Interim Remedial Measure Work Plan

29-05 38th Avenue
Queens, New York
NYSDEC BCP Site No. C241250

Prepared for:

New York State Department of Environmental Conservation
625 Broadway
Albany, New York 12233

On Behalf of:

FH 2BRO Building Corporation
23-01 41st Avenue, Long Island City, NY 11101
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Prepared by:

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February 2022 (Revised March 2022)

INTERIM REMEDIAL MEASURE WORK PLAN

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Acronyms and Abbreviations

Acronym	Definition
6 NYCRR	Title 6 New York Code of Rules and Regulations
AOC	Area of Concern
ASP	Analytical Services Protocol
BCA	Brownfield Cleanup Agreement
BCP	New York State Brownfield Cleanup Program
CAMP	Community Air Monitoring Plan
COC	Chemical of Concern
CSM	Conceptual Site Model
DER-10	New York State Department of Environmental Conservation Technical Guide 10
DUSR	Data Usability Summary Report
ELAP	Environmental Laboratory Approval Program
FWRIA	Fish and Wildlife Resources Impact Analysis
GPR	Ground Penetrating Radar
GQS	Part 703.5 Class GA Ambient Water Quality Standards and Guidance Values
GQS	Groundwater Quality Standard
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
IRM	Interim Remedial Measure
IRMWP	Interim Remedial Measure Work Plan
NAPL	Non-aqueous Phase Liquid
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
OSHA	Occupational Safety and Health Administration
PCBs	Polychlorinated Biphenyls
PCE	Tetrachloroethene
PFAS	Perfluoroalkyl and Polyfluoroalkyl Substances

Acronym	Definition
PFOA	Per-fluorooctanoic Acid
PFOS	Per-fluorooctanesulfonic Acid
PID	Photoionization Detector
PVC	Polyvinyl Chloride
QA/QC	Quality Assurance/Quality Control
QEP	Qualified Environmental Professional
QHHEA	Quantitative Human Health Exposure Assessment
RECs	Recognized Environmental Conditions
RI	Remedial Investigation
RIR	Remedial Investigation Report
RIWP	Remedial Investigation Work Plan
RRUSCO	Restricted Residential Use Soil Cleanup Objective
SCGs	Standards, Criteria and Guidance Values
SCO	Soil Cleanup Objective
SIM	Selective Ion Monitoring
SVOCs	Semi-Volatile Organic Compounds
TAL	Target Analyte List
TCE	Trichloroethene
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UUSCO	Unrestricted Use Soil Cleanup Objectives
VOCs	Volatile Organic Compounds
YORK	York Analytical Laboratories, Inc.

CERTIFICATION

I, Spiro Dongaris, P.E., certify that I am currently a NYS Professional Engineer and that this Interim Remedial Measure Work Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10) and that all activities will be performed in full accordance with the DEC-approved Interim Remedial Measure Work Plan and any DEC approved modifications.

STATE OF NEW YORK
SPIRO I DONGARIS
095954
LICENSED PROFESSIONAL ENGINEER

Professional Engineer Signature

Spiro Dongaris

March 23, 2022

Date

1.0 INTRODUCTION

Athenica Environmental Engineering PLLC (Athenica) has prepared this Interim Remedial Measure Work Plan (IRMWP) on behalf of FH 2BRO Builder Corp. (Volunteer) for the property known as the 29-05 38th Avenue Site (Site). The Site is located at 29-05 38th Avenue in the Long Island City section of Queens, New York, occupying Block 371, Lot 38 on the New York City Tax Map. The Site was accepted into the Brownfield Cleanup Program (BCP) on April 16, 2021. The Volunteer entered into a Brownfield Cleanup Agreement (BCA) with the New York State Department of Environmental Conservation (NYSDEC) on April 21, 2021, and the Site was assigned BCP Site No. C241250.

The overall objective of this IRMWP is to further investigate the presence of a suspected underground storage tank (UST) that was shown as a gasoline tank on a fire insurance map from 1936 and identified as a geophysical anomaly during the initial Site investigation in 2020. If found, the UST will be registered, the contents characterized, and the UST will be properly closed in accordance with all applicable regulations. In addition, any potentially-contaminated soil associated with the UST (based on field screening) will be excavated and stockpiled at the Site for subsequent characterization and proper disposal as part of the Site-wide soil excavation program. The IRMWP presents the planned remedial steps to be implemented at the Site to achieve this overall objective.

Following approval and implementation of the IRMWP, an IRM Report and a draft Remedial Action Work Plan (RAWP) will be submitted to the NYSDEC.

1.1 Project Background

The Site is located at 29-05 38th Avenue in the Long Island City section of Queens, New York and is identified as Block 371 and Lot 38 on the New York City Tax Map. **Figure 1** is a United States Geological Survey (USGS) topographical quadrangle map showing the Site location**.** The Site is located in a primarily mixed industrial, commercial, and residential area of the Long Island City area of Queens, New York. The Site is bounded by multi-family residential building (under construction as of the date of this document) to the northeast, 30th Street to the southeast, 38th Avenue to the southwest, and Old Ridge Road to the northwest. **Figure 2** is a map showing the Site boundary.

Reported historic uses of the Site include a gasoline station/auto service facility, a carpet cleaning facility, and residential buildings. The Site is currently vacant, with demolition of all buildings completed in October 2021. The four buildings previously located at the Site included, from southeast to northwest, a 1-story commercial building (former gasoline station/auto service facility from 1947 until at least 1950), 1.5-story warehouse (identified as a carpet cleaning facility from 1936 until 2006 and the location of the gasoline storage tank in 1936), 1-story residential building, and a 2-story residential building. The 1-story and 2-story residential buildings in the northwestern portion of the Site were constructed circa 1898 and 1936, respectively, and were utilized for residential use from the time of construction until demolition.

The majority of the Site is currently vacant and unused, and is surrounded by temporary construction fencing. This area of the Site is covered by soil, following completion of building demolition in October 2021. There is also a small (approximately 1,500 square feet in area) concrete-paved area along 38th Avenue that is currently used for parking of vehicles; this area is labeled as "Parking Lot" on **Figure 2**, and is). The former gasoline station and warehouse buildings were both slab-on-grade. Both residential buildings had basements, which were backfilled to grade with clean soil as part of demolition of these buildings, in accordance with New York City Department of Buildings requirements. Please note that all soil within the former basements will be excavated during Site redevelopment, and as such, will be characterized and properly disposed along with the rest of the soil to be excavated at the Site.

1.2 Remedial Investigation Findings

Athenica conducted Remedial Investigation (RI) field activities in November 2021, which included sampling of soil, groundwater, and soil vapor in accordance with a NYSDEC-approved RI Work Plan. The results of the RI indicate that the chemicals of concern (COCs) associated with the Site are volatile organic compounds (VOCs), primarily tetrachloroethene (PCE) detected in groundwater and soil vapor. For this reason, PCE is considered to represent the principal COC for the Site.

A summary of the RI findings, by sample medium, are as follows:

Soil

The impacts to soil, where present, are limited to polycyclic aromatic hydrocarbons (PAHs), which were detected in one (1) shallow RI soil sample at concentrations that slightly exceeded applicable criteria, and are similar to those typically associated with historic fill. It is assumed that no remedial action would be necessary below the proposed excavation depth for redevelopment based on the finding of this RI.

Groundwater

PCE was detected in all 11 groundwater samples collected during the RI, with detected concentrations ranging from 1.6 micrograms per liter (µg/L) to 120 µg/L; nine (9) of these concentrations exceeded the Class GA groundwater quality standard (GQS) for PCE of 5 µg/L, ranging from 7.6 µg/L to 120 µg/L.

Groundwater sample results from upgradient wells show that significant concentrations of PCE (up to 39 µg/L) are also migrating onto the Site, from unidentified upgradient sources.

Soil Vapor

PCE and its breakdown product trichloroethene (TCE) were detected in all of the soil vapor samples, at concentrations up to 23,000 micrograms per cubic meter (µg/m^3). The highest concentrations of these VOCs were detected in the southern and central portions of the Site.

1.3 Project Organization and Responsibility

Approval of this IRMWP by the NYSDEC will be obtained prior to field activities. Athenica will notify the NYSDEC a minimum of 10 business days prior to implementing IRM field activities.

The excavation subcontractor will be responsible for all excavation activities to include compliance with all applicable Occupational Safety and Health Administration (OSHA) regulations, personnel health and safety, and the installation of necessary support of excavation.

Athenica will be responsible for project management, subcontractor oversight, IRMWP compliance, determination of corrective measures when need, air sampling associated with a Community Air Monitoring Plan (CAMP) during intrusive activities, and collection of samples for laboratory analysis.

The following are the key personnel or agencies to be involved with IRMWP activities at the Site:

NYSDEC:

Steven Walsh
Project Manager
NYSDEC
Division of Environmental Remediation
625 Broadway
Albany, NY, 12233-7017
(518) 402-9824

NYSDOH:
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NYSDOH Bureau of Environmental Exposure Investigation
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Kenneth P. Wenz, PG, LEP, Senior Project Manager
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(718) 784-7490

Excavation Subcontractor:

To be selected

FH 2BRO Builder Corp. (Volunteer)

The authorized representative of the Volunteer is Jack Fang, President.

2.0 INTERIM REMEDIAL MEASURE WORK PLAN

This IRMWP is based on the review of the data collected during the RI and the previous investigation conducted at the Site. The scope of work for the proposed IRM is as follows, with work details provided in the subsequent subsections:

- Excavation to investigate the presence of a suspected UST, anticipated to extend to the proposed redevelopment depth of 15 feet bgs;
- If found, registration of the UST, characterization of the contents, and proper closure of the UST in accordance with all applicable regulations;
- Field screening and inspection of excavated material to assess the presence of soil contamination associated with the UST;
- Stockpiling of excavated soil (estimated at approximately 115 cubic yards (CY)) for subsequent characterization and off-Site disposal at a regulated facility; and
- Collection and analysis of confirmatory endpoint soil samples collected from the UST excavation sidewalls and base, to confirm compliance with Restricted Residential Use Soil Cleanup Objectives (RRUSCOs).

During soil disturbance activities (e.g., excavation, stockpiling, etc.), a CAMP will be implemented to monitor and, as required mitigate, any odors or fugitive dust that may be generated. This document is included as **Appendix A**. Field work will follow the health and safety protocols detailed in the Site-specific Construction Health and Safety Plan (CHASP) in **Appendix B**.

2.1 Summary of Remedial Alternatives

Remedial Alternative Analysis will be performed as part of the RAWP.

2.2 Selection of Preferred Remedy

The remedial Action will be selected as part of the RAWP.

2.3 Execution of the Work Plan

The hours for operation of remedial construction will conform to the NYCDOB construction code requirements or according to specific variances issued by that agency. NYSDEC will be notified by the Volunteer of any variances issued by the Department of Buildings. During working hours, excavation subcontractor will make every feasible effort to minimize potential impacts to the community. These include, but are not limited to, noise and traffic concerns associated with the implementation of this IRMWP.

All remedial work performed under this plan will comply with all applicable government requirement, including Site and worker safety requirements mandated by the Federal Occupational Health and Safety Administration (OHSA). Contractors and subcontractors will have the option of adopting the CHASP of this IRMWP or developing their own HASP.

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

The Volunteer and its contractors are solely responsible for the identification of utilities that might be affected by work under the IRMWP and implementation of all required, appropriate, or necessary health and safety measures during performance of work under this IRMRWP. The excavation subcontractor will be responsible for contacting the New York 811 Call Center to request a mark-out of subsurface utilities on adjacent public rights-of-way. Underground utility protection, if necessary, will be responsibility of the excavation contractor. After all utilities have been verified/confirmed/protected, excavation work will be initiated.

Mobilization will include the delivery of construction equipment and materials to the Site. All construction personnel will receive necessary training in accordance with the applicable HASP(s), CAMP, and established policies and procedures to be following during the implementation of the IRMWP. All parties involved in the implementation of the IRMWP will receive a copy of the IRMWP and site-specific CHASP, and will be briefed on their contents.

2.3 Underground Storage Tank Removal

There is currently a potential UST of unknown size and contents, as indicated by historic fire insurance maps and the findings of a geophysical survey conducted in 2020, located within the footprint of the former 1.5-story warehouse building. **Figure 3** is a map showing the location of the identified geophysical anomaly and the anticipated area of excavation.

If found, the UST will be registered, its contents characterized, and the UST will be properly closed in accordance with all applicable regulations and requirements.

All contents (i.e., liquids and tank sludge) will be removed from the tank and any connection lines (e.g., fill and vent piping, supply and return lines, etc.), containerized, and characterized for proper off-Site disposal. The tank contents will be properly disposed by the contractor. The UST will be cleaned, with cleaning fluids contained in NYSDOT-approved 55-gallon drums or extracted using a vacuum truck for proper disposal by the contractor. After completion of the decommissioning activities, the UST will be cut into manageable pieces and/or crushed and removed from the Site for disposal as scrap metal. Disposal documentation for the UST, its contents, and generated cleaning fluids will be provided.

Athenica will document the UST closure as follows:

- Describe the conditions of removed tank and piping,
- Observe the condition of the excavation floor and sidewalls for physical evidence of contamination (e.g., odors, staining, etc.),
- Conduct screening of soils comprising the floor and sidewall excavation utilizing a photoionization detector (PID), and

- Document tank removal activities by photographs and field notes recorded in a permanent field log.

2.3.1 Support of Excavation

Appropriate management of structural stability of on-Site or off-Site structures during on-Site activities including excavation is the sole responsibility of the Volunteer and its contractors. The Volunteer and its contractors are solely responsible for safe execution of all invasive and other work performed under this IRMWP. The Volunteer and its contractors will obtain any local, State, or Federal permits or approvals that may be required to perform work under this Plan. Further, the Volunteer and its contractors are solely responsible for the implementation of all required, appropriate, or necessary health and safety measures during performance of work under the approved IRMWP.

2.3.2 Excavated Soil Management

Excavated soils will be screened to evaluate for potential contamination, and stockpiled for subsequent characterization sampling and off-Site disposal. The excavated soil will be stockpiled on by a minimum of double 6-mil polyethylene sheeting that is sufficiently anchored to prevent any wind and water erosion. During non-working hours, the stockpile will be covered by the same material, which will be sufficiently anchored to prevent any wind and water erosion. The cover will be inspected at least once per working day, with corrective action taken as needed. The inspections and any corrective actions will be documented in the daily field reports and will occur until the materials have been properly removed from the Site.

During excavation, the soils removed will be screened continuously prior to stockpiling utilizing a PID with a 10.6 eV photovoltaic lamp. Visual, olfactory and PID screening and assessment will be performed by a qualified environmental professional or experienced field geologist under the direction of the PE during all remedial and development excavations into known or potentially contaminated material. Based on the screening results, soils will be segregated as warranted, including into multiple stockpiles as needed to separate the soil by potential contaminants (e.g., petroleum versus chlorinated contamination).

2.4 Disposal Characterization Sampling

Disposal characterization sampling will be conducted to identify potential disposal facilities for the excavated soil. All sampling and analyses for off-Site disposal characterization purposes will be completed in accordance with the requirements of the disposal facility and in conformance with applicable permits. Disposal characterization samples will not be analyzed with an ASP Category B data package.

2.5 Confirmatory Endpoint Sampling

Based on the sampling frequency outlined in Section 5.4 of DER-10, a minimum of five (5) endpoint samples consisting of four (4) sidewalls and one (1) base sample will be obtained from the UST excavation. If the UST excavation is expanded due to evidence of field contamination,

endpoint sampling will include one base sample for every 900 square feet and one sidewall sample for every 30 linear feet of excavation. **Figure 4** is a map showing proposed confirmatory endpoint soil samples at the UST excavation area.

Representative end point soil samples, along with chain-of-custody form, will be submitted to a NYSDOH ELAP-approved laboratory, for analysis for TCL VOCs.

Further details regarding the specific sampling methodology and analytical methods are presented in the QAPP, included as **Appendix C**.

2.6 Fugitive Dust and Odor Control

In accordance with NYSDEC and NYSDOH requirements, a CAMP will be implemented at the Site during all activities that involve soil disturbance, including excavation, on-Site transportation, and stockpiling. The objective of the CAMP is to provide a measure of protection for the downwind community (i.e., off-Site receptors, including residences and businesses) from potential airborne contaminant releases as a direct result of intrusive IRM activities. Air monitoring stations will be placed upwind and downwind of the work area.

VOCs and respirable particulates (PM-10) will be monitored at the upwind and downwind stations on a continuous basis. In addition to the fixed stations, VOCs will be monitored within the work zone using hand-held equipment by the Athenica personnel. The Site-specific CAMP is included in **Appendix A**.

Dust will be controlled by spraying water mist over the work area if perimeters action levels established in the CAMP are exceeded. The water mist will be generated by connecting a misting device to a hose, which will be connected to any potable water source. The degree to which these measures will be used will depend on particulate levels in ambient air at the Site perimeter as determined through implementation of the CAMP.

Specific odor control methods to be used on a routine basis will include double layer of 6-mil plastic sheeting for covering stockpiles and, if necessary, odor suppressant foam. If nuisance odors are identified, work will be halted, and the source of the odors will be identified and corrected. Work will not resume until all nuisance odors have been abated. NYSDEC will be notified of all odor events and of all other complaints about the project. Implementation of all odor controls, including the halt of work, will be the responsibility of the Volunteer's PE, who is responsible for certifying the IRM final report.

A foam unit will be used, if necessary, to suppress vapors and odors that are generated during the excavation. Foam will be applied, if warranted, to stockpiled soil and excavation sidewalls in an effort to maintain work zone and perimeter air monitoring criteria established in the CHASP and CAMP. Plastic sheeting will also be employed to suppress vapor and odors from stockpiled soil in the staging area, if necessary.

Any exceedances of CAMP criteria, and the actions taken to address the exceedances, will be communicated to the NYSDEC and NYSDOH within one business day following the occurrence.

3.0 INTERIM REMEDIAL MEASURE REPORT

The results of the IRMWP and supporting documentation will be compiled in an IRM Report. The report will provide a summary of the fieldwork performed and an interpretation of the confirmatory sample analytical data. Supporting documentation will consist of tables containing the analytical results; figures showing the size and location of IRM activities along with confirmatory sample locations; pertinent photographic documentation of the activities completed; waste disposal documentation of the various material generated for disposal; and findings, conclusions and recommendations resulting from the IRM work. The report will be submitted to NYSDEC for review. To facilitate the interpretation of data generated during the investigation activities, the data will be tabulated in data summary tables. Figures showing sampling locations with the corresponding analytical results will be prepared to enhance the overall understanding of Site conditions regarding the magnitude and location of contamination that may remain on-Site following redevelopment. The report will also include updated NYSDEC registration paperwork to reclassify the UST as out-of-service and removed, if necessary.

3.1 Quality Assurance/Quality Control (QA/QC)

A Site-specific Quality Assurance Project Plan (QAPP) was generated and included in the RIWP and presented in the IRMWP as **Appendix C**. The QAPP presents the sampling procedures, analytical methods and QA/QC procedures associated with the activities planned for this BCP Site, with the exception of waste classification sampling, which as noted above, will not be analyzed with an ASP Category B data package.

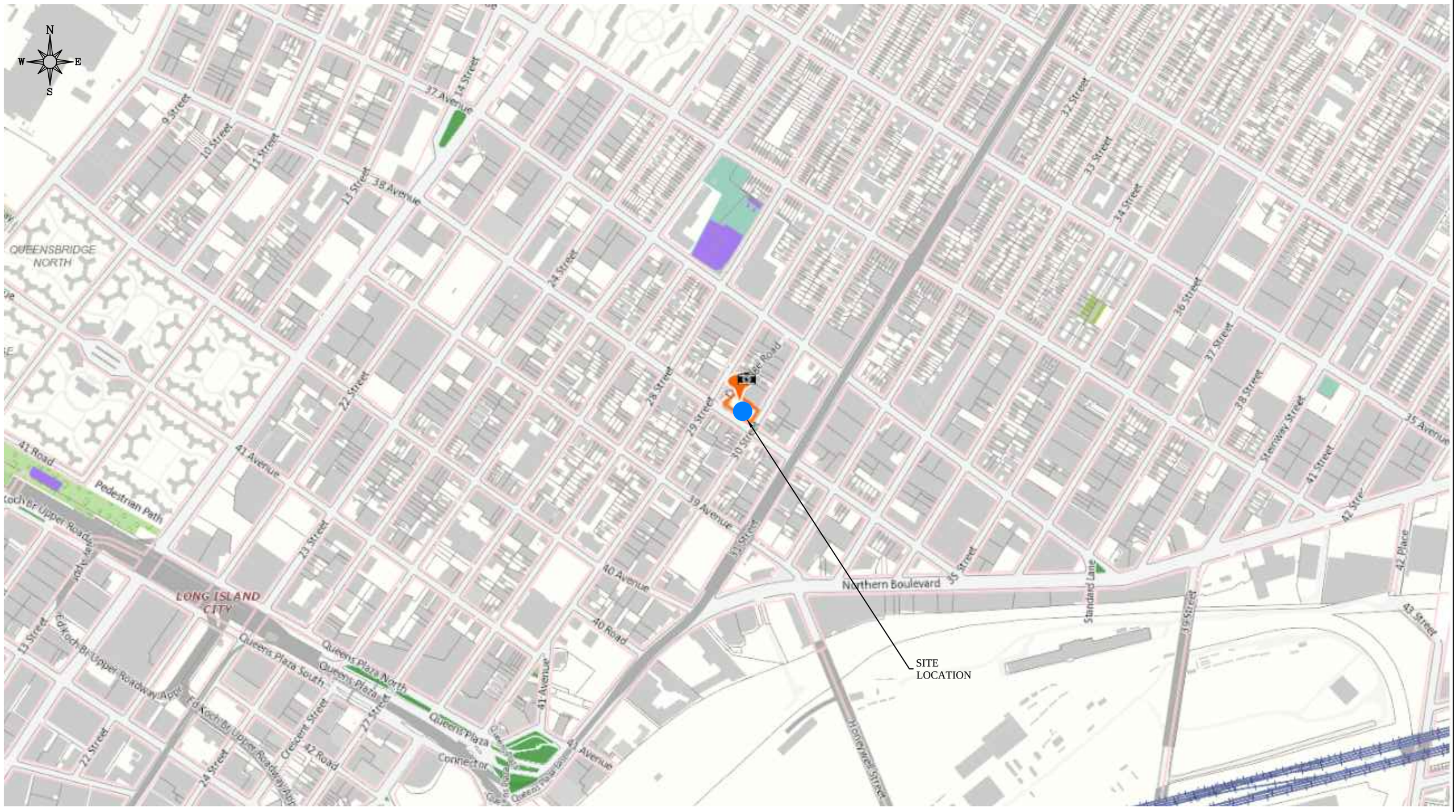
Protocols for sample collection, sample handling and storage, Chain of Custody procedures, and laboratory and field analyses are described or specifically referenced to related investigation documents. Preparation of laboratory data for submittal to NYSDEC in the appropriate Electronic Data Deliverable (EDD) and third-party validation is also referenced in this document. All protocols outlined in the QAPP are applicable under the IRMWP.

4.0 SCHEDULE

Below is an estimated schedule for implementation of this IRMWP.

