specify):		
Steam lines			Other (specify):		

Any mitigations taken if points cannot be obtained or site type was not listed:_____

_____

Mitigations taken by whom: _____

Subsurface Clearance Field Checklist

Utility Point System: Gain points to protect against utility strike

Site Description	Minimum Points Needed
Combination of 2 or more Site Types	5
Commercial/Office Park	5
Downtown/Urban Development	5
Manufacturing/Active	5
Manufacturing/Non-Active	5
Mine	5
Rail	5
Residential	5
Roadway (right-of-way, highway, and secondary routes)	5
Roadway (right-of-way, rural route)	5
Universities/Government Campus/Airports	5
Abandoned/Non-Active/Vacant	3
Remote (field, woods, undisturbed)	2
Work over water	2
Site Type Not Listed Above	Consult with the PM, Utility Specialist, and Project Team
Cannot Gain Minimum Points	Perform hand clearing/soft dig/vacuum excavation

1 Point Value (2 Maximum from this Category)
Facility/contact supplied information (GIS figure with photo overlay; extensive client records and drawings)
The utilities have been marked using GPS or surveyed (with minimum accuracy of 0.1 foot)
A review of the work scope with a knowledgeable site contact (client contact, site manager, maintenance manager or other site personnel) about the site's history and utility locations/conditions (with a utility site drawing). **A knowledgeable site contact is someone who has regular responsibilities for managing site infrastructure, construction activities, and/or retaining site drawings/figures.**
A visual inspection of the site to verify that the utilities match the drawings and figures (completed after the State One Call Subsurface Clearance Checklist)
Confirmation of the low density of subsurface utilities (based on site maps, previous private utility locates)
Shallow boring advancement (<2 feet below ground surface (bgs) with non-mechanical drilling techniques)

2 Point Values
As-built drawings (plot plans, as-builts, pipeline or facilities maps, and/or lease drawings), reviewed and verified by client for updated changes
Confirmation that utilities cut off at street and align with drawings and figures
Drawing/figure (measured to scale, shows site utilities as visually verified during site walk); includes any new or repaired lines that match site (e.g., pavement scarring); depth and diameter of utilities; and recent (includes any new construction activity)
Survey data and figures produced by Haley & Aldrich and/or Haley & Aldrich site utility experience with additional site inspection
Site drawing and figures from prior private utility locate created by Haley & Aldrich (drawing must include GPS coordinates and utilities are to scale)
GPR/EM Cable location by private utility locate directly above proposed ground disturbance/borehole location

3 Point Values	3 Point Values (Open Excavations Only)
Hand Clearing/Soft Dig/Vacuum Excavation to 5 feet bgs using the following soft dig clearance methods listed from least invasive to most: • Probing • Hand Digging • Hand Auguring • Vacuum Extraction • Air/Water Knife with Vacuum Extraction	Hand Clearing/Soft Dig/Vacuum Excavation using the following soft dig clearance methods to confirm location of known utilities prior to using mechanical excavation: • Probing • Hand Digging • Vacuum Extraction

Health & Safety Tailgate Meeting Form

Project:	Project No.:
Location:	Project Manager:
Subcontractor(s):	Date:
Site Safety & Health Officer (SSHO):	SSHO Contact Info:

Emergency Procedures

If an emergency occurs, follow procedure outlined in the HASP and contact numbers below. If non-life-threatening injury occurs, contact PM to report the incident. Seek first-aid treatment from the Occupational Health Center, as outlined in the HASP.

Emergency Dispatch phone number if other than 911:	
Local Hospital:	Local Hospital Phone #:
Evacuation/Muster Point:	Alt Evacuation/Muster Point:

Simultaneous Operations (SIMOPS)

SIMOPS or Multi-Crew Activity	☐ Yes	☐ No	If yes, describe SIMOPS:	
Has SIMOPS been communicated to all workforce?	☐ Yes	☐ No		
SIMOPS PIC:			**Phone Number:**	

Task Identification

Task	Responsible Company	Task Supervisor

Required Permits/Forms (*check all that apply*)