MILESTONE	Time Frame (weeks)	
	Individual	**Cumulative**
NYSDEC Review/Approval of IRMWP	4	4
IRMWP Implementation	1	5
IRM Report Preparation	4	9
NYSDEC Review and Approval of IRM Report	4	13

FIGURES



LEGEND:

SITE LOCATION

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LONG ISLAND CITY, NY 11104
TEL: (718) 784 - 7490
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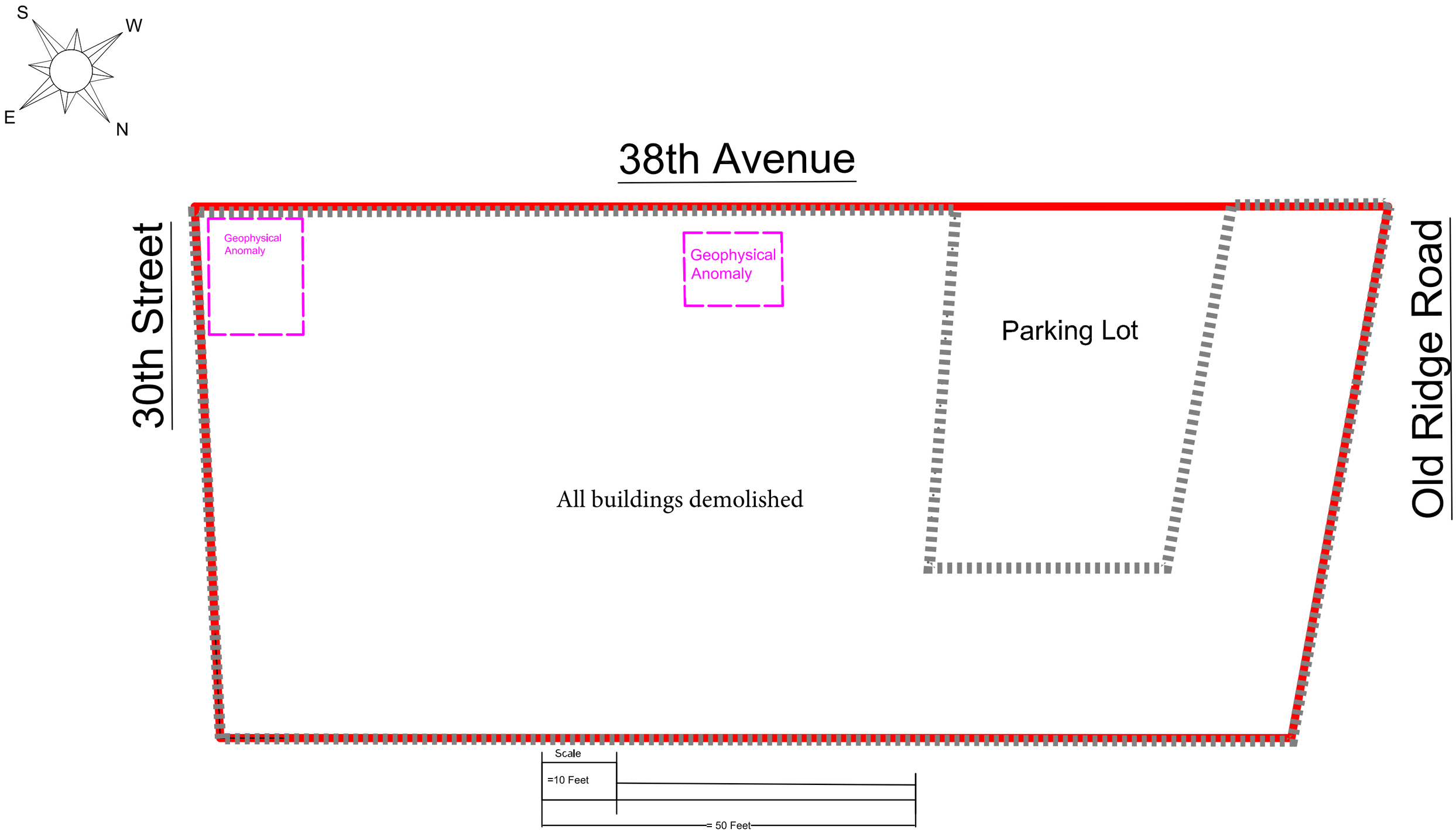
Date:	FEBRUARY 3, 2022
Drawn by:	EVAN GREENBERG, EIT
Checked by:	KENNETH P. WENZ JR., PG, LEP
Drawing Scale:	NOT TO SCALE
Project No.:	21-134-0741

Site: 29-05 38TH AVENUE
LONG ISLAND CITY, NY 11101

INTERIM REMEDIAL MEASURE WORK PLAN

Figure: 1

Title: SITE LOCATION MAP



LEGEND:

Site Boundary

Fencing

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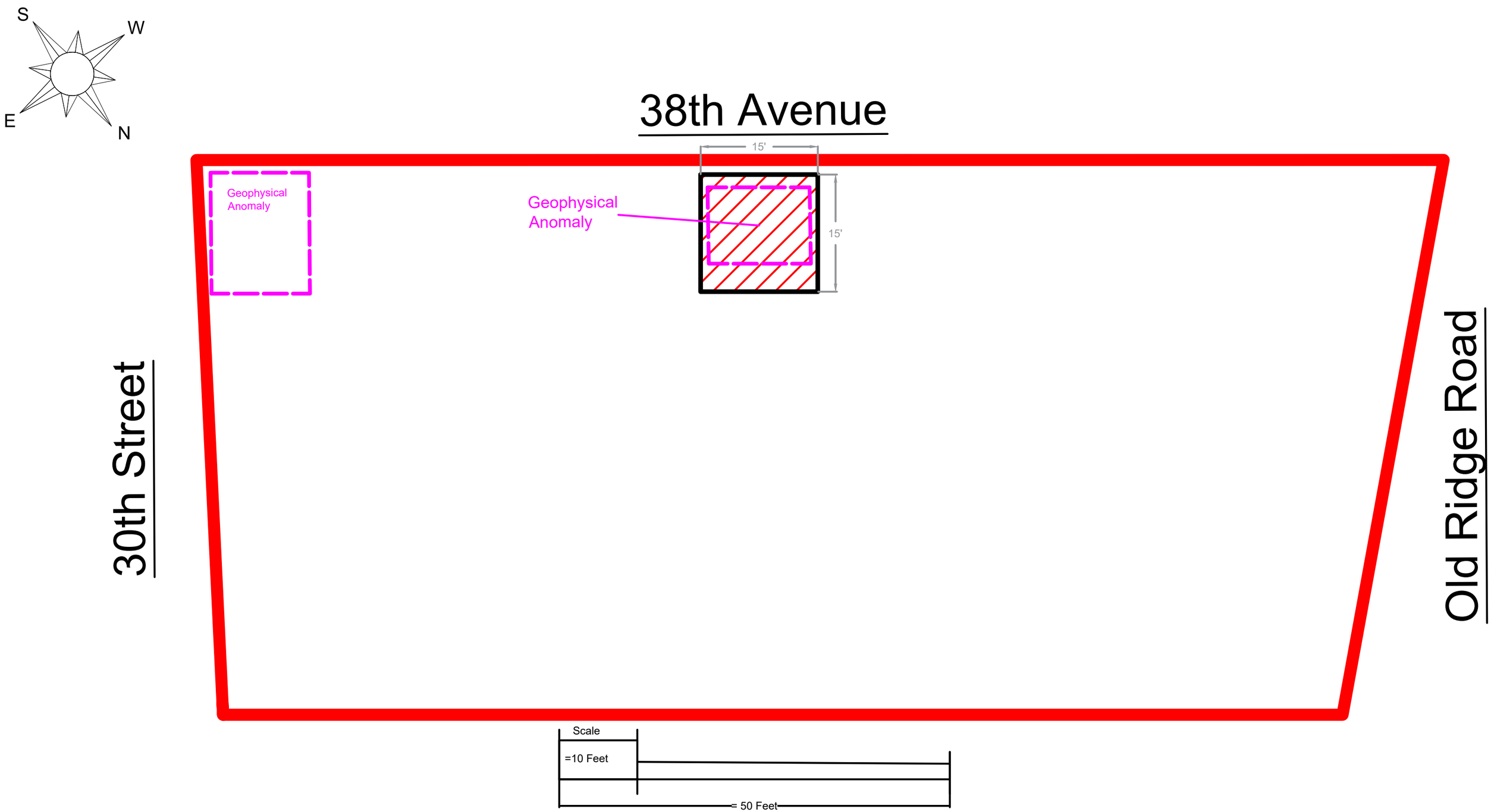
Site: 29-05 38TH AVENUE
LONG ISLAND CITY, NY 11101
INTERIM REMEDIAL MEASURE WORK PLAN

Figure: 2

Title: SITE PLAN



LEGEND:

- Site Boundary
- Geophysical Anomaly
- Proposed Excavation

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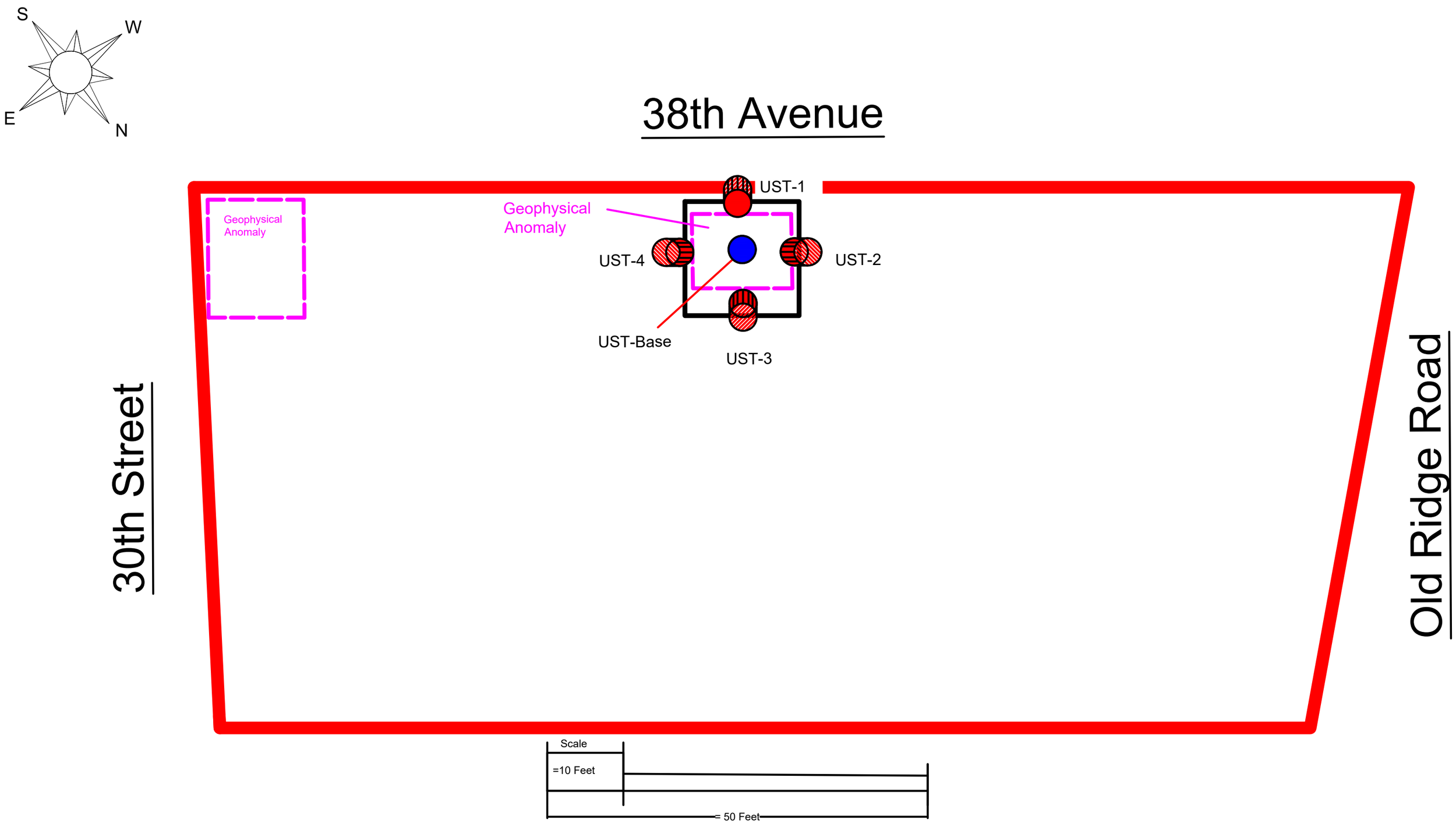
Project No.:	21-134-0741

Site: 29-05 38TH AVENUE
LONG ISLAND CITY, NY 11101
INTERIM REMEDIAL MEASURE WORK PLAN
Figure: 3

Title: PROPOSED INTERIM REMEDIAL MEASURE EXCAVATION



LEGEND:

- Site Boundary
- Geophysical Anomaly
- Proposed Excavation
- Endpoint Sample from Base of Excavation
- Endpoint Sample from Sidewall of Excavation

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Site: 29-05 38TH AVENUE
LONG ISLAND CITY, NY 11101
INTERIM REMEDIAL MEASURE WORK PLAN

Figure: 4

Title: PROPOSED CONFIRMATORY ENDPOINT SOIL SAMPLE LOCATIONS

APPENDIX A

COMMUNITY AIR MONITORING PLAN

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 are based on NYSDEC guidance, and exceedances thereof will necessitate appropriate response actions, such as increased monitoring, corrective actions to abate emissions, and/or work shut-down. Additionally, the CAMP helps to confirm that work activities did not spread contamination to off-Site receptors through the air.

Implementation of this CAMP will not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around all intrusive work areas.

Community Air Monitoring Plan

Real-time air monitoring for VOCs and particulate levels at locations upwind and downwind of the work area will be conducted during all intrusive sampling activities, as follows:.

Continuous monitoring will be conducted for all ground intrusive activities. Ground intrusive activities include, but are not limited to, advancing of soil borings, soil/waste excavation and handling, test pitting or trenching, and installation of monitoring wells or soil vapor probes.

Periodic monitoring for VOCs will be conducted during non-intrusive activities, such as collection of soil vapor/ambient air samples or sampling of 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 such 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) will be monitored at the upwind and downwind perimeter of the immediate work area on a continuous basis. The monitoring work will be performed using equipment appropriate to measure the types of contaminants known or suspected to be present (i.e., photoionization detector (PID)). The instruments will be calibrated at least daily in accordance with manufacturers' instructions. The equipment will 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 will 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 will 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 VOC level is above 25 ppm at the perimeter of the work area, activities will be halted.

4. All 15-minute readings will be recorded and will be available for review upon request. Instantaneous readings, if any, used for decision purposes will also be recorded.

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations will be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations, 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 will be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration will be visually assessed during all work activities.

1. If the downwind PM-10 particulate level is 100 micrograms per cubic meter ($\mu g/m^3$) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques will be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 $\mu g/m^3$ 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 $\mu g/m^3$ above the upwind level, work will 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 $\mu g/m^3$ of the upwind level and in preventing visible dust migration.

3. All readings will be recorded and will be available for review upon request.

Reporting

Any exceedances of CAMP criteria, and the actions taken to address the exceedances, will be communicated to the New York State Department of Environmental Conservation and New York State Department of Health within one business day following the occurrence.

APPENDIX B

CONSTRUCTION HEALTH AND SAFETY PLAN

CONSTRUCTION HEALTH & SAFETY PLAN

29-05 38th Avenue
Long Island City, New York 11101

Site Number C241250

Prepared on Behalf of:

FH 2BRO Builder Corp.
40-39 27th Street
Long Island City, New York 11101

Prepared By:

Athenica Environmental Engineering PLLC
45-09 Greenpoint Avenue
Long Island City, New York 11104

February 2022

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1.0 *GLOSSARY OF TERMS*

AHA	Activity Hazard Analysis
BZ	Breathing Zone
C	Ceiling Limit
CNS	Central Nervous System
CTPV	Coal tar pitch volatiles
CRZ	Contamination Reduction Zone
CSP	Construction Superintendent
CZ	Clean Zone
dBA	Decibels Adjusted
ERCP	Emergency Response and Contingency Plan
EZ	Exclusion Zone
FDNY	New York City Fire Department
GI	Gastrointestinal
HSO	Health & Safety Officer
IP	Ionization Potential
Mg/m^3	Micrograms per cubic meter
MPH	Miles per hour
NIOSH	National Institute for Occupational Safety and Health
OSHA	Occupational Health and Safety Administration
Owner	Street Five 116 LLC
PAHs	Poly aromatic hydrocarbons
PEL	Permissible Exposure Limit
PM	Project Manager
PPE	Personal Protective Equipment
PPM	Parts per Million
PSM	Project Safety Manager
SHASP	Site-Specific Health and Safety Plan
Site	116 North 5th Street, Brooklyn
STEL	Short-term exposure limit (15 minutes)
SZ	Support Zone
TLV	Threshold Limit Value
TWA	Time-weighted average (8 hours)
USEPA	United States Environmental Protection Agency
VP	Vapor Pressure at approximately 68 F° in mm Hg

2.0 *INTRODUCTION*

Athenica Environmental Engineering PLLC (Athenica) has prepared this Construction Health and Safety Plan (CHASP) on behalf of FH 2BRO Builder Corp. (Volunteer) for the property known as the 29-05 38th Avenue Site (Site). The Site is located at 29-05 38th Avenue in the Long Island City section of Queens, New York (see Figure 2-1) and is identified as Block 371 and Lot 38 on the New York City Tax Map (Site) and is enrolled in the New York State Brownfield Cleanup Program (BCP) under BCP Site No. C241250.

The Site is an irregularly shaped, 10,600-square-foot lot with no remaining on-Site structures (demolition of the previous Site structures was completed in October 2021). The Site has approximately 160 feet of frontage along 38th Avenue, 70 feet of frontage along 30th Street, and 71 feet of frontage along Old Ridge Road. Most of the Site is enclosed by temporary fencing, with access via a rolling gate along 38th Avenue. The remaining area of the Site (approximately 1,500 square feet in area) does not have a fence along 38th Avenue; this area is currently used for vehicle parking and is accessed from 38th Avenue. The most recent occupants of the Site, from southeast to northwest, were a gasoline filling station, a carpet cleaning facility, and a pair of residential dwelling.

This CHASP has been developed by Athenica for specific activities associated with the construction of a new mixed-use (commercial and residential) building at the Site.

This CHASP documents the policies and procedures which will protect workers from potential chemical hazards associated with the soils and/or fill at this Site. Other plans and documentation will establish the policies and procedures that will protect workers from potential physical hazards associated with traditional demolition and construction activities at the Site.

This plan assigns responsibilities, establishes standard operating procedures, and provides for contingencies that may arise during the disturbance of soil/fill at the Site. The general contractor and its subcontractors will be required to utilize this plan when working at the Site.

Although this plan focuses on the specific work activities planned for this Site, it must remain flexible because of the nature of this work. Conditions may change and unforeseen situations may arise that require modifications from the original plan. Therefore, Athenica only makes representations or warranties as to the adequacy of this CHASP for currently anticipated activities and conditions. This flexibility allows modification by authorized personnel, e.g. Project Manager, Project Safety Manager. All changes to procedures in this plan will be documented in writing using the form provided in Appendix B.

Refusal or failure to comply with this CHASP or violation of any safety procedures by field personnel and/or subcontractors may result in immediate removal from the Site following consultation with the Project Safety Manager (PSM) and the Project Manager (PM).

It is expected that this CHASP will be implemented at a multi-employer work Site. Information and references within this plan shall in no way imply or alleviate any other Site contractor from their responsibility to comply with any and all applicable State or Federal statutes or regulations regarding the completion of this project. It is the responsibility of each employer to communicate and coordinate work planning so as to prevent their work activities from becoming a potential hazard to other workers at the project Site. Failure to communicate will not alter an employer's responsibilities or obligations for any resulting injuries to their employees.

2.1 SITE HISTORY

Historic Sanborn maps presented in the March 2000 Phase I Environmental Site Assessment (ESA) by Middleton Environmental, Inc. (Middleton), revealed that the Site had been developed with four buildings. From southeast to northwest, these buildings included a 1-story commercial building, 1.5-story warehouse, 1-story residential building, and a 2-story residential building. Historic Sanborn maps identify the commercial building in the southeastern portion of the Site as an automotive service facility and gasoline station from 1947 until at least 1950. The 1.5-story warehouse is identified as a carpet cleaning facility from 1936 until 2006. The 1-story and 2-story residential buildings in the northwestern portion of the Site were constructed circa 1898 and 1936, respectively, and have maintained residential use since their construction.

The 1.5-story warehouse and a 1-story former gasoline station were demolished in early 2021, and the two residential structures were razed in October 2021, prior to the start of remedial investigation field activities.

Based on the findings of current and previous environmental studies at the Site, the identified areas of concern (AOCs) include:

1. Presence of historic fill material,
2. The past usage of the Site as a former gasoline station and automobile repair facility, as well as a carpet cleaning company, and
3. The past usage of the north adjacent property by historic dry-cleaning operations.

Soil sampling conducted as part of a Remedial Investigation (RI) of the Site by Athenica found soil impacted by polycyclic aromatic hydrocarbons (PAHs), and lead.

2.2 SCOPE OF WORK

The scope of work for redevelopment of the Site entails constructing a full basement beneath the entire existing building. Only those activities associated with the disturbance and handling of soil/fill are addressed in this CHASP.

The principal tasks covered in this HASP include the following:

- Mobilization/demobilization,
- Underpinning of existing walls,
- Excavation of urban fill and/or soil,
- Loading of urban fill into trucks for disposal,
- Installation of footings for new building, and
- Heavy equipment decontamination.

Activity Hazard Analyses for these tasks are provided in Section 4.5.

This CHASP has been prepared and approved for the above scope of work. In order to remain approved, any changes to the scope of work will require amendment of the plan. The Site Health and Safety Amendment Documentation form (Appendix B) will be used for all revisions/amendments to this plan.

FIGURE 2-1
SITE LOCATION MAP

3.0 *KEY PERSONNEL*

The Project Manager (PM), Construction Superintendent (CS), Health & Safety Officer (HSO), and Project Safety Manager (PSM) all share responsibilities for formulating and enforcing health and safety requirements, and assuring that the CHASP is implemented as intended. This section outlines the responsibilities for each of these positions. Responsibilities for Site employees and subcontractor personnel are also outlined in this section. The General Contractor and/or other authorized personnel may also be involved and identified in future CHASP documents, as appropriate.

3.1 PROJECT MANAGER (PM)

The PM has the overall responsibility for the project and to assure that the requirements of the contract are attained in a manner consistent with the CHASP requirements. The PM will coordinate with the CS and the HSO to assure that the work is completed in a manner consistent with the CHASP. The PM will supervise the allocation of resources and staffing to implement specific aspects of the CHASP and may delegate authority to expedite and facilitate any application of the program. This role will be filled by the General Contractor or Excavation Subcontractor. OER will be notified in the future who the PM will be for this project.

3.2 CONSTRUCTION SUPERINTENDENT (CS)

The CS is responsible for field implementation of the CHASP and Site Emergency Response and Contingency Plan, and will act as the HSO in his/her absence. This role will be filled by the general contractor or primary subcontractor. NYSDEC will be notified in the future who the CS will be for this project.

Specific responsibilities for the CS include:

- Ensures that the CHASP is implemented;
- Ensures that field work is scheduled with adequate equipment to complete the job safely;
- Enforces Site health and safety rules;
- Ensures that proper personal protective equipment is utilized;
- Ensures that the PSM is informed of project changes which require modifications to the CHASP;
- Ensures that the procedure modifications are implemented;
- Investigates incidents;
- Conducts the daily Site safety briefing;

- Reports to PSM to provide summaries of field operations and progress; and
- Acts as Emergency Coordinator.

3.3 HEALTH AND SAFETY OFFICER (HSO)

The HSO is authorized to administer the CHASP. The HSO's primary operational responsibilities include personal and environmental monitoring, selection and monitoring of personal protective equipment, assignment of protection levels, coordination/review of work permits and observation of work activities. The HSO is authorized to stop work when an imminent health or safety risk exists. The HSO will review the essential safety requirements with all on-Site personnel and will facilitate the daily safety meetings. NYSDEC will be notified in the future who the HSO will be for this project.

Specific responsibilities for HSO performance include:

- Monitoring workers for signs of stress, such as cold stress, heat stress, and fatigue. Reevaluating Site conditions on an on-going basis.
- Coordinating protective measures including engineering controls, work practices and personal protective equipment.
- Assisting the CS in the preparation, presentation and documentation of daily safety meetings.
- Conducting and preparing reports of daily safety inspections of work processes, Site conditions, and equipment conditions. Discussing any necessary corrective actions with the CS and reviewing new procedures.
- Initiating revisions of the CHASP as necessary for new tasks or modifications of existing operations and submitting to the Project Safety Manager for approval (see Appendix B).
- Performing air monitoring as required by the CHASP.
- Assisting the PM and CS in incident investigations.
- Preparing permits for special operations, e.g., hot work, confined spaces, line breaking, etc.
- Maintaining Site safety records.
- Conducting inspections of all fire extinguishers, first-aid kits and eye washes on a regular basis.
- Informing subcontractors of the elements of the CHASP.

3.4 PROJECT SAFETY MANAGER (PSM)

The Project Safety Manager (PSM) is responsible for developing/reviewing the CHASP and ensuring that it is complete and accurate. The PSM provides technical and administrative support and will be available for consultation when required. If necessary, the PSM will direct

modifications (Appendix B) to specific aspects of the CHASP to adjust for on-Site changes that affect safety. The HSO will coordinate with the PSM on necessary modifications to the CHASP. The PSM may make periodic visits to the project Site to review implementation of this CHASP. This role is role will be filled by the General Contractor's representative.

3.5 EMPLOYEE SAFETY RESPONSIBILITIES

Each employee is responsible for personal safety as well as the safety of others in the work area and is expected to participate fully in the Site safety and health program. Employees will use all equipment provided in a safe and responsible manner as directed by the CS. Employees shall report any hazardous conditions which might affect the health and safety of Site personnel to the CS and/or HSO. To protect the health and safety of all personnel, Site employees that knowingly disregard safety policies/procedures will be subject to removal.

Specific requirements include:

- Reading the CHASP and any amendments prior to the start of on-Site work.
- Providing documentation of any applicable medical surveillance and training to the CS/HSO prior to the start of work.
- Attending the pre-entry briefing prior to beginning on-Site work as well as other scheduled safety meetings.
- Asking any questions or reporting concerns regarding the content of the CHASP to the CS/HSO prior to the start of work.
- Reporting all potentially dangerous situations, incidents, injuries, and illnesses, regardless of their severity, to the CS/HSO.
- Complying with the requirements of this CHASP and the requests of the CS/HSO.

4.0 *ACTIVITY HAZARD ANALYSIS*

This section outlines the potential chemical and physical hazards which workers may be exposed to during work on this project. The assessment of chemical hazards in this section is based on the results of samples collected at the Site by Athenica between June 2020 and November 2021, as documented in previous reports submitted for the Site. This is a representative list of potential contaminants that have been identified through extensive soil, groundwater, and soil vapor/ ambient air testing at the Site.

4.1 CHEMICAL HAZARDS

Based on review of the Remedial Investigation, workers at this Site have the potential to be exposed to chemicals in soil including common polycyclic aromatic hydrocarbons (PAHs) and metals in soil associated with historic fill material, as well as tetrachloroethene (PCE) in soil vapor. All listed compounds will be considered as potential contaminants of concern.

Potential exposure to the contaminants in historic fill (i.e., PAHs and metals) may occur by direct contact during soil disturbance activities (excavation, stockpiling, loading, etc.). In addition, exposure to PCE, PAHs, and metals could occur via inhalation (PCE as a volatile chemical could be inhaled directly, while PAHs and metals could be adhered to inhaled particulates/dust). A summary of hazard information is listed in Table 4-1.

The following general symptoms may indicate exposure to a hazardous material. Personnel will be removed from the work Site and provided immediate medical attention should any of the following symptoms occur:

- Dizziness or stupor
- Nausea, headaches, or cramps
- Irritation of the eyes, nose, or throat
- Euphoria
- Chest pains and coughing
- Rashes or burns

TABLE 4-1
CHEMICAL DATA

COMPOUND	ACGIH TLV	OSHA PEL	ROUTE OF EXPOSURE	SYMPTOMS OF EXPOSURE	TARGET ORGANS	PHYSICAL DATA
PCE	169 mg/m^3	678 mg/m^3	Inhalation Ingestion Skin contact	Headache, nausea, vomiting, dizziness, and drowsiness	Respiratory system, eyes, skin, liver, kidneys, CNS	Non-combustible liquid
PAHs	0.2 mg/m^3	0.2 mg/m^3	Inhalation Ingestion Skin contact	Headache, nausea, vomiting, and diaphoresis	Genitourinary system, Hematopoietic system, GI Tract, Respiratory system, eyes, skin	Liquid, gas and solid, can be combustible
Lead	0.05 mg/m^3	0.05 mg/m^3	Inhalation Ingestion Skin contact	Weakness, lassitude, insomnia; facial pallor; eye irritation, anorexia, low-weight, malnutrition; constipation; abdominal pain; colic; hypertension, anemia; gingival lead line; tremors; paralysis of wrist, ankles; encephalopathy; neuropathy	GI Tract, CNS, kidneys, blood, gingival tissue	Noncombustible Solid

Abbreviations

ACGIH = American Conference of Governmental Industrial Hygienists
C = Ceiling Unit
CNS = Central Nervous System
CVS = Cardiovascular System
GI = Gastrointestinal
TLV = Threshold Level Value
mg/m^3= milligrams per cubic meter
OSHA = Occupational Safety and Health Administration
PNS = Peripheral Nervous System
ppm = parts per million
PEL – Permissible Exposure Level

4.2 PHYSICAL HAZARDS

To minimize physical hazards, standard safety protocols will be followed at all times. Failure to follow safety protocols may result in removal of the employee from the Site. All personnel shall be familiar with the physical hazards presented by each of the tasks they perform. Task specific hazard analyses are provided in Section 4.5. These hazard analyses shall be reviewed prior to beginning each task and periodically throughout the task. It must be noted that these activity hazard analyses are general in nature. It is the responsibility of the CS to revise and adapt them as necessary to reflect Site-specific conditions.

The CS and HSO will observe the general work practices of each crew member and enforce safe procedures. Work areas will be inspected by the crew leaders, CS and HSO. All hazards will be corrected in a timely manner. A variety of physical hazards may be encountered during work activities at this Site. Activity Hazard Analyses will be developed for each principal activity and will identify all major hazards to which employees may be exposed. Hard hats, safety glasses, and steel-toe safety boots are required in all work areas of the Site. Site-specific hazards and all necessary precautions will be discussed at the daily safety meetings. The General Contractor's Safety Manual will be maintained at the project Site as a reference document.

4.3 ENVIRONMENTAL HAZARDS

Environmental factors such as weather, wild animals, insects, and irritant plants may pose a hazard when performing outdoor tasks. The HSO and CS will take necessary actions to alleviate these hazards should they arise.

4.3.1 *Heat Stress*

The combination of warm ambient temperature and protective clothing increases the potential for heat stress. Heat stress disorders include:

- Heat rash
- Heat cramps
- Heat exhaustion
- Heat stroke

This information will be reviewed during safety meetings. Workers are encouraged to increase consumption of water and electrolyte-containing beverages, e.g. Gatorade™. Heat stress can be prevented by assuring an adequate work/rest schedule. Guidelines are presented below.

The CS and HSO will determine the specific work-rest schedule based on project specific conditions. In addition, workers are encouraged to take rests and report symptoms whenever they

feel any adverse effects that may be heat-related. The frequency of breaks may need to be increased based on worker recommendation to the HSO and CS. The CS and HSO will determine the specific work-rest schedule based on project specific conditions. In addition, workers are encouraged to take rests and report symptoms whenever they feel any adverse effects that may be heat-related. The frequency of breaks may need to be increased based on worker recommendation to the HSO and CS.

Heat stress can be prevented by assuring an adequate work/rest schedule and adequate fluid consumption. A guide for work-rest schedules for various protection levels (defined in Section 5.0) is given below. The number of hours before a work-rest period is based on experience with similar work. The time periods should be considered maximum. It must also be remembered that individual physical variability and differences in physical work activities may require revisions to Site plans. This table should be used as a guide. Professional judgment (evaluation of individual work load, ambient weather conditions, worker acclimatization and PPE levels) of the CS and HSO is necessary to assure a fully protective plan to prevent heat stress disorders.

GUIDELINES FOR WORK-REST PERIODS FOR VARIOUS PROTECTION LEVELS (A-D) NUMBER OF HOURS BEFORE REST PERIOD				
Temperature	**Level D**	**Level C**	**Level B**	**Level A**
90+ F*	2.0	1.5	1.0	0.5
87.5 F	2.5	2.0	1.5	1.0
82.5 F	3.0	2.5	2.0	1.5
77.5 F	3.5	3.0	2.5	1.5
72.5	4.0	3.5	2.5	1.5

**Work above 100 F will be reviewed with the Project Safety Manager to determine specific requirements.*

Alternately the work/rest schedule can be calculated based on heat stress monitoring results. Monitoring consists of taking the radial pulse of a worker for 30 seconds immediately after exiting the work area. The frequency of monitoring is described below.

If the heart rate exceeds 110 beats per minute at the beginning of the rest period, shorten the next work cycle by 1/3 and keep the rest period the same. If the heart rate still exceeds 110 beats per minute at the next rest period, increase the following rest period by 1/3. The initial rest period should be at least 5 minutes.

Body temperature, measured orally or through the ear canal, may also be monitored to assess heat stress. Workers should not be permitted to continue work when their body temperature

exceeds 100.4 F (38C). Monitoring should be conducted at the beginning of each break period as noted above.

Monitoring for heat stress will begin when the ambient temperature reaches or exceeds 72.5 degrees Fahrenheit when wearing chemical protective clothing (Level C, B, A), or 80 degrees Fahrenheit for Site activities performed with no chemical protective clothing (Level D). Monitoring should include pulse rate, weight loss, oral/ or ear canal temperature, signs and symptoms of heat stress and fluid intake.

An additional measure that can be employed to minimize heat stress is through the utilization of Heat Stress Relief Stations. A Heat Stress Relief Station (HSRS) is a location inside the exclusion zone where workers can partially remove their personal protective equipment, rest and take in fluids. Since the HSRS is established inside the exclusion zone, it is imperative that its use be closely monitored and controlled to ensure that workers do not ingest contamination during use.

The following is a detailed description of the HSRS:

- Location- The HSRS should be located in an area of the exclusion zone where it will be predominantly upwind of Site activities. This can typically be adjacent to the contamination reduction zone.
- Delineation- The HSRS must be separated from the exclusion zone by temporary fencing and must be labeled as “Heat Stress Relief Station”.
- Elements- The HSRS contains several elements:
    - A tarp or tent for shade;
    - A bench or chairs for workers to sit on;
    - A wash station;
    - A table for fluids, cups and clean personal protective equipment (PPE); and
    - A trash can for contaminated PPE.
- Set-Up- Proper set up of the HSRS is imperative its successful use.
    - In the Support Zone, prepare the water cooler with ice and water or Gatorade.
    - The person bringing the items to the HSRS must don the appropriate PPE required for the Exclusion Zone.
    - Bring the following items to the HSRS:
        - Cooler;
        - Clean disposable cups;
        - Disinfectant wipes;

        - A clean trash bag;
        - Surgical gloves; and
        - Duct tape.
    - Ensure the wash station has clean water and paper towels for drying hands/face.
- Procedure for Use- In order for the HSRS to be effective, it must be properly used. It is imperative that workers decontaminate properly before drinking fluids so that ingestion of Site contaminants does not take place. The following are the steps to properly use the HSRS:
    - Upon entering the HSRS:
        - If wearing a protective suit, remove duct tape on wrists and unzip and tie around waist;
        - Remove your outer gloves and surgical gloves; set outer gloves aside and throw surgical gloves into trash;
        - Wash hands and/or face at Wash Station;
        - Use disinfectant wipe on hands;
        - Get drink and/or rest on bench/chair.
    - Before re-entering the Exclusion Zone:
        - Dispose of cups in trash;
        - Put on a clean pair of surgical gloves;
        - If wearing a Tyvek, pull up and rezip;
        - Re-apply duct tape to wrists;
        - Put on outer gloves.
- Monitoring- The CS and HSO are both responsible for monitoring the use of the Heat Stress Relief Station. The HSO should review the procedures for use of the HSRS with the workers before its use begins to ensure that everyone understands the parameters for proper use.

4.3.2 *Exposure to Cold*

With outdoor work in the winter months, the potential exists for hypothermia and frostbite. Several forms of cold stress as well as preventative measures are described in this section of the CHASP.

4.3.2.1 *Cold Stress Conditions and Symptoms*

Typical cold stress conditions are included in the tables below, including symptoms and first aid precautions. If cold stress conditions develop, professional medical attention will be sought.

TABLE 4.3.2A COLD WEATHER INJURIES		
Cause	**Symptoms**	**First Aid**
Frostbite		
Freezing of tissue, normally due to exposure below 32°F	Numbness in affected area. Tingling, blistered, swollen or tender areas. Pale, yellowish waxy-looking skin.	Warm affected area with direct body heat. Consult with medical personnel ASAP. **Do not** thaw frozen area if treatment will be delayed. **Do not** massage or rub affected area. **Do not** wet area or rub with snow or ice.
Chilblain		
Repeated exposure of bare skin for prolonged periods to temperatures 20° to 60°F (for those not acclimated to cold weather).	Swollen, red skin. Tender, hot skin, usually accompanied by itching.	Warm affected area with direct body heat. **Do not** massage or rub. **Do not** wet area or rub with snow or ice. **Do not** expose affected area to open fire, stove or any other intense heat source.
Immersion Foot (Trench Foot)		
Prolonged exposure of the feet to wet conditions at temperatures between 32° to 50°F. Inactivity and damp socks (or tightly laced boots that impair circulation) speed onset and severity.	Cold numb feet may progress to hot with shooting pains. Swelling redness and bleeding.	Rewarm feet by exposing them to warm air. Evacuate victim to a medical facility. **Do not** massage, rub, moisten or expose affected area to extreme heat source.
Dehydration		
Depletion of body fluids.	Dizziness. Weakness.	Replace lost water. Water should be sipped not gulped. Get medical treatment.
Hypothermia		
Prolonged cold exposure and body heat loss. May occur at well above freezing, especially when a person is immersed in water.	Lack of shivering. Drowsiness, mental slowness, lack of coordination. Can progress to unconsciousness, irregular heartbeat and death.	Strip off clothing and wrap victim in blankets or a sleeping bag. Get victim to a heated location and medical treatment as soon as possible.

In cold weather, the potential for frostbite exists, especially in body extremities. Personnel will be instructed to pay particular attention to hands, feet, and any exposed skin when dressing. Personnel will be advised to obtain more clothing if they begin to experience loss of sensation due to cold exposure.

4.3.2.2 *Monitoring and Preventative Actions*

Typical cold stress monitoring procedures are included in the tables below, including temperatures to initiate monitoring, protective clothing uses and administrative practices to prevent or reduce the potential for cold stress related injury/illness. For weather conditions below -43 °C or -45 °F with no wind and/or similar conditions (see Work/Warm-up Table) all work will cease.

TABLE 4.3.2B
COLD STRESS PREVENTION*

	Temperature	Preventative Action
1	<61°F	Use thermometer to measure ambient temperature.
2	<40°F	Cold weather protective clothing available; check core body temperature at breaks using oral or ear canal thermometer. Maintain core body temperature above 96.8°F to avoid hypothermia.
3	<30°F	Record ambient temperature and wind speed every 4 hours; compare to wind chill chart when below 19.4°F.
4	<19°F	Provide and use heated warming shelters for work breaks and when cold stress symptoms appear.
5	<10°F	Constant observation of workers, i.e. "buddy system"; rest in heated shelters (see work-rest schedule); dry clothing available for change-out; acclimate new workers.
6	<0°F/ >5 mph winds	Obtain medical certification for workers subject to hypothermia risk.

** Based on "2009 ACGIH Threshold Limit Values... for Physical Agents."*
Note: refer to wind-chill and work-warmup charts in Table 4.3.2E

TABLE 4.3.2C COLD WEATHER CLOTHING REQUIREMENTS	
1	If wind chill is a factor at a work location, the cooling effect of the wind shall be reduced by shielding the work area or providing employees an outer windbreak layer garment.
2	Extremities, ears, toes, and nose shall be protected from extreme cold by protective clothing.
3	Employees performing light work whose clothing may become wet shall wear an outer layer of clothing which is impermeable to water.
4	Employees performing moderate to heavy work whose clothing may become wet shall wear an outer layer of clothing which is impermeable to water.
5	Outer garments must provide for ventilation to prevent wetting of inner clothing by sweat, or if not possible, a heated shelter for warming/drying clothing, or a change of clothing, shall be provided prior to returning to work in a cold environment.

Protective clothing greatly reduces the possibility of hypothermia in workers. However, personnel will be instructed to wear warm clothing and to stop work to obtain more clothing if they become too cold. Employees will also be advised to change into dry clothes if their clothing becomes wet from perspiration or from exposure to precipitation.

Employees will be instructed to use heated shelters on-Site, at regular intervals, depending upon the severity of ambient temperatures. Symptoms of cold stress, including heavy shivering, excessive fatigue, drowsiness, irritability, or euphoria necessitate immediate return to the shelter.

TABLE 4.3.2D
COOLING POWER OF WIND ON EXPOSED FLESH EXPRESSED AS EQUIVALENT TEMPERATURE *(under calm conditions)**

Actual Temperature Reading (F)												
Estimated Wind Speed (in MPH)	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	Equivalent Chill Temperature (F)											
Calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148
(Wind Speeds greater than 40 mph have little additional effect.)	***Little Danger*** In < hr with dry skin. Maximum danger of false sense of security				***Increasing Danger*** Danger of freezing of exposed flesh within one minute**.**				***Great Danger*** Flesh may freeze within 30 seconds.			
	Trench foot and immersion foot may occur at any point on this chart.											

**Developed by U.S. Army Research Institute of Environmental Medicine, Natick, MA. (Shaded area) Equivalent chill temperature requiring dry clothing to maintain core body temperature above 36 C (98.6 F) per cold stress TLV.*

TABLE 4.3.2E TLV WORK/WARM-UP SCHEDULE FOR FOUR-HOUR SHIFT*											
Air Temperature – Sunny Sky		**No Noticeable Wind**		**5 mph wind**		**10 mph wind**		**15 mph wind**		**20 mph wind**	
C (appx.)	**F (appx.)**	**Max. Work Period**	**No. of Breaks**	**Max. Work Period**	**No. of Breaks**	**Max. Work Period**	**No. of Breaks**	**Max. Work Period**	**No. of Breaks**	**Max. Work Period**	**No. of Breaks**
-26 to -28	-15 to -19	Normal	1	Normal	1	75 min	2	55 min	3	40 min	4
-29 to -31	-20 to -24	Normal	1	75 min	2	55 min	3	40 min	4	30 min	5
-32 to -34	-25 to -29	75 min	2	55 min	3	40 min	4	30 min	5	Non-Emergency work should cease	
-35 to -37	-30 to -34	55 min	3	40 min	4	30 min	5	Non-emergency work should cease			
-38 to -39	-35 to -39	40 min	4	30 min	5	Non-emergency work should cease					
-40 to -42	-40 to -44	30 min	5	Non-emergency work should cease							
< -43	< -45	Non-emergency work should cease									

** Adapted from Occupational Health and Safety Division, Saskatchewan Department of Labor*

4.3.3 *Biological Hazards*

The contractor will be required to monitor and control insects, rodents, and other pests identified on-Site. Standing water will not be allowed on-Site, in an effort to control insects. Pest control procedures used by the contractor will include bait, trap, spray, or other means to abate pest problems that develop on-Site during disruption activities.

4.3.4 *Noise*

Hearing protection is required for workers operating or working near heavy equipment, where the noise level is greater than 85 dbA (Time Weighted Average). The HSO will determine the need and appropriate testing procedures, (i.e., sound level meter and/or dosimeter) for noise measurement. The provisions for noise protection for workers are presented in other safety-related documents for the Site.

4.4 VEHICLE AND HEAVY EQUIPMENT SAFETY

4.4.1 *Vehicle Safety*

Motor vehicle incidents are the number one cause of occupational fatalities, accounting for one in three deaths. The safety provisions for vehicle use at the Site are presented in other safety-related documents for the Site.

4.4.2 *Heavy Equipment Safety*

The use of backhoes, front-end loaders, etc. for excavation and other material handling equipment will present various physical hazards. The safety provisions for heavy equipment use at the Site are presented on other safety-related documents for the Site.

4.5 TASK-SPECIFIC ACTIVITY HAZARD ANALYSES (AHA)

This section of the HASP provides a breakdown of the hazards and control measures for each principal task. These Activity Hazard Analyses (AHAs) are general in nature and must be made project specific by the Construction Superintendent prior to each task. The AHAs will be field checked by the supervisor on an ongoing basis and revised as necessary. All revisions will be communicated to the work crew.

Project Identification BCP Site No. C241250	**Location** 29-05 38th Avenue, Long Island City, Queens, NY	**Estimated Dates** February 2022 – July 2024
Phase of Work Mobilization/ Demobilization		**Analysis Approved by** Spiro Dongaris
TASKS	**HAZARDS**	**CONTROL MEASURES**
1. Mobilization and demobilization of equipment Site tools, personnel. 2. Set up/remove staging and decontamination areas.	Slips/trips/falls	• Maintain alertness to slip/trip/fall hazards • Maintain good housekeeping • Walk, do not run • Wear footwear with soles that grip
	Manual lifting/ material handling	• Observe proper lifting techniques • Obey sensible lifting limits (50 lb. maximum per person manual lifting) • Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads
	Temperature extremes	• Drink plenty of fluids • Train personnel of signs/symptoms of cold/heat stress • Monitor air temperatures when extreme weather conditions are present • Stay in visual and verbal contact with your buddy
	Hand tool usage	• Daily inspections will be performed • Remove broken or damaged tools from service • Use the tool for its intended purpose • Use in accordance with manufacturer instructions.
	Biological hazards	• Be alert to the presence of biological hazards • Wear insect repellent • CS/HSO should be aware of on-Site personnel with allergic reactions in insect bites and stings.