☐None	☐Lifting Plan	☐Other:
☐Confined Space Entry Permit	☐Hot Work Permit	☐Other:
☐Lock-out / Tag-out (LOTO)	☐Ground Disturbance Permit	☐Other:
☐Excavation Permit	☐Other:	☐Other:

Discussion of Work Hazards *(check all that apply)*

☐Chemical	☐Hazardous materials (lead, asbestos, etc.)	☐Radiological
☐Confined space	☐Hosting and rigging	☐Stored energy LOTO
☐Congested work area	☐Hot work	☐Traffic control
☐Elevated work	☐Material handling	☐Weather and/or temp extremes
☐Ergonomics	☐Noise pollution	☐Waste generation
☐Emergency egress	☐Oxygen deficiency	☐Other:

Required PPE *(check all that apply)*

										
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Hearing Protection	Safety Eyewear	Hard Hat	Safety Toed Shoes	Leather or Palm Protective	Safety Vest	Protective Clothing	Respiratory Protection	PFD	Face Shield	Fall Protection

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Tailgate Topic / Hazard Discussion

Item	Discussion

Management of Change (MoC)

Does the work activity require a MoC? If yes, has it been authorized by applicable management? ☐No ☐Yes
Has the safety information been updated to incorporate any change in product, equipment, material or process? This information should include how to investigate accidents, audit compliance with safety procedures, and plan for emergency responses. ☐No ☐Yes
Have the procedures for a MoC been reviewed and evaluated? ☐No ☐Yes
Have all affected staff been informed and trained on the new equipment, process, or other changes? Health and safety hazards must be emphasized including processes/procedures in an emergency. The training must occur before any staff is allowed to operate the equipment or perform the job relating to the changes. ☐No ☐Yes
Have written procedures been put into place for the next time there is a change in safety management? ☐No ☐Yes

Best Practice(s) Observed? ☐ Yes ☐ No If yes, describe:	**H&S Observations/ Near Misses/ Incidents Reported?** ☐ Yes ☐ No If yes, describe:
Safe Work Interventions? ☐ Yes ☐ No If yes, describe:	**Have additional hazards and risk controls been identified for future work?** ☐ Yes ☐ No If yes, update appropriate job hazard analysis (JHA).

Site Safety & Health Officer Acknowledgement

At the conclusion of the day, I certify that the work site has been inspected and is being left in a safe and clean condition and any incidents have been properly reported.

Signature Date

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HALEY ALDRICH

Worker Acknowledgement

By signing here, you are stating the following:

1. You understand the hazards and risk control actions associated with each task you are about to perform.
2. You understand the permit to work requirements pertinent to the work you are about to perform (if applicable).
3. You are aware that no tasks or work that is not risk-assessed is to be performed.
4. You also are aware of your obligation to implement 'Safe Work'.
5. You arrived and departed fit for duty.
6. You are physically and mentally fit for duty.
7. You are not under the influence of any type of medication, drugs, or alcohol that could affect your ability to work safely.
8. You are aware of your responsibility to bring any illness, injury (regardless of where or when it occurred), or fatigue issue you may have to the attention of the SSHO.
9. You signed out uninjured unless you have otherwise informed the SSHO.

Name (print)	Company	Initials & Sign In/Out Time		COVID-19 Self-Declaration
		In & Fit	Out & Fit	On File

Visitor Log (*Site Visitors not involved in the work activities*)

Name (print)	Company	Initials & Sign In/Out Time		COVID-19 Self Declaration
		In & Fit	Out & Fit	On File

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SOIL BORING LOG

BORING NO.

PROJECT		PROJECT #	
LOCATION		PROJECT MGR.	
CLIENT		FIELD REP.	
CONTRACTOR		DATE STARTED	
DRILLER		DATE FINISHED	

Elevation ft.	Datum	Boring Location				
Item	Casing	Sampler	Rig Make & Model		Surface Conditions	Drilling Notes
Type			Completion Depth (ft.)	Drilling Method		
Inside Diameter (in.)						
Hammer Weight (lb.)			Number of Samples			
Hammer Fall (in.)						