Project Identification BCP Site No. C241250	**Location** 29-05 38th Avenue, Long Island City, Queens, NY	**Estimated Dates** February 2022 – July 2024
Phase of Work Trenching/Excavation		**Analysis Approved by** Spiro Dongaris
TASKS	**HAZARDS**	**CONTROL MEASURES**
1. Trenching and excavation. 2. Install shoring/ sheeting protective system.	Chemical hazards	• Wear appropriate PPE per Section 5.1 • Practice contamination avoidance • Conduct real-time air monitoring per section 7.1.1 • Follow proper decontamination procedures • Wash hands/face before eating, drinking, smoking
	Cave-in	• Do not allow entry into the trench unless approved protective system is in place and has been inspected by the competent person. • Follow OSHA excavation regulations • Place ladder or entry device every 25 feet of lateral travel
	Struck By/ Against Motor Vehicles/ Operating Equipment	• Wear reflective warning vests when exposed to vehicular traffic • Isolate potential equipment swing areas • Make eye contact with vehicle operators before approaching/crossing high traffic areas • Understand and review hand signals • Use a spotter to direct equipment movement in high traffic areas • Audible back-up alarms on equipment • Operator inspects equipment daily for safety defects, including the braking system
	Slips/trips/falls	• Clear walkways, work areas of equipment and tools • Mark, identify, or barricade other obstructions • Use barricades or fencing for trenches greater than 6 feet deep • Maintain alertness to slip/trip/fall hazards • Maintain good housekeeping • Walk, do not run • Wear footwear with soles that grip
	Electrical hazards	• Maintain 10 foot minimum clearance to any overhead power lines • Call for Utility mark out prior to digging

Project Identification BCP Site No. C241250	**Location** 29-05 38th Avenue, Long Island City, Queens, NY	**Estimated Dates** February 2022 – July 2024
Phase of Work Trenching/Excavation		**Analysis Approved by** Spiro Dongaris
TASKS	**HAZARDS**	**CONTROL MEASURES**
1. Trenching and excavation. 2. Install shoring/ sheeting protective system.	Hand and power tool usage	• Daily inspections will be performed on tools and cords • Ensure all guards are in place • Remove broken or damaged tools from service • Use the tool for its intended purpose • Use in accordance with manufacturer instructions
	Noise	• Hearing protection mandatory at or above 85 dBA. • Instruct personnel how to properly wear hearing protective devices. • Disposable ear plugs or other hearing protection required while around noisy equipment.
	Manual lifting/ Material handling	• Observe proper lifting techniques • Obey sensible lifting limits (50 lb. maximum per person manual lifting) • Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads
	Temperature extremes.	• Drink plenty of fluids: • Train personnel of signs/symptoms of cold/heat stress; • Monitor air temperatures when extreme weather conditions are present; • Stay in visual and verbal contact with your buddy; and • Use procedures in Sections 3.3.1 and 3.3.2

Project Identification BCP Site No. C241250	**Location** 29-05 38th Avenue, Long Island City, Queens, NY	**Estimated Dates** February 2022 – July 2024
Phase of Work Loading of Trucks		**Analysis Approved by** Spiro Dongaris
TASKS	**HAZARDS**	**CONTROL MEASURES**
1. Load trucks with contaminated soils. 2. Cover and clean trucks.	Chemical hazards	• Wear appropriate PPE per Section 6.1 • Practice contamination avoidance • Conduct real-time air monitoring per section 8.1.1 • Follow proper decontamination procedures • Wash hands/face before eating, drinking, smoking
	Struck By/ Against Motor Vehicles/ Operating Equipment	• Wear reflective warning vests when exposed to vehicular traffic • Isolate potential equipment swing areas • Make eye contact with vehicle operators before approaching/crossing high traffic areas • Understand and review hand signals • Use a spotter to direct equipment movement in high traffic areas • Audible back-up alarms on equipment • Operator inspects equipment daily for safety defects, including the braking system
	Slips/trips/falls	• Maintain alertness to slip/trip/fall hazards • Maintain good housekeeping • Walk, do not run • Wear footwear with soles that grip
	Manual lifting/ material handling	• Observe proper lifting techniques • Obey sensible lifting limits (50 lb. maximum per person manual lifting) • Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads
	Temperature extremes	• Drink plenty of fluids • Train personnel of signs/symptoms of cold/heat stress • Monitor air temperatures when extreme weather conditions are present • Stay in visual and verbal contact with your buddy • Use procedures in Sections 4.3.1 and 4.3.2
	Noise	• Hearing protection mandatory at or above 85 dBA. • Instruct personnel how to properly wear hearing protective devices. • Disposable ear plugs or other hearing protection required while around noisy equipment.

Project Identification BCP Site No. C241250	**Location** 29-05 38th Avenue, Long Island City, Queens, NY	**Estimated Dates** February 2022 – July 2024
Phase of Work Installation of Footers		**Analysis Approved by** Spiro Dongaris
TASKS	**HAZARDS**	**CONTROL MEASURES**
1. Build forms. 2. Pour concrete. 3. Remove forms.	Chemical hazards	• Wear appropriate PPE per Section 6.1 • Practice contamination avoidance • Conduct real-time air monitoring per section 8.1.1 • Follow proper decontamination procedures • Wash hands/face before eating, drinking, smoking
	Struck By/ Against Motor Vehicles/ Operating Equipment	• Wear reflective warning vests when exposed to vehicular traffic • Isolate potential equipment swing areas • Make eye contact with vehicle operators before approaching/crossing high traffic areas • Understand and review hand signals • Use a spotter to direct equipment movement in high traffic areas • Audible back-up alarms on equipment • Operator inspects equipment daily for safety defects, including the braking system
	Concrete pumper	• Make sure nozzle man has eye contact with pump truck operator. • Ensure steady control over nozzle
	Splashing concrete	• Ensure eye protection is worn and other PPE as required by Section 6.1 • A portable eyewash will be maintained in the work area
	Falls from heights	• Fall protection is required over 6 feet when removing forms • Use PFAS where needed • OSHA required training before use of PFAS, scaffold or lift • Competent person inspects PFAS and scaffold
	Sharp Objects	• Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects being handled • Maintain all hand and power tools in a safe condition • Keep guards in place during use

Project Identification BCP Site No. C241250	**Location** 29-05 38th Avenue, Long Island City, Queens, NY	**Estimated Dates** February 2022 – July 2024
Phase of Work Installation of Footers		**Analysis Approved by** Spiro Dongaris
TASKS	**HAZARDS**	**CONTROL MEASURES**
1. Build forms. 2. Pour concrete. 3. Remove forms.	Hand and power tool usage	• Daily inspections will be performed on tools and cords • Ensure all guards are in place • Remove broken or damaged tools from service • Use the tool for its intended purpose • Use in accordance with manufacturer instructions
	Noise	• Hearing protection mandatory at or above 85 dBA. • Instruct personnel how to properly wear hearing protective devices. • Disposable ear plugs or other hearing protection required while around noisy equipment.
	Manual lifting/ material handling	• Observe proper lifting techniques • Obey sensible lifting limits (50 lb. maximum per person manual lifting) • Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads
	Slips/trips/falls	• Maintain alertness to slip/trip/fall hazards • Maintain good housekeeping • Walk, do not run • Wear footwear with soles that grip
	Temperature extremes.	• Drink plenty of fluids: • Train personnel of signs/symptoms of cold/heat stress; • Monitor air temperatures when extreme weather conditions are present; • Stay in visual and verbal contact with your buddy; and • Use procedures in Sections 4.3.1 and 4.3.2

Project Identification BCP Site No. C241250	**Location** 29-05 38th Avenue, Long Island City, Queens, NY	**Estimated Dates** February 2022 – July 2024
Phase of Work Heavy Equipment Decontamination		**Analysis Approved by** Spiro Dongaris
TASKS	**HAZARDS**	**CONTROL MEASURES**
1. Pressure wash or steam clean heavy equipment and vehicles.	Chemical hazards	• Wear appropriate PPE per Section 6.1 • Practice contamination avoidance • Conduct real-time air monitoring per section 8.1.1 • Follow proper decontamination procedures • Wash hands/face before eating, drinking, smoking
	Struck By/ Against Motor Vehicles/ Operating Equipment	• Wear reflective warning vests when exposed to vehicular traffic • Isolate potential equipment swing areas • Make eye contact with vehicle operators before approaching/crossing high traffic areas • Understand and review hand signals • Use a spotter to direct equipment movement in high traffic areas • Audible back-up alarms on equipment • Operator inspects equipment daily for safety defects, including the braking system
	Steam/heat/ splashing	• Wear face shield + safety glasses • Stay out of splash radius to minimize exposure • Do not direct steam/spray at anyone
	Hand and power tool usage	• Daily inspections will be performed on tools and cords • Ensure all guards are in place • Remove broken or damaged tools from service • Use the tool for its intended purpose • Use in accordance with manufacturer's instructions
	Slips/trips/falls	• Maintain alertness to slip/trip/fall hazards • Maintain good housekeeping • Walk, do not run • Wear footwear with soles that grip
	Temperature extremes	• Drink plenty of fluids • Train personnel of signs/symptoms of cold/heat stress • Monitor air temperatures when extreme weather conditions are present • Stay in visual and verbal contact with your buddy • Use procedures in Sections 4.3.1 and 4.3.2

5.0 *WORK AND SUPPORT AREAS*

To prevent migration of contamination from personnel and equipment, work areas will be clearly specified as designated below prior to beginning operations. Each work area will be clearly identified using signs or physical barriers.

5.1 EXCLUSION ZONE (EZ)

The EZ is the area suspected of contamination and presents the greatest potential for worker exposure. Personnel entering the area must wear the mandated level of protection for that area. In certain instances, different levels of protection will be required depending on the tasks and monitoring performed within that zone. The EZ for this project will include the excavation areas, any stockpiling/staging areas, and areas where disturbance of urban fill is likely occurring.

5.2 CONTAMINATION - REDUCTION ZONE (CRZ)

The CRZ or transition zone will be established between the EZ and support zone (SZ). In this area, personnel will begin the sequential decontamination process required to exit the EZ. To prevent off-Site migration of contamination and for personnel accountability, all personnel will enter and exit the EZ through the CRZ. The CRZ for this project will be the access/egress routes to/from the EZ and the personnel and equipment decontamination stations.

5.3 SUPPORT ZONE (SZ)

The SZ serves as a clean, control area. Operational support facilities are located within the SZ. Normal work clothing and support equipment are appropriate in this zone. Contaminated equipment or clothing will not be allowed in the SZ. There will be a clearly marked controlled access point from the SZ into the CRZ and EZ that is monitored closely by the HSO and the CS to ensure proper safety protocols are followed. The SZ will be any office areas/trailers and the parking and visitor access ways to the project Site.

5.4 SITE CONTROL LOG

A log of all personnel visiting, entering or working on the Site shall be maintained in the main office location. The log will record the date, name, company or agency, and time entering or exiting the Site.

No visitor will be allowed in the EZ without showing proof of training and compliance with applicable medical monitoring requirements. Visitors will supply their own protective equipment, including hard hat, boots and respiratory equipment, if required. Visitors will attend a Site orientation given by the HSO and sign the HASP.

5.5 GENERAL

The following items are requirements to protect the health and safety of workers and will be discussed in the safety briefing prior to initiating work on the Site.

- Eating, drinking, chewing gum or tobacco, smoking, or any practice that increases the probability of hand to mouth transfer and ingestion of contamination is prohibited in the EZ and CRZs.
- Hands and face must be washed upon leaving the EZ and before eating, drinking, chewing gum or tobacco and smoking or other activities which may result in ingestion of contamination.
- During Site operations, each worker will consider himself as a safety backup to his partner. All personnel will be aware of dangerous situations that may develop.
- Visual contact will be maintained between workers on-Site when performing hazardous duties.
- No personnel will be admitted to the Site without the proper safety equipment, training, and medical surveillance certification.
- All personnel must comply with established safety procedures. Any Site personnel who do not comply with safety policy, as established by the HSO or the CS, will be dismissed from the Site.
- Proper decontamination procedures must be followed before leaving the Site.
- All Site workers are authorized to stop work if they observe unsafe actions of workers or other unsafe conditions on-Site which may cause an imminent danger.
- All workers and visitors must sign in and out of the Site.

6.0 *PROTECTIVE EQUIPMENT*

This section specifies the levels of personal protective equipment (PPE) which are or may be required for each principal activity performed at this Site. All Site personnel must be trained in the use of all PPE utilized.

6.1 ANTICIPATED PROTECTION LEVELS

The following protection levels have been established for the Site work activities based on-Site information concerning the levels of contaminants and the scope of work. Results of Site air monitoring and visual inspection of the work activities may indicate the need for changes in final PPE level(s). Changes in the initial PPE Levels prescribed in the Table below require completion of the HASP amendment form in Appendix B.

Task	Initial PPE Level	Upgrade/ Downgrade PPE Level	Skin Protection	Respiratory Protection	Other PPE
General Support Zone Activities	Level D	—	Generally none	None	Hard-hat, Steel-toe work boots, safety glasses, safety vests. Leather work gloves as needed. Hearing protection when >85 dBA.
Mobilization/ Demobilization	Level D	—	Generally none	None	Hard-hat, Steel-toe work boots, safety glasses, safety vests. Leather work gloves as needed. Hearing protection when >85 dBA.
Excavation, Loading of Trucks with Contaminated Soil/Fill, Equipment Decontamination	Level D		Generally none	Initial: None (See Section 7)	Hard-hat, Steel-toe work boots, safety glasses, leather work gloves for material handling, hearing protection >85 dBA

6.2 PROTECTION LEVEL DESCRIPTIONS

This section lists the minimum requirements for each protection level. Modification to these requirements may have been noted in the Table shown above.

6.2.1 *Level D*

Level D consists of the following:

- Safety glasses with side shields
- Hard hat
- Steel-toed work boots
- Work clothing as prescribed by weather
- Leather work gloves when material handling

7.0 *DECONTAMINATION PROCEDURES*

This section describes the procedures necessary to ensure that both personnel and equipment are free from contamination when they leave the work Site.

7.1 PERSONNEL DECONTAMINATION

Decontamination procedures will ensure that material which workers may have contacted in the EZ does not result in personal exposure and is not spread to clean areas of the Site. This sequence describes the general decontamination procedures for Level D. The specific stages will vary depending on the Site, the task, the protection level, etc. Dry decontamination may be used if there is insufficient space to support a full decontamination station as delineated with the steps below and approved by the HSO. The CS and the HSO will ensure that the decontamination procedures are adequate.

Level D Decontamination

1. Go to end of EZ
2. Cross into CRZ
3. Wash face and hands

7.1.1 *Suspected Contamination*

Any employee suspected of sustaining skin contact with chemical materials will first use the emergency shower. Following a thorough drenching, the worker will proceed to the decontamination area. Here the worker will remove clothing and don clean clothing. Medical attention will be provided as determined by the degree of injury.

7.1.2 *Personal Hygiene*

Personnel will wash hands, arms, neck and face, following decontamination and before any eating, smoking, or drinking.

7.2 EQUIPMENT DECONTAMINATION

Heavy equipment and other vehicles operated within the EZ will be decontaminated before being removed from the Site. Workers operating the equipment/vehicles will move the equipment to a gross decontamination location near the exit of the EZ. Following gross decontamination the equipment/vehicle will be moved to the decontamination pad. Equipment decontamination will be performed on the pad until the equipment is visually clean. Following decontamination activities equipment will be inspected by the HSO or CS prior to leaving the Site. Once the equipment is inspected it will be removed from the Site.

Heavy Equipment / Vehicle Decontamination

1. Equipment operator will move the heavy equipment / vehicle to a position near the EZ / CRZ interchange
2. Worker will use manual equipment (shovel, track spade) to remove gross contamination from tracks, bucket, dump box, and vehicle undercarriage (as required)
3. Following removal of gross decontamination equipment will be moved onto the decontamination pad and pressure washed / steam cleaned until equipment / vehicle is visually clean.
4. Equipment / vehicle decontaminated for removal from the Site will be moved to a clean area for the HSO / CS inspection.
5. Once the equipment / vehicle is inspected and approved it will be removed from the Site. Vehicles that fail inspection will be returned to the decontamination pad for further cleaning and re-inspected.

7.3 DISPOSAL OF WASTES

Wastes will be disposed according to applicable Local, State and Federal regulations.

7.4 DUST /EROSION CONTROL

The contractor will control dust and implement erosion control measures to be protective of nearby ecologically sensitive areas and sensitive receptors.

8.0 *AIR MONITORING*

Air monitoring will be conducted in order to characterize personnel exposures and fugitive emissions from Site contaminants. Principal contaminants of concern are listed in Section 4.0 of this HASP. The target compounds selected for air monitoring purposes for this Site include particulates. Results of air monitoring will be used to ensure the proper selection of protective clothing and equipment, including respiratory protection, to protect on-Site personnel and off-Site receptors from exposure to unacceptable levels of Site contaminants. Descriptions of air monitoring strategies, procedures and equipment are provided below. Modification of this plan, including additional monitoring, may be considered as judged necessary by the PSM, in conjunction with the HSO.

8.1 WORK AREA AIR MONITORING

Work area air monitoring will include direct reading methods and personal exposure monitoring, and will conducted in accordance with the approved CAMP for the Site. Air monitoring will be conducted during soil excavation, transportation, relocation and/or staging, and any other activities that disturb soil or are intrusive. Air monitoring within the work zone will be conducted at least four times per day, and more frequently as warranted due to detected odors or other indications of contamination, or other factors.

8.1.1 *Direct Reading Air Monitoring*

During active sifting operations, direct reading air monitoring will be performed to determine the potential for worker exposure to airborne hazards. A summary of air monitoring information is provided in Section 8.1.5. Real-time air samples will be taken at least four times each 8-hour worker shift in the workers' breathing zone.

8.1.2 *Instrumentation*

The following is a description of the air monitoring equipment to be used:

- MIE PDR-1000 Personal DataRAM, Dust trak or equivalent unit for real-time measuring particulates.
- MiniRAE PID equipped with a 106 eV lamp, or equivalent for real-time measuring of VOC levels.

8.1.3 *Use and Maintenance of Survey Equipment*

All personnel using field survey equipment must have training in its operation, limitations, and maintenance. Maintenance and internal or electronic calibration will be performed in accordance

with manufacturer recommendations by individuals familiar with the devices before their use on-Site. Repairs, maintenance, and internal or electronic calibration of these devices will be recorded in an equipment maintenance logbook. The equipment maintenance logbook for each instrument will be kept in that instrument's case. For rented monitoring equipment, repairs and maintenance will be conducted by the rental company. Daily calibration records will be documented on a log sheet found in Appendix D.

Air monitoring equipment will be calibrated before work begins. Only basic maintenance (such as changing batteries) will be performed by on-Site personnel. Any additional maintenance or repairs will be performed by a trained service technician.

8.1.4 *Air Monitoring Recordkeeping*

The HSO will ensure that all air-monitoring data is recorded on a data sheet found in Appendix D. The PSM may periodically review this data.

8.1.5 *Action Levels*

During soil/waste excavation, transportation, relocation and/or staging or any intrusive activities, direct reading air monitoring will be performed in the EZ to determine exposure to workers. A summary of air monitoring information is provided in the table below.

Monitoring Device	Monitoring Location/ Personnel	Monitoring Frequency	Action Level	Action
pDr-1000 (Dust)	Soil excavation areas/laborers, technicians, equipment operators	Minimum of four times every 8-hour shift during soil disturbance activities	<5.0 mg/m^3 *	Level D
			≥5.0 mg/m^3 *	Stop work; notify PSM Implement dust suppression measures and resume work after dust levels are below action level
MiniRAE 3000 PID (VOCs)	Soil excavation areas/laborers, technicians, equipment operators	Minimum of four times every 8-hour shift during soil disturbance activities	<5.0 parts per million (ppm) *	Level D
			5.0 ppm to 25.0 ppm *	Implement VOC suppression measures and resume work after VOC levels are below action level
			≥25.0 ppm *	Stop work; notify PSM

** Above background levels and sustained in the breathing zone for 5 minutes*

As indicated by the below calculations, the action level for PAHs and lead were selected based on the OSHA PEL for respirable dust, which was found to be significantly lower than the calculated actions levels for PAHs and lead based on utilizing the highest concentrations of these contaminants found in soil.

- OSHA PEL for respirable dust: 5 mg/m^3,
- Maximum concentration of PAHs found in soil is 1.53 ppm or 0.000153%.
    - 5.0 mg/m^3 multiplied by 0.000153% = 0.000008 mg/m^3.
    - OSHA PEL for PAHs is 0.2 mg/m^3.
- Maximum concentration of lead found in soil is 92.8 ppm or 0.00928%.
    - 5.0 mg/m^3 multiplied by 0.00928% = 0.00464 mg/m^3.
    - OSHA PEL for lead is 0.05 mg/m^3.

As indicated by the below calculations, the action level for PCE was selected based on the OSHA PEL of 100 ppm (which corresponds to 678 mg/m^3), as follows:

- OSHA PEL for PCE: 100 ppm, or 678 mg/m^3.
- PID response factor (10.6 eV lamp) for PCE is 0.57.
- Multiplying the PID response factor and the PEL yields a PID reading of 57 ppm that would equal the PEL, based on a “worst-case” assumption that the entire PID reading is from PCE.
- Maximum concentration of PCE detected in soil vapor: 23 mg/m^3, or 3.39 ppm. As a result, using the 25 ppm limit for total VOCs (as measured by the PID) for stopping work (as identified in the CAMP) will be approximately half of the PEL, and therefore conservative.

9.0 *EMERGENCY RESPONSE AND CONTINGENCY PLAN (ERCP)*

9.1 PRE-EMERGENCY PLANNING

Prior to engaging in construction/remediation activities at the Site, the CS will plan for possible emergency situations and have adequate supplies and manpower to respond. In addition, Site personnel will be briefed on proper emergency response procedures during the Site orientation.

The following situations would warrant implementation of the emergency plan:

Fire/Explosion	• The potential for human injury exists. • Toxic fumes or vapors are released. • The fire could spread on-Site or off-Site and possibly ignite other flammable materials or cause heat-induced explosions. • The use of water and/or chemical fire suppressants could result in contaminated run-off. • An imminent danger of explosion exists.
Spill or Release of Hazardous Materials	• The spill could result in the release of flammable liquids or vapors, thus causing a fire or gas explosion hazard. • The spill could cause the release of toxic liquids or fumes in sufficient quantities or in a manner that is hazardous to or could endanger human health.
Natural Disaster	• A rain storm exceeds the flash flood level. • The facility is in a projected tornado path or a tornado has damaged facility property. • Severe wind gusts are forecasted or have occurred and have caused damage to the facility.
Medical Emergency	• Overexposure to hazardous materials. • Trauma injuries (broken bones, severe lacerations/ bleeding, burns). • Eye/skin contact with hazardous materials. • Medical Conditions e.g., loss of consciousness, heat stress (heat stroke), heart attack, respiratory failure, allergic reaction.

The following measures will be taken to assure the availability of adequate equipment and manpower resources:

- Sufficient equipment and materials will be kept on-Site and dedicated for emergencies only. The inventory will be replenished after each use.
- It will be the responsibility of the CS/HSO to brief on-Site personnel on anticipated hazards at the Site. The CS/HSO shall also be responsible for anticipating and requesting equipment that will be needed for response activities.

Communications will be established prior to commencement of any activities at the remediation-Site. Communication will be established so that all responders on-Site have availability to all pertinent information to allow them to conduct their activities in a safe and healthful manner. A telephone will be available to summon assistance in an emergency.

Primary communication with local responders in the event of an emergency will be accomplished using commercial telephone lines.

9.2 EMERGENCY RECOGNITION AND PREVENTION

Because unrecognized hazards may result in emergency incidents, it will be the responsibility of the CS and Health & Safety Officer (HSO), through daily Site inspections and employee feedback to recognize and identify hazards that are found at the Site. These may include:

Chemical Hazards	• Materials at the Site • Materials brought to the Site	
Physical Hazards	• Fire/explosion • Slip/trip/fall • Electrocution	• Confined space • IDLH atmospheres • Excessive noise
Mechanical Hazards	• Heavy equipment • Stored energy system • Pinch points	• Electrical equipment • Vehicle traffic
Environmental Hazards	• Electrical Storms • High winds • Heavy Rain/Snow	• Heat Stress • Vehicle traffic

9.3 EMERGENCY TELEPHONE NUMBERS

Emergency telephone numbers can be found in Table 9-1. The emergency numbers will be posted at strategic locations across the Site and in all Site trailers.

Figure 9-1 is the Hospital Route Map with directions to the nearest hospital. Only in a non-emergency situation are personnel to be transported to the hospital by Site representatives.

TABLE 9-1
EMERGENCY TELEPHONE NUMBERS

Emergency Contacts

Emergency Medical Service (New York City Fire Department (FDNY))…...	911
Police: New York City Police Department (NYPD)…….....	911
Hospital: Mount Sinai Hospital Queens……...……	(718) 932-1000
Fire: New York City Fire Department (FDNY)…….	911
New York City Office of Emergency Management……...	911
National Response Center……..	(800) 424-8802
Poison Control Center…….....	(800) 222-1222
Chemtrec…….	(800) 262-8200
Center for Disease Control…….	(800) 311-3435
USEPA (Region II)…….	(212) 637-5000
NYSDEC Emergency Spill Response…….……	(800) 457-7362

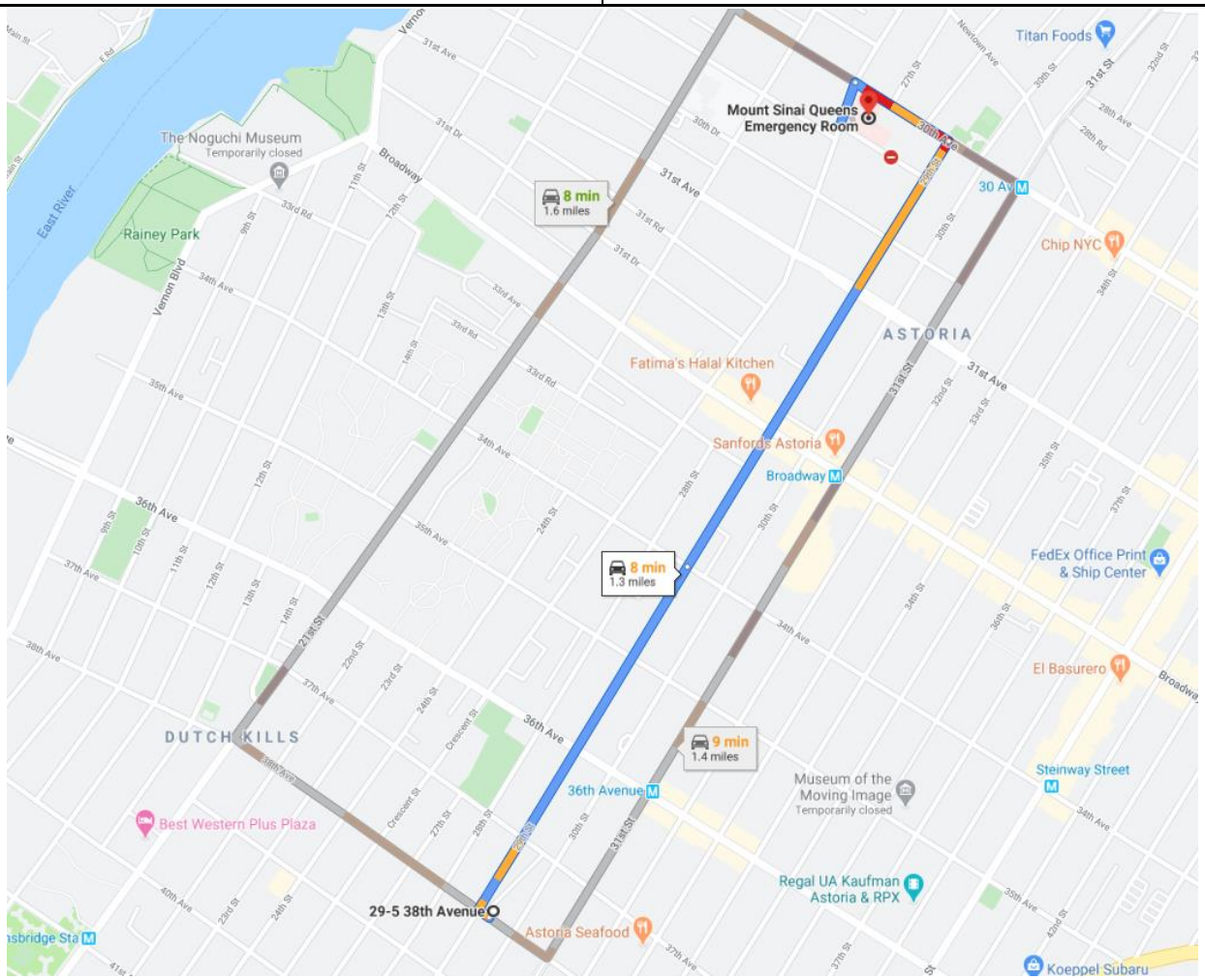
Project Contacts

Athenica, Principal: Spiro Dongaris, P.E. …….…….. (718) 784-7490
Athenica Project Manager: Kenneth Wenz, P.G. ……..... (631) 742-0638
Athenica Field Task Leader: To be determined……....
General Contractor Safety Officer: To be determined……..

FIGURE 9-1
DIRECTIONS AND HOSPITAL ROUTE MAP

Site Location: 29-05 38th Avenue, Long Island City (Queens), New York
Hospital Location: 2530 30th Avenue, Long Island City (Queens), New York 11102
Telephone: (718) 932-1000

Direction	Distance
Head northwest on 38th Avenue toward 29th Street	100 feet
Turn right onto 29th Street	1.1 mile
Turn left onto 30th Avenue	.1 mile
Hospital will be on the left. Follow signs for Emergency Room	End



Once a hazard has been recognized, the CS and/or the HSO will take immediate action to prevent the hazard from becoming an emergency. This may be accomplished by the following:

- Daily safety meeting
- Task-specific training prior to commencement of activity
- Personal Protective Equipment (PPE) selection/use
- Written and approved permits for hot work, confined space
- Trenching/shoring procedure
- Air monitoring
- Following all standard operating procedures

9.4 PERSONNEL ROLES, LINES OF AUTHORITY, AND COMMUNICATIONS

This section of the ERCP describes the various roles, responsibilities, and communication procedures that will be followed by personnel involved in emergency responses.

The primary emergency coordinator for this Site is the CS. In the event an emergency occurs and the emergency coordinator is not on-Site, the HSO will serve as the emergency coordinator until the CS arrives. The emergency coordinator will determine the nature of the emergency and take appropriate action as defined by this ERCP.

The emergency coordinator will implement the ERCP immediately as required. The decision to implement the plan will depend upon whether the actual incident threatens human health or the environment.

Immediately after being notified of an emergency incident, the emergency coordinator or his designee will evaluate the situation to determine the appropriate action.

9.4.1 *Responsibilities and Duties*

This section describes the responsibilities and duties assigned to the emergency coordinator.

It is recognized that the structure of the "Incident Command System" will change as additional response organizations are added. Personnel will follow procedures as directed by the fire department, LEPC, State and Federal Agencies as required.

9.4.2 *On-Site Emergency Coordinator Duties*

The on-Site emergency coordinator is responsible for implementing and directing the emergency procedures. All emergency personnel and their communications will be coordinated through the emergency coordinator. Specific duties are as follows:

- Identify the source and character of the incident, type and quantity of any release. Assess possible hazards to human health or the environment that may result directly from the problem or its control.
- Discontinue operations in the vicinity of the incident if necessary to ensure that fires, explosions, or spills do not recur or spread to other parts of the Site. While operations are dormant, monitor for leaks, pressure build-up, gas generation, or ruptures in valves, pipes, or other equipment, where safe and appropriate.
- Notify the Client Representative and local Emergency Response Teams if their help is necessary to control the incident. Table 9-1 provides telephone numbers for emergency assistance.
- Direct on-Site personnel to control the incident until, if necessary, outside help arrives. Specifically: Ensure that the building or area where the incident occurred and the surrounding area are evacuated and shut off possible ignition sources, if safe and appropriate. The Emergency Response Coordinator is responsible for directing Site personnel such that they avoid the area of the incident and leave emergency control procedures unobstructed.
- If fire or explosion is involved, notify local Fire Department.
- Have protected personnel, in appropriate PPE, on standby for rescue.

If the incident may threaten human health or the environment outside of the Site, the emergency coordinator should immediately determine whether evacuation of area outside of the Site may be necessary and, if so, notify the Police Department and the Office of Emergency Management.

When required, notify the National Response Center. The following information should be provided to the National Response Center:

- Name and telephone number
- Name and address of facility
- Time and type of incident
- Name and quantity of materials involved, if known
- Extent of injuries
- Possible hazards to human health or the environment outside of the facility.

The emergency telephone number for the National Response Center is 800-424-8802.

If hazardous waste has been released or produced through control of the incident, ensure that:

- Waste is collected and contained.
- Containers of waste are removed or isolated from the immediate Site of the emergency.
- Treatment or storage of the recovered waste, contaminated soil or surface water, or any other material that results from the incident or its control is provided.
- Ensure that no waste that is incompatible with released material is treated or stored in the facility until cleanup procedures are completed.
- Ensure that all emergency equipment used is decontaminated, recharged, and fit for its intended use before operations are resumed.
- Notify the USEPA Regional Administrator that cleanup procedures have been completed and that all emergency equipment is fit for its intended use before resuming operations in the affected area of the facility. The USEPA Regional Administrator's telephone number is included in the Emergency Contacts.
- Record date, time, details of the incident, and submit a written report to the USEPA Regional Administrator. The report is due to the USEPA within 15 days of the incident.

9.5 SAFE DISTANCES AND PLACES OF REFUGE

The emergency coordinator for all activities will be the CS. No single recommendation can be made for evacuation or safe distances because of the wide variety of emergencies which could occur. Safe distances can only be determined at the time of an emergency based on a combination of Site and incident-specific criteria. However, the following measures are established to serve as general guidelines.

In the event of minor hazardous materials releases (small spills of low toxicity), workers in the affected area will report initially to the contamination reduction zone. Small spills or leaks (generally less than 55 gallons) will require initial evacuation of at least 50 feet in all directions to allow for cleanup and to prevent exposure. After initial assessment of the extent of the release and potential hazards, the emergency coordinator or his designee will determine the specific boundaries for evacuation. Appropriate steps such as caution tape, rope, traffic cones, barricades, or personal monitors will be used to secure the boundaries.

If a major incident may threaten the health or safety of the surrounding community, the public will be informed and, if necessary, evacuated from the area. The emergency coordinator, or his designee will inform the proper agencies in the event that this is necessary. Telephone numbers are listed in Table 9-1.

Places of refuge will be established prior to the commencement of activities. These areas must be identified for the following incidents:

- Chemical release
- Fire/explosion
- Power loss
- Medical emergency
- Hazardous weather

In general, evacuation will be made to the Site entrance, unless the emergency coordinator determines otherwise. It is the responsibility of the emergency coordinator to determine when it is necessary to evacuate personnel to off-Site locations.

In the event of an emergency evacuation, all the employees will gather at the entrance to the Site until a head count establishes that all are present and accounted for. No one is to leave the Site without notifying the emergency coordinator.

9.6 EVACUATION ROUTES AND PROCEDURES

All emergencies require prompt and deliberate action. In the event of an emergency, it will be necessary to follow an established set of procedures. Such established procedures will be followed as closely as possible. However, in specific emergency situations, the emergency coordinator may deviate from the procedures to provide a more effective plan for bringing the situation under control. The emergency coordinator is responsible for determining which situations require Site evacuation.

9.6.1 *Evacuation Signals and Routes*

Two-way radio communication or equivalent will be used to notify employees of the necessity to evacuate an area or building involved in a release/spill of a hazardous material. As necessary, each crew supervisor will have a two-way radio. Total Site evacuation will be initiated only by the emergency coordinator, however, in his absence, decision to preserve the health and safety of employees will take precedence.

9.6.2 *Evacuation Procedures*

In the event evacuation is necessary the following actions will be taken:

- The emergency signal will be activated.
- No further entry of visitors, contractors, or trucks will be permitted. Vehicle traffic within the Site will cease in order to allow safe exit of personnel and movement of emergency equipment.
- Shut off all machinery if safe to do so.

- ALL on-Site personnel, visitors, and contractors in the support zone will assemble at the entrance to the Site for a head count and await further instruction from the emergency coordinator.
- ALL persons in the exclusion zone and contamination reduction zone will be accounted for by their immediate crew leaders. Leaders will determine the safest exits for employees and will also choose an alternate exit if the first choice is inaccessible.
- During exit, the crew leader should try to keep the group together. Immediately upon exit, the crew leader will account for all employees in his crew.
- Upon completion of the head count, the crew leader will provide the information to the emergency coordinator.
- Contract personnel and visitors will also be accounted for.
- The names of emergency response team members involved will be reported to the emergency coordinator.
- A final tally of persons will be made by the emergency coordinator or designee. No attempt to find persons not accounted for will involve endangering lives of Site personnel by re-entry into emergency areas.
- In all questions of accountability, immediate crew leaders will be held responsible for those persons reporting to them. Visitors will be the responsibility of those employees they are seeing. Contractors and truck drivers are the responsibility of the Construction Superintendent.
- Personnel will be assigned by the emergency coordinator to be available at the main gate to direct and brief emergency responders.
- Re-entry into the Site will be made only after clearance is given by the emergency coordinator. At his direction, a signal or other notification will be given for re-entry into the facility.

9.7 EMERGENCY SPILL RESPONSE PROCEDURES AND EQUIPMENT

In the event of an emergency involving a hazardous material spill or release, the following general procedures will be used for rapid and safe response and control of the situation. Emergency contacts found in Table 9-1 provide a quick reference guide to follow in the event of a major spill.

9.7.1 *Notification Procedures*

If an employee discovers a chemical spill or process upset resulting in a vapor or material release, he or she will immediately notify the on-Site emergency coordinator.

On-Site Emergency Coordinator will obtain information pertaining to the following:

- The material spilled or released.

- Location of the release or spillage of hazardous material.
- An estimate of quantity released and the rate at which it is being released.
- The direction in which the spill, vapor or smoke release is heading.
- Any injuries involved.
- Fire and/or explosion or possibility of these events.
- The area and materials involved and the intensity of the fire or explosion.

This information will help the on-Site emergency coordinator to assess the magnitude and potential seriousness of the spill or release.

9.7.2 *Procedure for Containing/Collecting Spills*

The initial response to any spill or discharge will be to protect human health and safety, and then the environment. Identification, containment, treatment, and disposal assessment will be the secondary response.

If for some reason a chemical spill is not contained within a dike or sump area, an area of isolation will be established around the spill. The size of the area will generally depend on the size of the spill and the materials involved. If the spill is large (greater than 55 gallons) and involves a tank or a pipeline rupture, an initial isolation of at least 100 ft. in all directions will be used. Small spills (less than or equal to 55 gallons) or leaks from a tank or pipe will require evacuation of at least 50 ft. in all directions to allow cleanup and repair and to prevent exposure. When any spill occurs, only those persons involved in overseeing or performing emergency operations will be allowed within the designated hazard area. If possible the area will be roped or otherwise blocked off.

If the spill results in the formation of a toxic vapor cloud (by reaction with surrounding materials or by outbreak of fire) and its release (due to high vapor pressures under ambient conditions), further evacuation will be necessary. In general an area at least 500 feet wide and 1,000 feet long will be evacuated downwind if volatile materials are spilled. (Consult the DOT Emergency Response Guide for isolation distances for listed hazardous materials.)

If an incident may threaten the health or safety of the surrounding community, the public will be informed and possibly evacuated from the area. The on-Site emergency coordinator will inform the proper agencies in the event this is necessary. (Refer to Table 9-1)

As called for in regulations developed under the Comprehensive Environmental Response Compensation Liability Act of 1980 (Superfund), a spill of a pound or more of any hazardous material for which a reportable quantity has not been established and which is listed under the Solid Waste Disposal Act, Clean Air Act, Clean Water Act, or TSCA shall be reported.

Clean up personnel will take the following measures:

- Make sure all unnecessary persons are removed from the hazard area.
- Put on protective clothing and equipment.
- If a flammable material is involved, remove all ignition sources, and use spark and explosion proof equipment for recovery of material.
- Remove all surrounding materials that could be especially reactive with materials in the waste. Determine the major components in the waste at the time of the spill.
- If wastes reach a storm sewer, try to dam the outfall by using sand, earth, sandbags, etc. If this is done, pump this material out into a temporary holding tank or drums as soon as possible.
- Place all small quantities of recovered liquid wastes (55 gallons or less) and contaminated soil into drums for incineration or removal to an approved disposal Site.
- Spray the spill area with foam, if available, if volatile emissions may occur.
- Apply appropriate spill control media (e.g. clay, sand, lime, etc.) to absorb discharged liquids.

For large spills, establish diking around leading edge of spill using booms, sand, clay or other appropriate material. If possible, use diaphragm pump to transfer discharged liquid to drums or holding tank.

9.7.3 *Emergency Response Equipment*

The following equipment will be staged in the support zone and throughout the Site, as needed, to provide for safety and first aid during emergency responses.

- ABC-type fire extinguisher
- First-aid kit, industrial size
- Portable eyewash

9.7.4 *Emergency Spill Response Clean-Up Materials and Equipment*

A sufficient supply of appropriate emergency response clean-up and personal protective equipment will be available as needed.

The materials listed below may be kept on-Site for spill control, depending on the types of hazardous materials present on-Site. The majority of this material will be located in the support zone, in a supply trailer or storage area. Small amounts, as necessary, will be placed on pallets and located in the active work areas.

- Sand or clay to solidify/absorb liquid spills.

* **Note: All contaminated soils, absorbent materials, solvents and other materials resulting from the clean-up of spilled or discharged substances shall be properly stored, labeled, and disposed of off-Site.**

9.8 EMERGENCY CONTINGENCY PLAN

This section of the ERCP details the contingency measures the Site Contractor will take to prepare for and respond to fires, explosions, spills and releases of hazardous materials, hazardous weather, and medical emergencies.

9.9 MEDICAL EMERGENCY CONTINGENCY MEASURES

The procedures listed below will be used to respond to medical emergencies. A minimum of one First-Aid/CPR trained personnel should be available on-Site.

9.9.1 *Response*

The nearest workers will immediately assist a person who shows signs of medical distress or who is involved in an accident. The work crew supervisor will be summoned.

The work crew supervisor will immediately make radio contact with the on-Site emergency coordinator to alert him of a medical emergency situation. The supervisor will advise the following information:

- Location of the victim at the work Site
- Nature of the emergency
- Whether the victim is conscious
- Specific conditions contributing to the emergency, if known

The Emergency Coordinator will notify the Health & Safety Officer. The following actions will then be taken depending on the severity of the incident:

- *Life-Threatening Incident* – If an apparent life-threatening condition exists, the crew supervisor will inform the emergency coordinator by radio, and the local Emergency Response Services (EMS) will be immediately called. An on-Site person will be appointed who will meet the EMS and have him/her quickly taken to the victim. Any injury within the EZ will be evacuated by personnel to a clean area for treatment by EMS personnel. No one will be able to enter the EZ without showing proof of training, medical surveillance and Site orientation.
- *Non-Life-Threatening Incident* – If it is determined that no threat to life is present, the Health & Safety Officer will direct the injured person through decontamination

procedures (see below) appropriate to the nature of the illness or accident. Appropriate first aid or medical attention will then be administered.

* **Note: The area surrounding an accident Site must not be disturbed until the scene has been cleared by the Health & Safety Officer.**

Any personnel requiring emergency medical attention will be evacuated from exclusion and contamination reduction zones if doing so would not endanger the life of the injured person or otherwise aggravate the injury. Personnel will not enter the area to attempt a rescue if their own lives would be threatened. The decision whether or not to decontaminate a victim prior to evacuation is based on the type and severity of the illness or injury and the nature of the contaminant. For some emergency victims, immediate decontamination may be an essential part of life-saving first aid. For others, decontamination may aggravate the injury or delay life-saving first aid. Decontamination will be performed if it does not interfere with essential treatment.

If decontamination can be performed, observe the following procedures:

- Wash external clothing and cut it away.

If decontamination cannot be performed, observe the following procedures:

- Wrap the victim in blankets or plastic to reduce contamination of other personnel.
- Alert emergency and off-Site medical personnel to potential contamination, instruct them about specific decontamination procedures.
- Send Site personnel familiar with the incident and chemical safety information, e.g. MSDS, with the affected person.

All injuries, no matter how small, will be reported to the HSO or the CS. An accident/injury/illness report will be completely and properly filled out and submitted to the Corporate Health and Safety Manager.

A list of emergency telephone numbers is given in Table 9.1.

9.9.2 *Notification*

The following personnel/agencies will be notified in the event of a medical emergency:

- Local Fire Department or EMS
- On-Site Emergency Coordinator
- Workers in the affected areas
- Client Representative

9.10 FIRE CONTINGENCY MEASURES

Because flammable/combustible materials are present at this Site, fire is an ever-present hazard. Safety personnel are not trained professional firefighters. Therefore, if there is any doubt that a fire can be quickly contained and extinguished, personnel will notify the emergency coordinator by radio and vacate the structure or area. The emergency coordinator will immediately notify the local Fire Department.

The following procedures will be used to prevent the possibility of fires and resulting injuries:

- Sources of ignition will be kept away from where flammable materials are handled or stored.
- The air will be monitored for explosivity before and during hot work and periodically where flammable materials are present. Hot work permits will be required for all such work.
- "No smoking" signs will be conspicuously posted in areas where flammable materials are present.
- Fire extinguishers will be placed in all areas where a fire hazard may exist.
- Before workers begin operations in an area the foreman will give instruction on egress procedures and assembly points. Egress routes will be posted in work areas and exit points clearly marked.

9.10.1 *Response*

The following procedures will be used in the event of a fire:

- Anyone who sees a fire will notify their supervisor who will then contact the Emergency Coordinator by radio. The emergency coordinator will activate the emergency air horns and contact the local Fire Department.
- When the emergency siren sounds, workers will disconnect electrical equipment in use (if possible) and proceed to the nearest fire exit.
- Work crews will be comprised of pairs of workers (buddy system) who join each other immediately after hearing the fire alarm and remain together throughout the emergency. Workers will assemble at a predetermined rally point for a head count.
- When a small fire has been extinguished by a worker, the emergency coordinator will be notified.

9.11 HAZARDOUS WEATHER CONTINGENCY MEASURES

Operations outside will not be started or continued when the following hazardous weather conditions are present:

- Lightning
- Heavy Rains/Snow
- High Winds

9.11.1 *Response*

- Excavation/soil stock piles will be covered with plastic liner.
- All equipment will be shut down and secured to prevent damage.
- Personnel will be moved to safe refuge. The emergency coordinator will determine when it is necessary to evacuate personnel to off-Site locations and will coordinate efforts with fire, police and other agencies.

9.11.2 *Notification*

The emergency coordinator will be responsible for assessing hazardous weather conditions and notifying personnel of specific contingency measures. Notifications will include:

- Site workers and subcontractors
- Client Representative
- Local Emergency Management Agency

9.12 SPILL/RELEASE CONTINGENCY MEASURES

In the event of release or spill of a hazardous material the following measures will be taken:

9.12.1 *Response*

Any person observing a spill or release will act to remove and/or protect injured/contaminated persons from any life-threatening situation. First aid and/or decontamination procedures will be implemented as appropriate.

First aid will be administered to injured/contaminated personnel. All personnel will act to prevent any unsuspecting persons from coming in contact with spilled materials by alerting other nearby persons. Attempt to stop the spill at the source, if possible. Without taking unnecessary risks, personnel will attempt to stop the spill at the source. This may involve activities such as righting a drum, closing a valve or temporarily sealing a hole with a plug.

The emergency coordinator will be notified of the spill/release, including information on material spilled, quantity, personnel injuries and immediate life threatening hazards. Air monitoring will be implemented by the emergency coordinator and HSO to determine the potential impact on the surrounding community. Notification procedures will be followed to inform on-Site personnel and off-Site agencies. The emergency coordinator will make a rapid

assessment of the spill/release and direct confinement, containment and control measures. Depending upon the nature of the spill, measures may include:

- Construction of a temporary containment berm utilizing on-Site clay absorbent earth
- Digging a sump, installing a polyethylene liner and
- Diverting the spill material into the sump placing drums under the leak to collect the spilling material before it flows over the ground
- Transferring the material from its original container to another container

The emergency coordinator will notify the Client Representative of the spill and steps taken to institute clean-up. Emergency response personnel will clean-up all spills following the spill clean-up plan developed by the emergency coordinator. Supplies necessary to clean up a spill may include, but are not limited to:

- Shovel, rake
- Clay absorbent
- Polyethylene liner
- Personal safety equipment
- Steel drums
- Pumps and miscellaneous hand tools

The emergency coordinator will inspect the spill Site to determine that the spill has been cleaned up to the satisfaction of the Client Representative. If necessary, soil, water or air samples may be taken and analyzed to demonstrate the effectiveness of the spill clean-up effort. The emergency coordinator will determine the cause of the spill and determine remedial steps to ensure that recurrence is prevented. The emergency coordinator will review the cause with the Client Representative and obtain his concurrence with the remedial action plan.