Depth (ft.)	Recovery (in/tot)	PID (ppm)	Odor	Moisture	Description Depth (ft)	Visual-Manual Identification & Description (Color, primary component NAME, secondary component, optional descriptions [SYMBOL])	Remarks (Sample Information, Depth of Casing, Other Tests, Fill Interval, etc.)
0							
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth in feet to: Water

Well Construction Information

Type	Depth	Notes

Summary

Overburden (Linear ft.) _____

Rock Cored (Linear ft.) _____

Number of Samples _____

BORING NO.

*NOTE: Maximum Particle Size is determined by direct observation within the limitations of sampler size.

NOTE: Soil descriptions based on a modified Burmister method of visual-manual identification as practiced by Haley & Aldrich, Inc.

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Soil Boring Log

BORING NO.

Page of

Depth (ft.)	Recovery (ft)	PID (ppm)	Odor	Moisture	Description Depth (ft)	Visual-Manual Identification & Description (Color, primary component NAME, secondary component, optional descriptions [SYMBOL])	Remarks (Sample Information, Depth of Casing, Other Tests, Fill Interval, etc.)

NOTES:

FILE NO.

BORING NO.

*NOTE: Maximum Particle Size is determined by direct observation within the limitations of sampler size.

NOTE: Soil descriptions based on a modified Burmister method of visual-manual identification as practiced by Haley & Aldrich, Inc.

PERMANENT WELL INSTALLATION REPORT

HALEY ALDRICH

Well No.

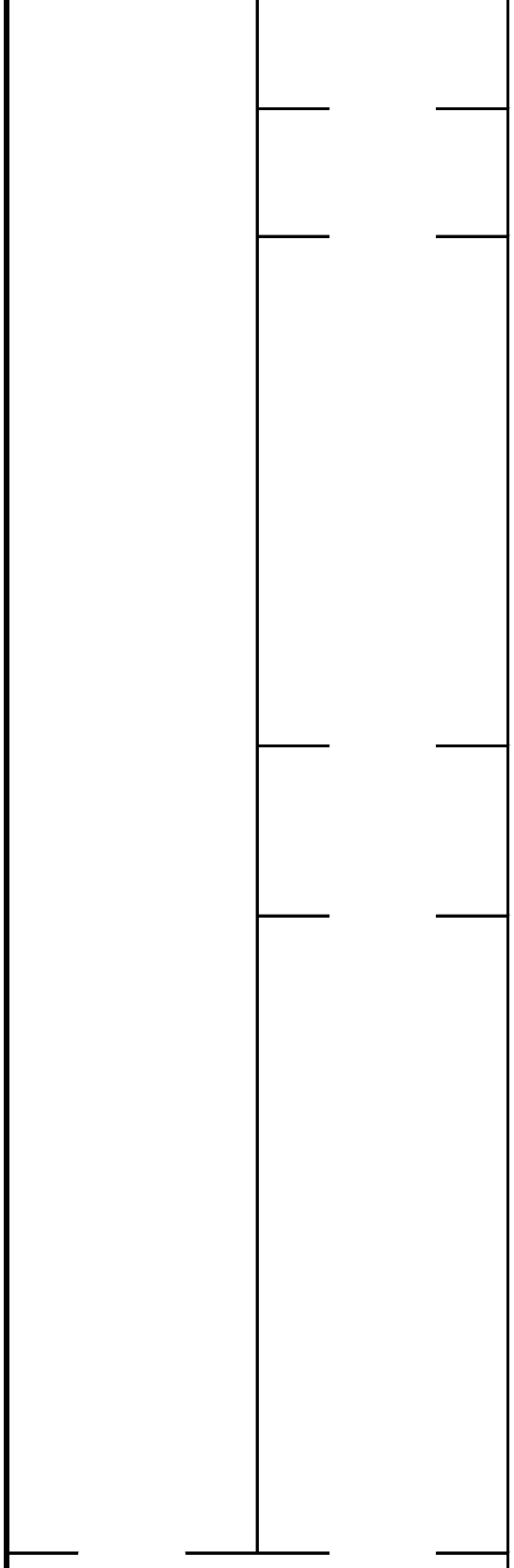
Boring No.