10.0 *TRAINING REQUIREMENTS*

All personnel entering the exclusion zone will be trained in the provisions of this Site safety plan and be required to sign the CHASP Acknowledgment form in Appendix A.

10.1 SITE-SPECIFIC TRAINING ORIENTATION

Outlines of the orientation for Site workers, subcontractor personnel and visitors are presented below:

CONTRACTOR WORKERS	VISITORS

• HASP sign off
• Sign in/out procedures
• Site background/characterization
• Chain of command
• Rules and regulations
• Hours of work
• Absences
• Personal Protective Equipment/respirator fit test (if applicable)
• Emergency Information
  • Emergency signal
  • Gathering point
  • Responsibilities/roles
  • Emergency phone numbers
• Site Control/Work Zones
• Hazards/AHAs
• Air Monitoring Program
• Forms, Site-specific
• Incident Reporting
• Lead Awareness (Appendix C)
	• Sign in/out procedures
	• Site Background/ Characterization
	• Review of Site map
	• Work Zones in progress
	• Emergency plan/signals
	• Training/medical requirements
	• Zones/areas open to visitors

10.2 DAILY SAFETY MEETINGS

A safety meeting will be conducted by the CS and the HSO before each shift begins. Topics to be discussed include task hazards and protective measures (physical, chemical, environmental); emergency procedures; PPE levels and other relevant safety topics. Meetings will be documented in a log book or specific form.

APPENDIX A

- ***HEALTH AND SAFETY PLAN CERTIFICATION***
- ***GENERAL/SUB-CONTRACTOR HEALTH & SAFETY PLAN ACKNOWLEDGEMENT***
- ***NOTICE OF SAFETY VIOLATION***
- ***PRE-JOB SAFETY CHECKLIST***

HEALTH AND SAFETY PLAN CERTIFICATION

By signing this document, I am stating that I have read and understand the Site health and safety plan for _____ (Contractor) personnel, subcontractors and visitors entering the Site.

COMPANY NAME	NAME (PRINT)	SIGNATURE	DATE

NOTICE OF SAFETY VIOLATION

TO: _____(Name of Contractor/Subcontractor Supervisor)
FROM: _____(Name of Owner/Contractor's Project Manager)
DATE: _____
SUBJECT: ***Notice of Safety Violations***

The following Safety Violations were observed at the Name of Site/Project on Date.

1. _____
2. _____
3. _____
4. _____
5. _____

You are requested to take the necessary corrective action to alleviate these safety violations by _____ (Date).

Please notify _____(Name of Contractor/Subcontractor's Project Manager) when you have completed this corrective action.

Thank you in advance for your cooperation in this effort.

CONTRACTOR/SUBCONTRACTOR
PRE-JOB SAFETY CHECKLIST

JOB: SUBCONTRACTOR:

LOCATION: PROJECT NO.:

		Yes	No
1.	Standard emergency signals fully understood?	☐	☐
2.	Subcontractor responsibility in time of emergency understood?	☐	☐
3.	Fire and ambulance telephone numbers known?	☐	☐
4.	Areas for possible evacuation designated?	☐	☐
5.	Special safety rules for the plant or area known?	☐	☐
6.	Nature of Chemical or special hazards for area reviewed with safety officer?	☐	☐
7.	Special safety equipment for the area of job known?	☐	☐
8.	Safety shower and eye wash locations known?	☐	☐
9.	Smoking area designated?	☐	☐
10.	Have you been advised of potential hazards, protective Measures and availability of hazard information? e.g. Health & Safety Plan	☐	☐
11.	Do you understand you are required to provide your employees with the information in (10) above?	☐	☐
12.	Have you provided MSDSs to Athenica for any hazardous material you intend to bring on-Site?	☐	☐
13.	Have you submitted training/medical certification records?	☐	☐
14.	Are your subcontractors aware of the above rules?	☐	☐

Remarks: (Explain all No Answers)

_____

_____

_____

_____

_____ _____

Subcontractor's Supervisor Date

_____ _____

Contractor's Project Manager Date

_____ _____

Contractor's Project Supervisor Date

_____ _____

Health & Safety Officer Date

APPENDIX B

HEALTH AND SAFETY PLAN AMENDMENTS AND DOCUMENTATION FORM

SITE-SPECIFIC HEALTH AND SAFETY PLAN
AMENDMENT DOCUMENTATION

Project Name: _____ **Project No.:** _____

Amendment No.: _____ **Date:** _____

Amendment Page(s): **Revises:** _____ **Section(s):** _____

Task(s) Amendment Affects:* _____

_____

**(Attach new/revised Job Safety Analyses)*

Reason For Amendment:

_____

_____

_____

Amendment: *(Attach separate sheet(s) as necessary)*

_____

_____

_____

_____

_____

_____

Completed by: _____ **Approved by:** _____

APPENDIX C

DAILY SAFETY REPORT FORM

AIR MONITORING RECORD FORM

EQUIPMENT CALIBRATION RECORD FORM

DAILY SAFETY REPORT

Date:	Site Name:	Site Location:

Time	Temp.	Wind Dir	Wind Spd	Conditions

Activity	PPE Worn

Time	Observations/Actions

Notes Taken By: _____

AIR MONITORING RECORD

Site Name:

Site Location:

Date:

Time	Respirable Particulates (mg/m^3)	Location	Activity	Initials

EQUIPMENT CALIBRATION RECORD

Site Name:					**Site Location:**		
Date	**Instrument**	**S/N**	**Battery**	**Zero**	**Init. Rdg.**	**Adjustments**	**Initials**
	pDR-1500, Dusttrack or equivalent			Filter			
	Mini-RAE 3000 PID, or equivalent			100 ppm isobutylene			
	pDR-1500, Dusttrack or equivalent			Filter			
	Mini-RAE 3000 PID, or equivalent			100 ppm isobutylene			
	pDR-1500, Dusttrack or equivalent			Filter			
	Mini-RAE 3000 PID, or equivalent			100 ppm isobutylene			
	pDR-1500, Dusttrack or equivalent			Filter			
	Mini-RAE 3000 PID, or equivalent			100 ppm isobutylene			
	pDR-1500, Dusttrack or equivalent			Filter			
	Mini-RAE 3000 PID, or equivalent			100 ppm isobutylene			
	pDR-1500, Dusttrack or equivalent			Filter			
	Mini-RAE 3000 PID, or equivalent			100 ppm isobutylene			
	pDR-1500, Dusttrack or equivalent			Filter			
	Mini-RAE 3000 PID, or equivalent			100 ppm isobutylene			

Calibration gases: 1. 100 ppm isobutylene, 2. 50% LEL methane, 3. 50 ppm CO, 4. 25 ppm H_2

APPENDIX D

TAILGATE SAFETY MEETING FORM

Daily Safety Meeting Report

Project Name:
Location:
Date:

Today's Tasks/Activities:

_____
_____
_____
_____
_____
_____

Potential Chemical/Physical Hazards:

_____
_____
_____
_____
_____

Personal Protective Equipment:

_____
_____
_____
_____
_____

Attendees:

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

HSO: _____ Const. Supt: _____

(Signature) **(Signature)**

APPENDIX C

QUALITY ASSURANCE PROJECT PLAN

QUALITY ASSURANCE PROJECT PLAN

29-05 38th Avenue
Long Island City, New York 11101

Site Number C241250

Prepared for:

FH 2BRO Builder Corp.
40-39 27th Street
Long Island City, New York 11101

Prepared By:

Athenica Environmental Engineering PLLC
45-09 Greenpoint Avenue
Long Island City, New York 11104

June 24, 2021

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1.0 INTRODUCTION

1.1 Purpose

This Quality Assurance Project Plan (QAPP) has been prepared by Athenica Environmental Engineering, PLLC (Athenica) to establish the data quality objectives and data collection and analytical procedures for the site characterization activities at the property located at 29-05 38th Avenue, Long Island City, Queens, New York (Site), which has been designated by the NYSDEC as Site Number C241250. Investigation and remediation (if warranted) at the Site will be conducted under the New York State Brownfield Cleanup Program (BCP).

1.2 Site Description

As described in the Remedial Investigation Work Plan (RIWP), the Site is currently vacant except for two residential structures located in the western portion of the property. Two other structures at the Site, a 1.5-story warehouse (historically utilized for carpet cleaning) and a 1-story former gasoline station, were demolished in early 2021. The residential structures will be vacated and demolished prior to the start of any investigative activities.

1.3 Project Scope of Work

The overall purpose of the Remedial Investigation (RI) is to further characterize subsurface conditions at Site and support planned development of the Site in accordance with the requirements of the NYSDEC Brownfield Cleanup Program (BCP). The proposed scope of work for the site characterization program is described in detail in Section 3.0 of the RIWP Work Plan and will include collection and laboratory analysis of 10 subsurface soil samples, 11 groundwater samples, 5 soil vapor samples, and 1 outdoor ambient air sample. Additional samples will be collected as warranted. Proposed sample locations are shown on Figure 4 of the RIWP.

1.4 Project Organization

Athenica's Principal-in-Charge and Project Director for this project will be Spiro Dongaris, a New York State-licensed Professional Engineer with more than 30 years of technical and management experience in the environmental engineering and consulting field. Mr. Dongaris has worked extensively with state and local agencies on numerous site investigation and remediation projects throughout New York City and the surrounding area, including Brownfield Sites. He has extensive knowledge and experience in environmental engineering, site assessments and construction management, in cost estimating and negotiating of bids, and oversees all aspects of the firm's work in these areas. As Principal of Athenica, he is responsible for the firm's overall commitment of resources to a project and its successful completion. In addition, he also oversees work in industrial hygiene, public safety and occupational health, and engineering design.

Mr. Dongaris will provide overall project administration and will be responsible for all top management decisions and overall oversight. In addition, as a New York State-licensed

Professional Engineer, he will also serve as the Professional Engineer for this contract, actively participating in designing remediation systems and preparing design documents/drawings. As Professional Engineer, Mr. Dongaris will sign and seal design documents, as required by law.

Kenneth Wenz, Jr., Senior Project Manager at Athenica, will serve as the Project Manager for this project. Mr. Wenz has more than 34 years of experience in the environmental field, including both consulting and regulatory positions, and is a Licensed Professional Geologist in New York, a Registered Professional Geologist in Pennsylvania, a Licensed Environmental Professional in Connecticut, and a Certified Professional Geologist. He has managed and implemented numerous investigation and remediation projects in New York City, New York State, New Jersey, Connecticut, Pennsylvania, Illinois, and Vermont, which have included Brownfield projects, federal and state Superfund investigation and remediation programs, state and local programs (e.g., NJ ISRA, CT RSR, NYCOER, etc.), petroleum spills, and property transfers (Phase I/II/III ESAs), as well as soil, soil vapor, sediment, and water assessment and remediation programs for numerous commercial, industrial, and government clients. His experience includes scoping, conducting, managing, and providing data assessment and technical review of deliverables for hundreds of Phase I ESAs, Phase II ESAs, and remediation projects,. As such, he has substantial experience with all phases of environmental investigation/remediation, and with implementing such programs in compliance with all applicable environmental regulations.

As Project Manager, he will be responsible for the overall technical performance, budget management, and schedule execution for the program, and will serve as liaison on behalf of the Volunteer with regulatory personnel and stakeholders, as needed. Mr. Wenz will also provide project evaluation, technical input, and review of project deliverables, to ensure that all work meets all applicable project requirements as well as our exacting quality standards, and will oversee all project staff and validate scopes of work to ensure that all project deliverables are provided on time.

William Silveri will serve as the Quality Control Officer for this contract. Mr. Silveri has over 30 years of experience in the environmental consulting field, and is a Licensed Professional Geologist in New York and a Certified Hazardous Materials Manager. He has managed and conducted numerous environmental investigation and remediation projects in the New York City area, which has included substantial experience in report preparation, data review and assessment, and technical review of project deliverables (reports, specifications, etc.) prepared by others. As Quality Control Officer, he will be responsible for detailed technical review and evaluation of laboratory data, as well as providing quality control review of project deliverables, to ensure that all work plans, reports, specifications, etc. meet the quality and technical standards of Athenica

In addition, Athenica will utilize subcontractors for drilling, laboratory services, and data validation, as described in Section 3.0 of the RIWP. Once determined, the names of the selected subcontractors will be provided to the NYSDEC.

2.0 GENERAL QAPP PROCEDURES

Athenica will follow the sampling, sample handling and storage, and sample equipment decontamination procedures specified by the RIWP: Sampling procedures, field equipment functionality, chain-of-custody, and other relevant information will be recorded in the field. Data validation activities will include the manual check of laboratory data tables and reduced data summary tables. Conclusions and/or recommendations will be reviewed by one or more qualified peers of the professional who developed them to verify their accuracy on the basis of acquired data and conducted analyses.

A detailed description of the procedures to be used during this program for collection of the soil, groundwater and soil vapor samples is provided in RIR Work Plan. As noted, all samples will be collected using new, dedicated sampling equipment. As a result, field decontamination of equipment will not be conducted as part of this site characterization.

The data quality objectives for analysis of soil/historic fill, groundwater, and soil gas are summarized in Tables 1 through 3.

3.0 SAMPLE HANDLING

The following subsections describe the manner in which representative samples will be collected at the Site.

3.1 Soil Sample Collection

Representative soil samples will be collected directly from the acetate sleeve of the direct-push boring. For VOC analysis, a discrete soil sample will be collected from the desired sampling depth utilizing a dedicated Encore™ sampler or Terra Core sampling kit that includes a dedicate sample plunger. For non-VOC analysis, representative sample aliquots of soil sample will be collected from the required sampling depth, and will then be homogenized into a single sample for analysis. The homogenization of the sample will occur in a new, dedicated, disposable container (aluminum pan, plastic zip-top bag, etc.) or in a decontaminated stainless-steel container, utilizing dedicated sampling equipment (wooden tongue depressor, plastic spoon, etc.).

3.2 Groundwater Sample Collection

Representative groundwater samples will be collected from temporary groundwater monitoring wells after well development, as described in the RIWP, utilizing dedicated sampling equipment. The groundwater sampling will follow USEPA's low-flow (minimal draw down) procedures that are summarized below and described in more detail in Appendix A.

The low-flow sampling procedure was designed to facilitate collection of groundwater samples that reflect total mobile organic and inorganic contaminant levels in the groundwater, with minimal physical and chemical alterations caused by the sampling event.

The low-flow groundwater sampling procedure will include the following general steps:

1. An appropriate, dedicated sampling pump and non-PFAS sampling tubing will be selected for use at the Site;
2. The pump intake will be placed at least 2 feet above the bottom of the well screen;
3. Prior to purging, the depth to groundwater will be measured utilizing a groundwater interface meter and recorded on a well purging purge form;
4. Groundwater will be purged at a flow rate that causes the groundwater level to be lowered (i.e., drawdown) by no more than 0.3 feet;
5. During purging, depth to groundwater will be periodically measured to allow adjustment of the groundwater flow rate to minimize any drawdown;
6. After the water level in the monitoring well has stabilized, purged water will be conveyed to a flow-through cell to allow for monitoring of the following indicator field parameters, including turbidity, temperature, specific conductance, pH, Oxidation/Reduction Potential (ORP), and dissolved oxygen (DO);
7. During the well purging, the above indicator parameters will be measured at least every 5 minutes;
8. Purging will cease after stabilization of these indicator parameters. Stabilization is considered to be achieved when three consecutive readings are within the following limits:
    - Turbidity = less than 5 NTUs or 10 percent for values greater than 5 NTUs.
    - DO = less than 0.5 mg/L or 10 percent for values greater than 0.5 mg/L.
    - Specific Conductance = 3 percent of prior reading.
    - Temperature = 3 percent of prior reading.
    - ORP = plus or minus 10 millivolts of prior reading.
9. After stabilization of indicator parameters, the tubing from the pump will be disconnected from the flow-through-cell, and representative groundwater samples will be collected directly from the pump's tubing;
10. After completion of purging, samples will be collected using the same equipment (i.e., pump and tubing) that were utilized for purging. Samples for PFAS and 1,4-dioxane analysis will be collected first (where applicable), followed by the VOC samples, and lastly the SVOC samples.

3.3 Sample Identification/Labeling

Immediately upon collection, each sample will be labeled with an adhesive label. This sample label contains the authoritative information for the sample, including the Site name, date and time of sampling, sampler's initials, tests to be performed, preservative (if applicable), and a unique sample identifier. The unique identifier for each sample will include, at a minimum, the sample location and (where applicable) sample horizon (e.g., S-1 12-14', WC-3S, SV-2). This information

will also be included on the chain of custody forms that will accompany the samples to the laboratory.

3.4 Sample Containers and Preservation

The analytical laboratory will supply appropriate sample containers for the media that will be sampled during this program. The containers will be pre-preserved, where appropriate. Table 3 provides a summary of the sample preservation and containerization requirements.

Soil samples submitted for VOC analysis will be collected by utilizing Encore™ samplers or field-preserved using methanol (i.e., Terra Core sampling kits). Soil samples to be analyzed for non-VOC parameters will be collected in unpreserved 8-ounce glass jars. Groundwater samples submitted for VOC analysis will be preserved to a pH of ≤ 2 with hydrochloric acid (HCl), and groundwater samples to be analyzed for SVOCs will be collected into unpreserved, 1-liter amber glass bottles, which will be preserved by cooling the samples to 4° C). The soil and groundwater samples to be analyzed for PFAS will be collected into high-density polyethylene (HDPE) containers, which will be kept separated from the containers for other analyses (i.e., provided and maintained in a separate cooler), and will be handled in accordance with NYSDEC guidance (as discussed below in Section 3.8). The laboratory will provide all required Encore™ samplers or Terra Core sampling kits, -preserved 40-mL VOC vials, amber glass containers, and HDPE bottles for the respective analyses. All soil and groundwater samples will also be preserved by cooling to 4° C.

Soil vapor and ambient air samples will be collected into evacuated 6-liter Summa canisters. The canisters will be provided by the laboratory and will be batch-certified as clean by the laboratory.

3.5 Equipment Decontamination

Non-dedicated sampling equipment will be decontaminated between each use in the following manner:

- Wash and scrub with non-phosphate detergent (e.g., Alconox) and potable water solution, and
- Rinse with potable water.

3.6 Field Documentation

Field team members will maintain bound logbooks to document all field activities. Field logbooks will provide the means for recording field observations and data collection activities conducted during the investigation. Logbooks will be supported by (but not replaced by) standardized forms, including, but not limited to boring logs, groundwater sampling logs, and equipment calibration sheets.

3.7 Chain-of-Custody and Shipping

Chain-of-Custody forms will be utilized to document the path of sample containers from the Site to the laboratory. Sample/bottle tracking sheets or the Chain-of-Custody will be used to document the custody of the samples within the laboratory from sample receipt though completion of analysis. The project manager will notify the laboratory of upcoming field sampling events and the subsequent transfer of samples. This notification will include information concerning the number and type of samples and the anticipated date of arrival. Sample shipping containers (e.g., coolers) will be provided by the laboratory for shipping samples. All sample containers within each shipping will be individually labeled with an adhesive identification label provided by the laboratory.

In the event that collected samples require shipping (as opposed to sample pick-up by the laboratory or delivery to the laboratory by Athenica personnel), each sample shipping container will be sealed with two adhesive custody seals. The custody seals will be initialed by a member of the field sampling team.

3.8 Additional Sample Handling Requirement for Emerging Contaminant Analysis

Collection of samples for analysis for Per- and Polyfluoroalkyl Substances (PFAS) will follow NYSDEC protocol established in the document titled *Sampling, Analysis, and Assessment of Per-And Polyfluoroalkyl Substances (PFAS) Under NYSDEC's Part 375 Remedial Programs*, dated January 2021. A copy of this document is included in Appendix B of this QAPP.

General sample handling requirements for PFAS will include the following:

- Sampling methods are intended to be consistent with analysis of samples by USEPA method 537.1;
- Preferred material for sample containers is high density polyethylene (HDPE);
- Acceptable materials for sampling equipment include stainless steel, HDPE, PVC, silicone, acetate and polypropylene;
- No sampling equipment components or sample containers should come in contact with aluminum foil, low density polyethylene, glass, or polytetrafluoroethylene (PTFE, Teflon™);
- Personnel performing sampling or drilling should wear nitrate gloves while conducting field work or handling sample containers;
- Personal protection equipment (PPE) will avoid any water or stain resistant materials that potential PFAS containing material (including Gore-Tex®); and

- Use of any potential PFAS containing clothing or personal care product will be allowed only if there is no other suitable alternative and approved by the NYSEC.

As an additional precaution to minimize laboratory artifacts arising from sample collection, Athenica will utilize only sample containers certified by the laboratory to be free of PFAS. Additionally, Athenica will collect PFAS and 1,4-dioxane samples prior to collection of samples for other analysis.

4.0 DATA QUALITY REQUIREMENTS

The following subsections describe the manner in which representative samples will be analyzed at the Site.

4.1 Analytical Methods

This program includes, at a minimum, collection and laboratory analysis of at least 10 soil samples, 11 groundwater samples, five soil vapor samples, and one outdoor ambient air sample. Soil samples will be analyzed for Target Compound List (TCL) VOCs by USEPA Method 8260, TCL SVOCs by USEPA Method 8270D, Target Analyte List (TAL) metals by USEPA Method 610C, TCL pesticides by USEPA Method 8081B, and TCL PCBs by USEPA Method 8082. Samples of soil and groundwater will be analyzed for VOCs by the referenced USEPA Method. Soil vapor and ambient air samples will be analyzed for VOCs by USEPA Method TO-15. In addition, two soil and two groundwater samples will be analyzed for PFAS by modified USEPA Method 537.1 and analyzed for 1,4-dioxane by modified USEPA Method 8270 (with selective ion monitoring (SIM) analysis).

All analyses will be conducted by a laboratory approved under the NYSDOH Environmental Laboratory Approval Program (ELAP). The data quality objectives for the required analysis are summarized in Tables 1 through 3.

4.2 Data Quality Assurance Objectives

Data quality objectives (DQOs) for measurement data in terms of sensitivity precision, accuracy, representativeness, comparability, and completeness are established so that the data collected are sufficient and of adequate quality for their intended use. Data collected and analyzed in conformance with the DQO process described in this QAPP will be used in assessing the uncertainty associated with decisions related to this site.

4.2.1 Precision

Precision measures the reproducibility of measurements under a given set of conditions. Specifically, it is a quantitative measure of the variability of a group of measurements compared to their average value. The overall precision of measurement data is a mixture of sampling and analytical factors. Analytical precision is easier to control and quantify than sampling precision; there are more historical data related to individual method performance and the “universe” is not limited to the samples received in the laboratory. In contrast, sampling precision is unique to each site or project. Overall system (sampling plus analytical) precision will be determined by analysis of field duplicate samples. Analytical results from laboratory duplicate samples will provide data on measurement (analytical) precision. The laboratory objective for precision is to equal or exceed the precision demonstrated for the applied analytical methods on similar samples. Precision is evaluated by the analyses of laboratory and field duplicates. Field duplicates will be collected at a frequency of one per 10 environmental samples of each type.

Relative Percent Difference (RPD) criteria are used to evaluate precision between duplicates, using the equation below:

$$RPD = 100 \times [2(X1 - X2) / (X1 + X2)]$$

where:
X1 and X2 are reported concentrations for each duplicate sample and subtracted differences represent absolute values.

Criteria for evaluation of laboratory duplicates are specified in the applicable methods. The objective for field duplicate precision is < 50% RPD for all matrices. Precision is not calculable where the analyte is not detected in one or both of the sample and duplicate. The absolute difference between the results (X1 - X2) may be a more appropriate measure of analytical precision where the reported concentrations are low (i.e., less than five times the RL).

4.2.2 Accuracy

The laboratory objective for accuracy is to equal or exceed the accuracy demonstrated for the applied analytical method on similar samples. Percent Recovery Criteria, published by the NYSDEC as part of the ASP, and those determined from laboratory performance data are used to evaluate accuracy in matrix (sample) spike and blank spike quality control samples. A matrix spike and blank spike will be performed once for every sample delivery group (SDG) as specified in the ASP-CLP. Other method-specific laboratory QC samples (such as laboratory control samples and continuing calibration standards) may also be used in the assessment of analytical accuracy. Sample (matrix) spike recovery is calculated as:

$$\%R = (SSR-SR)/SA \times 100,$$

where:
SSR = Spiked Sample Result
SR = Sample Result, and
SA = Spike Added

4.2.3 Representativeness

The representativeness of data is only as good as the representativeness of the samples collected. Sampling and handling procedures, and laboratory practices are designed to provide a standard set of performance-driven criteria to provide data of the same quality as other analyses of similar matrices using the same methods under similar conditions.

Representativeness is assessed qualitatively (there are no equations or numerical criteria for this data quality indicator).

4.2.4 Comparability

Comparability of analytical data among laboratories becomes more accurate and reliable when all labs follow the same procedure and share information for program enhancement. Some of these procedures include:

- Instrument standards traceable to National Institute of Standards and Technology (NIST), USEPA, or the New York State Department of Health or Environmental Conservation;
- Using standard methodologies;
- Reporting results for similar matrices in consistent units;
- Applying appropriate levels of quality control within the context of the laboratory quality assurance program; and,
- Participation in inter-laboratory studies to document laboratory performance.

By using traceable standards and standard methods, the analytical results can be compared to other labs operating similarly. The QA Program documents internal performance. Periodic laboratory proficiency studies are instituted as a means of monitoring intra-laboratory performance. Comparability is assessed qualitatively (there are no equations or numerical criteria for this data quality indicator).

4.2.5 Completeness

The goal of completeness is to generate the maximum amount possible of valid data. The highest degree of completeness would be to find all deliverables flawless, valid, and acceptable. The lowest level of completeness is excessive failure to meet established acceptance criteria and consequent rejection of data. The completeness goal is 95 percent useable data. However, it is acknowledged that this goal may not be fully achievable; for example, individual analytes may be rejected within an otherwise acceptable analysis; or some sampling locations may not be accessible. The impact of rejected or unusable data will be determined on a case-by-case basis. If the study can be completed without the missing datum or data, no further action would be necessary. However, loss of critical data may require re-sampling or reanalysis.

4.2.6 Sensitivity

Sensitivity criteria are established so that reporting limits are adequate to verify the absence of a non-detected analyte at the applicable threshold concentration (e.g., regulatory limits or guidance values). Laboratory reporting limits will be reviewed prior to sample collection to verify that limits are appropriate for the specific analytes and matrices.

4.3 Field Quality Assurance

Field quality assurance/quality control samples associated with the generation of environmental data typically include field (equipment rinsate) blanks; field duplicates; and trip blanks. The sampling frequency of these field-related QA/QC samples are discussed below and summarized in Table 5.

4.3.1 Equipment (Rinsate) Blanks

The purpose of an equipment blank is to determine if contaminants have been introduced through contact with sampling equipment. As dedicated sampling equipment will be utilized, no use of equipment blanks is anticipated other than for sample collect for PFAS and 1,4-Dioxane. Equipment blanks will be utilized for every day when samples are collected for PFAS and 1,4-Dioxane analysis and will consist of pouring PFAS-free water provided by the laboratory over the field sampling equipment into an appropriate container.

4.3.2 Field Duplicate Samples

The purpose of duplicates is to evaluate precision. Duplicates will be collected at a frequency of 1 per 20 samples of soil or groundwater, and will be analyzed for the same parameters as the environmental sample. A field duplicate sample is a co-located sample or a sample that is divided into two from the same sampling location and depth. Homogenizing solid samples, such as soil, is appropriate only for non-VOC analysis.

4.3.3 Trip Blanks

The purpose of a trip blank is to identify any VOC-related contamination that occurred during transportation of the samples. The trip blank travels along with empty glassware from the lab to the Site and returns from the Site with the collected sampled. A trip blank will be analyzed for every day that groundwater sampling for VOCs occurs, and will be analyzed for VOCs.

4.4 Laboratory Quality Assurance

Method-required laboratory quality assurance includes an instrument performance check; calibration check; and method blank analysis for each group of 20 or fewer samples. In addition, internal standards are added to every sample (environmental samples and laboratory QA/QC samples). Laboratories typically perform additional QC, such as spikes, laboratory duplicates, and laboratory control samples. The frequency of these analyses is specified in the laboratory's analytical SOP for the method, and is discussed below and summarized in Table 5.

4.4.1 Instrument Performance Check

The instrument performance check verifies the operation of the GC/MS and verifies that it mees tuning and mass spectral abundance criteria prior to sample data acquisitions.

4.4.2 Calibration Checks

An initial five-point calibration check must be performed after the instrument performance check but prior to the analysis of blanks and samples. Concentrations of the calibration standards should be selected to span the concentration range of interest. One of the concentrations of the initial calibration must be the same as the daily calibration check.

On a daily basis, a single-point calibration check must be analyzed (with each group of 20 or fewer samples). The percent difference (%D) for each compound in the daily calibration check should be within ±30 percent of the response determined in the initial calibration in order to proceed with sample analysis. If the %D criteria are not met, a new five-point calibration should be performed.

4.4.3 Method Blanks

Method blanks are used to assess the background variability of the method and to assess the introduction of contamination to the samples by the method, technique, or instrument as the sample is prepared and analyzed in the laboratory.

The method blank should not contain any target analytic at a concentration greater than its quantitation level (reporting limit; typically, three times the MDL) or its action level, whichever is more stringent. Method blanks are analyzed at a frequency of one for every 20 samples analyzed, or every analytical batch, whichever is more frequent.

4.4.4 Matrix Spike/Matrix Spike Duplicate (MS/MSD)

Site-specific MS/MSD samples will be submitted at a rate of one per 20 samples, for soil and groundwater samples collected during this sampling program.

4.4.5 Internal Standards

Internal standards (IS) are added to every sample analyzed for VOCs (in any matrix) and SVOCs. Sample-specific IS recovery should be 40 percent or less of the mean response in the most recent valid calibration.

5.0 QUALITY MANAGEMENT

A senior Athenica representative will serve as the Quality Assurance and Quality Control Officer (QA/QC) for the project. This individual will no have direct project responsibility but will independently monitor the implementation of the RIWP. The primary duties of the QA/QC officer will be:

- Monitor the project in accordance with the requirement of this QAPP and the RIWP;
- Review the project to ensure that the overall data quality objectives are attained;
- Record any deviations and inform the Project Manager (PM) of any such deviations;
- Meet with the PM, as needed, to discuss compliance with the QAPP;
- Advise the PM of findings and recommend changes on methods to improve quality; and
- Verify that outside services meet the data objectives of the QAPP.

6.0 DATA REDUCTION, VALIDATION, AND REPORTING

Data validation activities will include the manual check of laboratory data tables and reduced data summary tables. A cycle of markup, revision, and trace checking shall be performed and a check by the PM will ensure data quality.

Conclusions and/or recommendations will be reviewed by one or more qualified peers of the professional who developed them to ensure their accuracy on the basis of acquired data and conducted analyses.

The guidance followed to perform quality data validation, and the methods and procedures outlined herein and elsewhere in the field sampling plan and remedial investigation work plan, pertain to initiating and performing data validation, as well as reviewing data validation performed by others (if applicable). An outline of the data validation process is presented here, followed by a description of data validation review summaries.

6.1 Laboratory Data Reporting and Reduction

The laboratory will meet the applicable documentation, data reduction, and reporting protocols as specified in the NYSDEC ASP Category B deliverable requirements.

In addition to the hard copy of the data report, the Electronic Data Deliverable (EDD) will be provided to NYSDEC in format pursuant to DER-10 requirements. The EDD will be generated, to the extent possible, directly from the laboratory's electronic files or information management system, to minimize possible transcription errors resulting from the manual transcription of data.

6.2 Data Validation

A subcontractor to Athenica will review and validate the groundwater, soil, and soil vapor/ambient air data. The data validator will be independent of the laboratory and independent of Athenica. Data validation will be performed by following guidelines established in the specific USEPA Region 2 SOPs.

Where necessary and appropriate, supplemental validation criteria may be derived from the USEPA Functional Guidelines (USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review, USEPA 540/R-99/008; October 1999, and National Functional Guidelines for Inorganic Data Review, USEPA 540/R-04-004; October 2004), as appropriate.

Validation reports will consist of text results of the review and marked up copies of Form I (results with qualifiers applied by the validator). Validation will consist of target and non-target compounds with corresponding method blank data, spike and surrogate recoveries, sample data, and a final note of validation decision or qualification, along with any pertinent footnote references. Qualifiers applied to the data will be documented in the report text. The results of the

data validation will be presented in a data Usability Summary Report (DUSR) prepared by the validation subcontractor.

6.3 Data Usability

Subsequent to review of the items evaluated in the subcontractor's DUSRs, Athenica will then prepare a brief summary of the data usability. This summary, which will be provided as part of the RIR, encompassed both quantitative and qualitative aspects of the data usability.

The quantitative aspect is a summary of the data quality as expressed by qualifiers applied to the data; the percent rejected, qualified (i.e., estimated), missing, and fully acceptable data are reported. As appropriate, this quantitative summary is broken down by matrix, laboratory, or analytical fraction or method.

The qualitative element of the data usability summary is the QA officer's translation and summary of the validation reports into a discussion useful to data users. The qualitative aspect will discuss the significance of the qualifications applied to the data, especially in terms of those most relevant to the intended use of the data. The usability report will also indicate whether there is a suspected bias (high or low) in qualified data and will also provide a subjective overall assessment of the data quality.

6.4 Field Data

Field data collected during the field activity will be presented in tabular form with any necessary supporting text. Unless activities resulted in significant unexpected results, field data comments can be added as footnotes to the tables.

7.0 DOCUMENT CONTROL

Project documents will be maintained in a secure area of Athenica's office at 45-09 Greenpoint Avenue in Long Island City, Queens, New York. Access to these files will be limited to the PM, the Principal-in-Charge and those designated by the PM.

A system is established to ensure that only the latest authorized documents are employed to execute the work. This includes marking all previous versions "void" or "superseded" and/or sending communication to team members indicating the document is no longer valid and the new document should be used. The QAO or designee will periodically conduct review the document retention practices to ensure the new documents are being used.

The Principal-in-Charge, Project Manager, and/or QAO will be responsible for reviewing all documents for conformance.

Records of project activities will be maintained at Athenica's Office will be available for review, upon request.

8.0 QUALITY RECORDS AND DOCUMENTATION

Project Quality Records, which provide evidence of conformance to the requirements of this document, will be kept in Athenica's corporate office. Records will be stored electronically in the project file, which will be maintained in a suitable environment to prevent damage, deterioration, or loss. The PM, in consultation with the QA/QC Officer, is responsible for identifying the records to be retained and establishing protection and controlled-retrieval procedures for such documents, including applicable retention times and ultimate disposal method(s).

9.0 TRAINING

Athenica will employ only qualified and experienced personnel to execute any task of the scope of work. Junior staff will have role solely for supporting implementation of a project task. The PM is responsible for verifying that each employee assigned to the project has read and understands the requirements of this document and is familiar with its procedures/instructions. Training will consist of in-house technical and non-technical seminars given by qualified and experienced senior staff members. In addition, specific meetings will be designed and held to review quality of work and address any corrective measures needed to correct any non-conforming activities that are identified. Project staff will be required to attend any meetings that are held.

TABLES

Table 1
Chemical Parameters and Data Quality Levels
For Soil Samples – 29-05 38th Street, Long Island City, Queens, NY

Parameter	DQL[1 and 2]
Target Compound List (TCL) Volatile Organic Compounds (mg/Kg)	
1,1,1,-2 Tetrachloroethane	NS
1,1,1-Trichloroethane	0.68
1,1,2,2-Tetrachloroethane	NS
1,1-,2-Trichloro-1,2,2-triuoroethane (freon 113)	NS
1,1,2-Trichloroethane	NS
1,1-Dichloroethane	0.27
1,1-Dichloroethylene	0.33
1,2,3-Trichlorobenzene	NS
1,2,3-Trichloropropane	NS
1,2,4-Trichlorobenzene	NS
1,2,4-Trimethylbenzene	3.6
1,2-Dibromo-3-chloropropane	NS
1,2-Dibromoethane	NS
1,2-Dichlorobenzene	1.1
1,2-Dichloroethane	0.02
1,2-Dichloropropane	NS
1,3,5-Trimethylbenzene	8.4
1,3-Dichlorobenzene	2.4
1,4-Dichlorobenzene	1.8
1,4-Dioxane	0.1
2-Butanone	0.12
2-Hexanone	NS
4-Methyl-2-pentanone	NS
Acetone	0.05
Acrolein	NS
Acrylonitrile	NS
Benzene	0.06
Bromochloromethane	NS
Bromodichloromethane	NS
Bromoform	NS
Bromomethane	NS
Carbon disulfide	NS
Carbon tetrachloride	0.76
Chlorobenzene	1.1
Chloroethane	NS
Chloroform	0.25
Chloromethane	NS

Table 1 Chemical Parameters and Data Quality Levels For Soil Samples – 29-05 38th Street, Long Island City, Queens, NY	
Parameter	**DQL[1 and 2]**
cis-1,2-Dichloroethylene	0.25
cis-1,3-Dichloropropylene	NS
Cyclohexane	NS
Dibromochloromethane	NS
Dibromomethane	NS
Dichlorodifluoromethane	NS
Ethyl Benzene	1.0
Hexachlorobutadiene	NS
Isopropylbenzene	NS
Methyl acetate	NS
Methyl tert-butyl ether (MTBE)	0.93
Methylcyclohexane	NS
Methylene chloride	0.05
n-Butylbenzene	12
n-Propylbenzene	3.9
o-Xylene	NS
p- & m- Xylenes	NS
p-Isopropyltoluene	NS
sec-Butylbenzene	11
Styrene	NS
tert-Butyl alcohol (TBA)	NS
tert-Butylbenzene	5.9
Tetrachloroethylene	1.3
Toluene	0.7
trans-1,2-Dichloroethylene	0.19
trans-1,3-Dichloropropylene	NS
trans-1,4-dichloro-2-butene	NS
Trichloroethylene	0.47
Trichlorofluoromethane	NS
Vinyl Chloride	0.02
Xylenes, Total	0.26
TCL Semivolatile Organic Compounds (mg/Kg)	
1,1'-Biphenyl	NS
1,2,4,5-Tetrachlorobenzene	NS
1,2,4-Trichlorobenzene	NS
1,2-Dichlorobenzene	1.1
1,2-Diphenylhydrazine (as Azobenzene)	NS
1,3-Dichlorobenzene	2.4
1,4-Dichlorobenzene	1.8
2,3,4,6-Tetrachlorophenol	NS

Table 1
Chemical Parameters and Data Quality Levels
For Soil Samples – 29-05 38th Street, Long Island City, Queens, NY

Parameter	DQL[1 and 2]
2,4,5-Trichlorophenol	NS
2,4,6-Trichlorophenol	NS
2,4-Dichlorophenol	NS
2,4-Dimethylphenol	NS
2,4-Dinitrophenol	NS
2,4-Dinitrotoluene	NS
2,6-Dinitrotoluene	NS
2-Chloronaphthalene	NS
2-Chlorophenol	NS
2-Methylnaphthalene	NS
2-Methylphenol	0.33
2-Nitroaniline	NS
2-Nitrophenol	NS
3- & 4-Methylphenols	0.33
3,3-Dichlorobenzidine	NS
3-Nitroaniline	NS
4,6-Dinitro-2-methylphenol	NS
4-Bromophenyl phenyl ether	NS
4-Bromophenyl phenyl ether	NS
4-Chloroaniline	NS
4-Chlorophenyl phenyl ether	NS
4-Nitroaniline	NS
4-Nitrophenol	NS
Acenaphthene	20.0
Acenaphthylene	100.0
Acetophenone	NS
Aniline	NS
Anthracene	100.0
Atrazine	NS
Benzaldehyde	NS
Benzidine	NS
Benzo(a)anthracene	1.0
Benzo(a)pyrene	1.0
Benzo(a)pyrene	1.0
Benzo(g,h,i)perylene	100.0
Benzo(k)fluoranthene	3.9
Benzoic acid	NS
Benzyl alcohol	NS
Benzyl butyl phthalate	NS
Bis(2-chloroethoxy)methane	NS
Bis(2-chloroethyl)ether	NS
Bis(2-chloroisopropyl)ether	NS

Table 1 Chemical Parameters and Data Quality Levels For Soil Samples – 29-05 38th Street, Long Island City, Queens, NY	
Parameter	**DQL[1 and 2]**
Bis(2-ethylhexyl)phthalate	NS
Caprolactam	NS
Carbazole	NS
Chrysene	3.9
Dibenzo(a,h)anthracene	0.33
Dibenzofuran	59.0
Diethyl phthalate	NS
Dimethyl phthalate	NS
Di-n-butyl phthalate	NS
Di-n-octyl phthalate	NS
Fluoranthene	100.0
Fluorene	100.0
Hexachlorobenzene	1.2
Hexachlorobutadiene	NS
Hexachlorocyclopentadiene	NS
Hexachloroethane	NS
Indeno(1,2,3-cd)pyrene	0.5
Isophorone	NS
Naphthalene	100.0
Nitrobenzene	NS
N-Nitrosodimethylamine	NS
N-nitroso-di-n-propylamine	NS
N-Nitrosodiphenylamine	NS
Pentachlorophenol	0.8
Phenanthrene	100.0
Phenol	0.33
Pyrene	100
Polychlorinated Biphenyls (PCBs) (mg/kg)	
Aroclor -1016	NS
Aroclor -1221	NS
Aroclor -1232	NS
Aroclor -1242	NS

Table 1 Chemical Parameters and Data Quality Levels For Soil Samples – 29-05 38th Street, Long Island City, Queens, NY	
Parameter	**DQL[1 and 2]**
Aroclor -1248	NS
Aroclor -1254	NS
Aroclor -1260	NS
Total PCBs	0.1
TCL PESTICIDES (mg/kg)	
4,4'-DDD	0.0033
4,4'-DDE	0.0033
4,4'-DDT	0.0033
Aldrin	0.005
Alpha –BHC	0.02
Alpha-Chlordane	0.094
Beta-BHC	0.036
Chlordane, total	NS
Delta-BHC	0.04
Dieldrin	0.005
Endosulfan I	2.4
Endosulfan II	2.4
Endosulfan Sulfate	2.4
Endrin	0.014
Endrin Aldehyde	NS
Endrin Ketone	NS
Gamma-BHC (Lindane)	0.1
Gamma-Chlordane	NS
Heptachlor	0.042
Heptachlor Epoxide	NS
Methoxychlor	NS
Toxaphene	NS
METALS (mg/kg)	
Aluminum	NS
Antimony	NS
Arsenic	13.0
Barium	350.0

Table 1 Chemical Parameters and Data Quality Levels For Soil Samples – 29-05 38th Street, Long Island City, Queens, NY	
Parameter	**DQL[1 and 2]**
Beryllium	7.2
Cadmium	2.5
Calcium	NS
Chromium	NS
Cobalt	NS
Copper	50.0
Iron	NS
Lead	63.0
Magnesium	NS
Manganese	1,600.0
Nickel	30.0
Potassium	NS
Selenium	3.9
Silver	2.0
Sodium	NS
Thallium	NS
Vanadium	NS
Zinc	100.9
Mercury by 7473	
Mercury	0.18
1,4 -Dioxane by 8270 Sim-Soil	
1,4-Dioxane	0.1
TCL PFAs	
1H, 1H, 2H, 2H-Perfluorodecanesulfonic acid	0.0005
1H, 1H, 2H, 2H-Perfluorooctanesulfonic acid	0.0005
N-EtFOSAA	0.0005
N-MeFOSAA	0.0005
Perfluoro-1-decanesulfonic acid (PFDS)	0.0005
Perfluoro-1-heptanesulfonic acid (PFHpS)	0.0005
Perfluoro-1-octanesulfonamide (FOSA)	0.0005
Perfluorobutanesulfonic acid (PFBS)	0.0005
Perfluorodecanoic acid (PFDA)	0.0005

Table 1 Chemical Parameters and Data Quality Levels For Soil Samples – 29-05 38th Street, Long Island City, Queens, NY	
Parameter	**DQL[1 and 2]**
Perfluorododecanoic acid (PFDoA)	0.0005
Perfluoroheptanoic acid (PFHpA)	0.0005
Perfluorohexanesulfonic acid (PFHxS)	0.0005
Perfluorohexanoic acid (PFHxA)	0.0005
Perfluoro-n-butanoic acid (PFBA)	0.0005
Perfluorononanoic acid (PFNA)	0.0005
Perfluorooctanesulfonic acid (PFOS)	0.0005
Perfluorooctanoic acid (PFOA)	0.0005
Perfluoropentanoic acid (PFPeA)	0.0005
Perfluorotetradecanoic acid (PFTA)	0.0005
Perfluorotridecanoic acid (PFTrDA)	0.0005
Perfluoroundecanoic acid (PFUnA)	0.0005

DQL=Data Quality Level
[1] DQLs for TCL VOCs, SVOCs, PCBs, Pesticides, and metals are based on NYSDEC Part 375 Unrestricted Use Soil Cleanup Objective.
[2] DQLs for PFAS in soils are based on NYSDEC Guidance of 0.5 µg/Kg or 0.0005 mg/Kg
NS=No standard

Table 2
Chemical Parameters and Data Quality Levels
For Groundwater Samples – 29-05 38th Street, Long Island City, Queens, NY

Parameter	DQL[1]
Target Compound List (TCL) Volatile Organic Compounds (µg/L)	
1,1,1,-2 Tetrachloroethane	5.0
1,1,1-Trichloroethane	5.0
1,1,2,2-Tetrachloroethane	5.0
1,1-,2-Trichloro-1,2,2-triuoroethane (freon 113)	5.0
1,1,2-Trichloroethane	1.0
1,1-Dichloroethane	5.0
1,1-Dichloroethylene	5.0
1,2,3-Trichlorobenzene	5.0
1,2,3-Trichloropropane	0.04
1,2,4-Trichlorobenzene	5.0
1,2,4-Trimethylbenzene	5.0
1,2-Dibromo-3-chloropropane	0.04
1,2-Dibromoethane	0.0006
1,2-Dichlorobenzene	3.0
1,2-Dichloroethane	0.6
1,2-Dichloropropane	1.0
1,3,5-Trimethylbenzene	5.0
1,3-Dichlorobenzene	3.0
1,4-Dichlorobenzene	3.0
1,4-Dioxane	NS
2-Butanone	50.0
2-Hexanone	50.0
4-Methyl-2-pentanone	NS
Acetone	50.0
Acrolein	NS
Acrylonitrile	NS
Benzene	1.0
Bromochloromethane	5.0
Bromodichloromethane	50.0
Bromoform	50.0
Bromomethane	5.0
Carbon disulfide	NS
Carbon tetrachloride	5.0
Chlorobenzene	5.0
Chloroethane	5.0
Chloroform	7.0
Chloromethane	5.0
cis-1,2-Dichloroethylene	5.0
cis-1,3-Dichloropropylene	0.4