PROJECT		**H&A FILE NO.**	
LOCATION		**PROJECT MGR.**	
CLIENT		**FIELD REP.**	
CONTRACTOR		**DATE INSTALLED**	
DRILLER		**WATER LEVEL**	

Ground El. _____ ft	**Location** _____	**Drilling Equipment** _____	**Guard Pipe** ☐
El. Datum _____			**Roadway Box** ☐

SOIL/ROCK CONDITIONS

BOREHOLE BACKFILL



Type of protective cover/lock (circle one): Pent.bolt 9/16" hex. 1/2" hex. 7/10" hex.

Padlock key no._____

Height/Depth of top of guard pipe/roadway box above/below ground surface _____ **ft**

Height/Depth of top of riser pipe above/below ground surface _____ **ft**

Type of protective casing: _____

Length _____ **ft**

Inside Diameter _____ **in**

Depth of bottom of guard pipe/roadway box _____ **ft**

Type of Seals	**Top of Seal (ft)**	**Thickness (ft)**

Type of riser pipe: _____

Inside diameter of riser pipe _____ **in**

Type of backfill around riser _____

Diameter of borehole _____ **in**

Depth to top of well screen _____ **ft**

Type of screen Machine Slotted PVC

Screen gauge or size of openings _____ **in**

Diameter of screen _____ **in**

Type of backfill around screen _____

Depth of bottom of well screen _____ **ft**

Depth of bottom of borehole _____ **ft**

(Not to Scale)

Riser Pay Length (L1)		Length of Screen (L2)		Pay length
_____ ft	+	_____ ft	=	_____ ft

COMMENTS: _____

HALEY ALDRICH

LOW-FLOW GROUNDWATER SAMPLING RECORD

PROJECT		**H&A FILE NO.**	
LOCATION		**PROJECT MGR.**	
CLIENT		**FIELD REP**	
CONTRACTOR		**DATE**	

GROUNDWATER SAMPLING INFORMATION

Well ID:		**Well Volume:**		**Start Time:**	
Well Depth:		**Equipment:**		**Sample Time:**	
Depth to Water:					

GROUNDWATER QUALITY PARAMETERS

Time	Volume purged, gallons or liters (circle one)	Temp, C (+/-3%)	Conductivity, us/cm (+/- 3%)	Dissolved Oxygen, mg/L (+/- 10%)	pH (+/-0.1)	ORP/eH, mv (+/-10mv)	Turbidity, NTU (<5 NTU)	Depth to Water (ft)

Notes:

Synoptic Water Level Measurement Log

PROJECT	
LOCATION	
CLIENT	
H&A FILE NO.	
PROJECT MANAGER	
FIELD REP.	
GAUGING DATE	
WEATHER	

MONITORING WELL ID	TIME	DEPTH TO WATER (FT BELOW TOC)	TOP OF CASING (FT)	GROUNDWATER ELEVATION (FT)

Comments:

1. Monitoring wells "X" through "X" were surveyed by "Insert Name of Surveyor" on "Day Month Year"
2. Wells were gauged on "Day Month Year"
3. Elevation refers to the North American Vertical Datum of 1988 (NAVD88).
4. All dimensions are in US survey feet.

SOIL VAPOR/INDOOR/AMBIENT AIR SAMPLING LOG

Project Name/Location: _____ Project Number: _____

Site: _____
Date Collected: _____
Personnel: _____
Weather: _____
Humidity: _____

Sample ID	Caniser Size	Canister ID	Flow Controller ID	Sample Start Time	Canister Start Pressure ("Hg)	Sample End Time	Canister End Pressure ("Hg)	Sample Start Date	Sample Type	Analyses Method

Notes:
Summas and flow regulators provided by

Analyses for VOCs by Method TO-15/TO-15SIM (circle one)

APPENDIX G
NYSDOH CAMP Guidance Document

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

Overview

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

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

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

Community Air Monitoring Plan

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

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

Periodic monitoring for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. “Periodic” monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or

overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

VOC Monitoring, Response Levels, and Actions

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

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

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

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

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

Particulate Monitoring, Response Levels, and Actions

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

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

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

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

December 2009

Appendix 1B
Fugitive Dust and Particulate Monitoring

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

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

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

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

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

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

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

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

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

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

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

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

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