Table 2
Chemical Parameters and Data Quality Levels
For Groundwater Samples – 29-05 38th Street, Long Island City, Queens, NY

Parameter	DQL[1]
Cyclohexane	NS
Dibromochloromethane	50.0
Dibromomethane	NS
Dichlorodifluoromethane	5.0
Ethyl Benzene	5.0
Hexachlorobutadiene	0.5
Isopropylbenzene	5.0
Methyl acetate	NS
Methyl tert-butyl ether (MTBE)	10.0
Methylcyclohexane	5.0
Methylene chloride	5.0
n-Butylbenzene	5.0
n-Propylbenzene	5.0
o-Xylene	5.0
p- & m- Xylenes	5.0
p-Isopropyltoluene	5.0
sec-Butylbenzene	5.0
Styrene	5.0
tert-Butyl alcohol (TBA)	NS
tert-Butylbenzene	5.0
Tetrachloroethylene	5.0
Toluene	5.0
trans-1,2-Dichloroethylene	5.0
trans-1,3-Dichloropropylene	0.4
trans-1,4-dichloro-2-butene	NS
Trichloroethylene	5.0
Trichlorofluoromethane	5.0
Vinyl Chloride	2.0
Xylenes, Total	5.0
Semivolatile Organic Compounds (ug/L)[+15]	
1,1'-Biphenyl	NS
1,2,4,5-Tetrachlorobenzene	NS
1,2,4-Trichlorobenzene	5.0
1,2-Dichlorobenzene	3.0
1,2-Diphenylhydrazine (as Azobenzene)	NS
1,3-Dichlorobenzene	3.0
1,4-Dichlorobenzene	3.0
2,3,4,6-Tetrachlorophenol	NS
2,4,5-Trichlorophenol	1.0
2,4,6-Trichlorophenol	1.0
2,4-Dichlorophenol	5.0
2,4-Dimethylphenol	50.0

Table 2
Chemical Parameters and Data Quality Levels
For Groundwater Samples – 29-05 38th Street, Long Island City, Queens, NY

Parameter	DQL[1]
2,4-Dinitrophenol	10.0
2,4-Dinitrotoluene	5.0
2,6-Dinitrotoluene	5.0
2-Chloronaphthalene	10.0
2-Chlorophenol	1.0
2-Methylnaphthalene	NS
2-Methylphenol	1.0
2-Nitroaniline	5.0
2-Nitrophenol	1.0
3- & 4-Methylphenols	1.0
3,3-Dichlorobenzidine	5.0
3-Nitroaniline	5.0
4,6-Dinitro-2-methylphenol	NS
4-Bromophenyl phenyl ether	NS
4-Bromophenyl phenyl ether	1.0
4-Chloroaniline	5.0
4-Chlorophenyl phenyl ether	NS
4-Nitroaniline	5.0
4-Nitrophenol	1.0
Acenaphthene	20.0
Acenaphthylene	NS
Acetophenone	NS
Aniline	5.0
Anthracene	50.0
Atrazine	NS
Benzaldehyde	NS
Benzidine	NS
Benzo(a)anthracene	0.002
Benzo(a)pyrene	0.002
Benzo(a)pyrene	0.002
Benzo(g,h,i)perylene	NS
Benzo(k)fluoranthene	0.002
Benzoic acid	NS
Benzyl alcohol	NS
Benzyl butyl phthalate	50.0
Bis(2-chloroethoxy)methane	5.0
Bis(2-chloroethyl)ether	1.0
Bis(2-chloroisopropyl)ether	5.0
Bis(2-ethylhexyl)phthalate	5.0
Caprolactam	NS
Carbazole	NS
Chrysene	0.002

Table 2
Chemical Parameters and Data Quality Levels
For Groundwater Samples – 29-05 38th Street, Long Island City, Queens, NY

Parameter	DQL[1]
Dibenzo(a,h)anthracene	NS
Dibenzofuran	NS
Diethyl phthalate	50.0
Dimethyl phthalate	50.0
Di-n-butyl phthalate	50.0
Di-n-octyl phthalate	50.0
Fluoranthene	50.0
Fluorene	50.0
Hexachlorobenzene	0.04
Hexachlorobutadiene	0.5
Hexachlorocyclopentadiene	5.0
Hexachloroethane	5.0
Indeno(1,2,3-cd)pyrene	0.002
Isophorone	50.0
Naphthalene	10.0
Nitrobenzene	0.4
N-Nitrosodimethylamine	NS
N-nitroso-di-n-propylamine	NS
N-Nitrosodiphenylamine	50.0
Pentachlorophenol	1.0
Phenanthrene	50.0
Phenol	1.0
Pyrene	50.0
TCL PFAs	
1H, 1H, 2H, 2H-Perfluorodecanesulfonic acid	0.002
1H, 1H, 2H, 2H-Perfluorooctanesulfonic acid	0.002
N-EtFOSAA	0.002
N-MeFOSAA	0.002
Perfluoro-1-decanesulfonic acid (PFDS)	0.002
Perfluoro-1-heptanesulfonic acid (PFHpS)	0.002
Perfluoro-1-octanesulfonamide (FOSA)	0.002
Perfluorobutanesulfonic acid (PFBS)	0.002
Perfluorodecanoic acid (PFDA)	0.002
Perfluorododecanoic acid (PFDoA)	0.002
Perfluoroheptanoic acid (PFHpA)	0.002
Perfluorohexanesulfonic acid (PFHxS)	0.002
Perfluorohexanoic acid (PFHxA)	0.002

Table 2 Chemical Parameters and Data Quality Levels For Groundwater Samples – 29-05 38th Street, Long Island City, Queens, NY	
Parameter	**DQL[1]**
Perfluoro-n-butanoic acid (PFBA)	0.002
Perfluorononanoic acid (PFNA)	0.002
Perfluorooctanesulfonic acid (PFOS)	0.002
Perfluorooctanoic acid (PFOA)	0.002
Perfluoropentanoic acid (PFPeA)	0.002
Perfluorotetradecanoic acid (PFTA)	0.002
Perfluorotridecanoic acid (PFTrDA)	0.002
Perfluoroundecanoic acid (PFUnA)	0.002

RL= Reporting Limit
DQL=Data Quality Level
[1] DQL for TCL VOCs and SVOCs are based on NYSDEC TOGS Standards and Guidance Values for Class GA Groundwater
[2] DQLs for PFAS in groundwater are based on NYSDEC Guidance value of 2 ng/L or 0.002 µg/L
NS=No standard
N

Table 3
Analytical Parameters, Methods, Preservation and Container Requirements
29-05 38th Street, Long Island City, Queens, NY

Sample Matrix	Analytical Parameter	Sample Type	No. of Samples	USEPA Analytical Method	Sample Preservation	Holding Time	Sample Container
Soil	TCL VOCs	Grab	TBD	USEPA Method 8260	Cool to 4º C Encore Sampler or Terra Core Kit	48 Hours (14 days after frozen)	(3) 5-gram Encore Sampler/ (1) Terra Core kit
	TCL SVOCs	Grab	TBD	USEPA Method 8270	Cool to 4º C; no headspace	14 days	4 oz. glass jar
	TAL Metals (Except Hg)	Grab	TBD	USEPA Method SW846/6020	None	6 months	4 oz. glass jar
	Hg	Grab	TBD	USEPA Method SW846/7471B	None	28 days	4 oz. glass jar
	PCB	Grab	TBD	USEPA Method 8082	Cool to 4º C	7 days	4 oz. glass jar
	Pesticides	Grab	TBD	USEPA Method 8081	Cool to 4º C	7 days	4 oz. glass jar
	PFAs	Grab	TBD	USEPA Method 537.1	Cool to 6º C	14 days	HDPE Only
Groundwater	TCL VOCs	Grab	TBD	USEPA Method 8260	pH<2 with HCl; Cool to 4º C; no headspace	14 days	(3) 40 mL VOA vials
	TCL SVOCs	Grab	TBD	USEPA Method 8270	Cool to 4º C; no headspace	7 Days	2 Liter Amber Jars
	PFAS	Grab	TBD	USEPA Method 537.1	Cool to 6º C; no headspace	14 days	HDPE Only

TBD = To Be Determined

Table 4
QA/QC Sampling Summary
29-05 38th Street, Long Island City, Queens, NY

Matrix/Analysis	Analytical Method	Field Duplicate	Equipment Blank	Trip Blank	Matrix Spike	Matrix Spike Duplicate
Soil TCL VOCs	EPA Method 8260	1 per 20 samples	-	-	1 per 20 samples	1 per 20 samples
Soil TCL SVOCs	EPA Method 8270	1 per 20 samples	-	-	1 per 20 samples	1 per 20 samples
Soil TCL Pesticides	EPA Method 8081B	1 per 20 samples	-	-	1 per 20 samples	1 per 20 samples
Soil TCL PCBs	EPA Method 8082A	1 per 20 samples	-	-	1 per 20 samples	1 per 20 samples
Soil TAL Metals	EPA Method 7471/9012B	1 per 20 samples	-	-	1 per 20 samples	1 per 20 samples
Soil PFAs	EPA Method 537.1	-	1 per day of sampling	-	-	-
Groundwater TCL VOCs	EPA Method 8260	1 per 20 samples -	-	1 per day of sampling	1 per 20 samples	1 per 20 samples
Groundwater TCL SVOCs	EPA Method 8270	1 per 20 samples -	-	-	1 per 20 samples	1 per 20 samples
Groundwater PFAs	EPA Method 537.1	-	1 per day of sampling	-	-	-

APPENDIX A

USEPA Region I
Low-Flow Groundwater Sampling Procedure

U.S. ENVIRONMENTAL PROTECTION AGENCY REGION I

LOW STRESS (low flow) PURGING AND SAMPLING PROCEDURE FOR THE COLLECTION OF GROUNDWATER SAMPLES FROM MONITORING WELLS

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Prepared by: Charles Porfert 1/19/10
(Charles Porfert, Quality Assurance Unit) Date

Approved by: Gerard Sotolongo 1-19-10
(Gerard Sotolongo, Quality Assurance Unit) Date

Revision Page

Date	Rev #	Summary of changes	Sections
7/30/96	2	Finalized	
01/19/10	3	Updated	All sections

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USE OF TERMS

Equipment blank: The equipment blank shall include the pump and the pump's tubing. If tubing is dedicated to the well, the equipment blank needs only to include the pump in subsequent sampling rounds. If the pump and tubing are dedicated to the well, the equipment blank is collected prior to its placement in the well. If the pump and tubing will be used to sample multiple wells, the equipment blank is normally collected after sampling from contaminated wells and not after background wells.

Field duplicates: Field duplicates are collected to determine precision of the sampling procedure. For this procedure, collect duplicate for each analyte group in consecutive order (VOC original, VOC duplicate, SVOC original, SVOC duplicate, etc.).

Indicator field parameters: This SOP uses field measurements of turbidity, dissolved oxygen, specific conductance, temperature, pH, and oxidation/reduction potential (ORP) as indicators of when purging operations are sufficient and sample collection may begin.

Matrix Spike/Matrix Spike Duplicates: Used by the laboratory in its quality assurance program. Consult the laboratory for the sample volume to be collected.

Poteniometric Surface: The level to which water rises in a tightly cased well constructed in a confined aquifer. In an unconfined aquifer, the potentiometric surface is the water table.

QAPP: Quality Assurance Project Plan

SAP: Sampling and Analysis Plan

SOP: Standard operating procedure

Stabilization: A condition that is achieved when all indicator field parameter measurements are sufficiently stable (as described in the "Monitoring Indicator Field Parameters" section) to allow sample collection to begin.

Temperature blank: A temperature blank is added to each sample cooler. The blank is measured upon receipt at the laboratory to assess whether the samples were properly cooled during transit.

Trip blank (VOCs): Trip blank is a sample of analyte-free water taken to the sampling site and returned to the laboratory. The trip blanks (one pair) are added to each sample cooler that contains VOC samples.

SCOPE & APPLICATION

The goal of this groundwater sampling procedure is to collect water samples that reflect the total mobile organic and inorganic loads (dissolved and colloidal sized fractions) transported through the subsurface under ambient flow conditions, with minimal physical and chemical alterations from sampling operations. This standard operating procedure (SOP) for collecting groundwater samples will help ensure that the project's data quality objectives (DQOs) are met under certain low-flow conditions.

The SOP emphasizes the need to minimize hydraulic stress at the well-aquifer interface by maintaining low water-level drawdowns, and by using low pumping rates during purging and sampling operations. Indicator field parameters (e.g., dissolved oxygen, pH, etc.) are monitored during purging in order to determine when sample collection may begin. Samples properly collected using this SOP are suitable for analysis of groundwater contaminants (volatile and semi-volatile organic analytes, dissolved gases, pesticides, PCBs, metals and other inorganics), or naturally occurring analytes. This SOP is based on Puls, and Barcelona (1996).

This procedure is designed for monitoring wells with an inside diameter (1.5-inches or greater) that can accommodate a positive lift pump with a screen length or open interval ten feet or less and with a water level above the top of the screen or open interval (Hereafter, the "screen or open interval" will be referred to only as "screen interval"). This SOP is not applicable to other well-sampling conditions.

While the use of dedicated sampling equipment is not mandatory, dedicated pumps and tubing can reduce sampling costs significantly by streamlining sampling activities and thereby reducing the overall field costs.

The goal of this procedure is to emphasize the need for consistency in deploying and operating equipment while purging and sampling monitoring wells during each sampling event. This will help to minimize sampling variability.

This procedure describes a general framework for groundwater sampling. Other site specific information (hydrogeological context, conceptual site model (CSM), DQOs, etc.) coupled with systematic planning must be added to the procedure in order to develop an appropriate site specific SAP/QAPP. In addition, the site specific SAP/QAPP must identify the specific equipment that will be used to collect the groundwater samples.

This procedure does not address the collection of water or free product samples from wells containing free phase LNAPLs and/or DNAPLs (light or dense non-aqueous phase

liquids). For this type of situation, the reader may wish to check: Cohen, and Mercer (1993) or other pertinent documents.

This SOP is to be used when collecting groundwater samples from monitoring wells at all Superfund, Federal Facility and RCRA sites in Region 1 under the conditions described herein. Request for modification of this SOP, in order to better address specific situations at individual wells, must include adequate technical justification for proposed changes. All changes and modifications must be approved and included in a revised SAP/QAPP before implementation in field.

BACKGROUND FOR IMPLEMENTATION

It is expected that the monitoring well screen has been properly located (both laterally and vertically) to intercept existing contaminant plume(s) or along flow paths of potential contaminant migration. Problems with inappropriate monitoring well placement or faulty/improper well installation cannot be overcome by even the best water sampling procedures. This SOP presumes that the analytes of interest are moving (or will potentially move) primarily through the more permeable zones intercepted by the screen interval.

Proper well construction, development, and operation and maintenance cannot be overemphasized. The use of installation techniques that are appropriate to the hydrogeologic setting of the site often prevent "problem well" situations from occurring. During well development, or redevelopment, tests should be conducted to determine the hydraulic characteristics of the monitoring well. The data can then be used to set the purging/sampling rate, and provide a baseline for evaluating changes in well performance and the potential need for well rehabilitation. Note: if this installation data or well history (construction and sampling) is not available or discoverable, for all wells to be sampled, efforts to build a sampling history should commence with the next sampling event.

The pump intake should be located within the screen interval and at a depth that will remain under water at all times. It is recommended that the intake depth and pumping rate remain the same for all sampling events. The mid-point or the lowest historical midpoint of the saturated screen length is often used as the location of the pump intake. For new wells, or for wells without pump intake depth information, the site's SAP/QAPP must provide clear reasons and instructions on how the pump intake depth(s) will be selected, and reason(s) for the depth(s) selected. If the depths to top and bottom of the well screen are not known, the SAP/QAPP will need to describe how the sampling depth will be determined and how the data can be used.

Stabilization of indicator field parameters is used to indicate that conditions are suitable for sampling to begin. Achievement of turbidity levels of less than 5 NTU, and stable drawdowns of less than 0.3 feet, while desirable, are not mandatory. Sample collection

may still take place provided the indicator field parameter criteria in this procedure are met. If after 2 hours of purging indicator field parameters have not stabilized, one of three optional courses of action may be taken: a) continue purging until stabilization is achieved, b) discontinue purging, do not collect any samples, and record in log book that stabilization could not be achieved (documentation must describe attempts to achieve stabilization), c) discontinue purging, collect samples and provide full explanation of attempts to achieve stabilization (note: there is a risk that the analytical data obtained, especially metals and strongly hydrophobic organic analytes, may reflect a sampling bias and therefore, the data may not meet the data quality objectives of the sampling event).

It is recommended that low-flow sampling be conducted when the air temperature is above 32°F (0°C). If the procedure is used below 32°F, special precautions will need to be taken to prevent the groundwater from freezing in the equipment. Because sampling during freezing temperatures may adversely impact the data quality objectives, the need for water sample collection during months when these conditions are likely to occur should be evaluated during site planning and special sampling measures may need to be developed. Ice formation in the flow-through-cell will cause the monitoring probes to act erratically. A transparent flow-through-cell needs to be used to observe if ice is forming in the cell. If ice starts to form on the other pieces of the sampling equipment, additional problems may occur.

HEALTH & SAFETY

When working on-site, comply with all applicable OSHA requirements and the site's health/safety procedures. All proper personal protection clothing and equipment are to be worn. Some samples may contain biological and chemical hazards. These samples should be handled with suitable protection to skin, eyes, etc.

CAUTIONS

The following cautions need to be considered when planning to collect groundwater samples when the below conditions occur.

If the groundwater degasses during purging of the monitoring well, dissolved gases and VOCs will be lost. When this happens, the groundwater data for dissolved gases (e.g., methane, ethene, ethane, dissolved oxygen, etc.) and VOCs will need to be qualified. Some conditions that can promote degassing are the use of a vacuum pump (e.g., peristaltic pumps), changes in aperture along the sampling tubing, and squeezing/pinching the pump's tubing which results in a pressure change.

When collecting the samples for dissolved gases and VOCs analyses, avoid aerating the groundwater in the pump's tubing. This can cause loss of the dissolved gases and VOCs in

the groundwater. Having the pump's tubing completely filled prior to sampling will avoid this problem when using a centrifugal pump or peristaltic pump.

Direct sun light and hot ambient air temperatures may cause the groundwater in the tubing and flow-through-cell to heat up. This may cause the groundwater to degas which will result in loss of VOCs and dissolved gases. When sampling under these conditions, the sampler will need to shade the equipment from the sunlight (e.g., umbrella, tent, etc.). If possible, sampling on hot days, or during the hottest time of the day, should be avoided. The tubing exiting the monitoring well should be kept as short as possible to avoid the sun light or ambient air from heating up the groundwater.

Thermal currents in the monitoring well may cause vertical mixing of water in the well bore. When the air temperature is colder than the groundwater temperature, it can cool the top of the water column. Colder water which is denser than warm water sinks to the bottom of the well and the warmer water at the bottom of the well rises, setting up a convention cell. "During low-flow sampling, the pumped water may be a mixture of convecting water from within the well casing and aquifer water moving inward through the screen. This mixing of water during low-flow sampling can substantially increase equilibration times, can cause false stabilization of indicator parameters, can give false indication of redox state, and can provide biological data that are not representative of the aquifer conditions" (Vroblesky 2007).

Failure to calibrate or perform proper maintenance on the sampling equipment and measurement instruments (e.g., dissolved oxygen meter, etc.) can result in faulty data being collected.

Interferences may result from using contaminated equipment, cleaning materials, sample containers, or uncontrolled ambient/surrounding air conditions (e.g., truck/vehicle exhaust nearby).

Cross contamination problems can be eliminated or minimized through the use of dedicated sampling equipment and/or proper planning to avoid ambient air interferences. Note that the use of dedicated sampling equipment can also significantly reduce the time needed to complete each sampling event, will promote consistency in the sampling, and may reduce sampling bias by having the pump's intake at a constant depth.

Clean and decontaminate all sampling equipment prior to use. All sampling equipment needs to be routinely checked to be free from contaminants and equipment blanks collected to ensure that the equipment is free of contaminants. Check the previous equipment blank data for the site (if they exist) to determine if the previous cleaning procedure removed the contaminants. If contaminants were detected and they are a concern, then a more vigorous cleaning procedure will be needed.

PERSONNEL QUALIFICATIONS

All field samplers working at sites containing hazardous waste must meet the requirements of the OSHA regulations. OSHA regulations may require the sampler to take the 40 hour OSHA health and safety training course and a refresher course prior to engaging in any field activities, depending upon the site and field conditions.

The field samplers must be trained prior to the use of the sampling equipment, field instruments, and procedures. Training is to be conducted by an experienced sampler before initiating any sampling procedure.

The entire sampling team needs to read, and be familiar with, the site Health and Safety Plan, all relevant SOPs, and SAP/QAPP (and the most recent amendments) before going onsite for the sampling event. It is recommended that the field sampling leader attest to the understanding of these site documents and that it is recorded.

EQUIPMENT AND SUPPLIES

A. Informational materials for sampling event

A copy of the current Health and Safety Plan, SAP/QAPP, monitoring well construction data, location map(s), field data from last sampling event, manuals for sampling, and the monitoring instruments' operation, maintenance, and calibration manuals should be brought to the site.

B. Well keys.

C. Extraction device

Adjustable rate, submersible pumps (e.g., centrifugal, bladder, etc.) which are constructed of stainless steel or Teflon are preferred. Note: if extraction devices constructed of other materials are to be used, adequate information must be provided to show that the substituted materials do not leach contaminants nor cause interferences to the analytical procedures to be used. Acceptance of these materials must be obtained before the sampling event.

If bladder pumps are selected for the collection of VOCs and dissolved gases, the pump setting should be set so that one pulse will deliver a water volume that is sufficient to fill a 40 mL VOC vial. This is not mandatory, but is considered a "best practice". For the proper operation, the bladder pump will need a minimum amount of water above the pump; consult the manufacturer for the recommended submergence. The pump's recommended submergence value should be determined during the planning stage, since it may influence well construction and placement of dedicated pumps where water-level fluctuations are significant.

Adjustable rate, peristaltic pumps (suction) are to be used with caution when collecting samples for VOCs and dissolved gases (e.g., methane, carbon dioxide, etc.) analyses. Additional information on the use of peristaltic pumps can be found in Appendix A. If peristaltic pumps are used, the inside diameter of the rotor head tubing needs to match the inside diameter of the tubing installed in the monitoring well.

Inertial pumping devices (motor driven or manual) are not recommended. These devices frequently cause greater disturbance during purging and sampling, and are less easily controlled than submersible pumps (potentially increasing turbidity and sampling variability, etc.). This can lead to sampling results that are adversely affected by purging and sampling operations, and a higher degree of data variability.

D. Tubing

Teflon or Teflon-lined polyethylene tubing are preferred when sampling is to include VOCs, SVOCs, pesticides, PCBs and inorganics. Note: if tubing constructed of other materials is to be used, adequate information must be provided to show that the substituted materials do not leach contaminants nor cause interferences to the analytical procedures to be used. Acceptance of these materials must be obtained before the sampling event.

PVC, polypropylene or polyethylene tubing may be used when collecting samples for metal and other inorganics analyses.

The use of 1/4 inch or 3/8 inch (inside diameter) tubing is recommended. This will help ensure that the tubing remains liquid filled when operating at very low pumping rates when using centrifugal and peristaltic pumps.

Silastic tubing should be used for the section around the rotor head of a peristaltic pump. It should be less than a foot in length. The inside diameter of the tubing used at the pump rotor head must be the same as the inside diameter of tubing placed in the well. A tubing connector is used to connect the pump rotor head tubing to the well tubing. Alternatively, the two pieces of tubing can be connected to each other by placing the one end of the tubing inside the end of the other tubing. The tubing must not be reused.

E. The water level measuring device

Electronic "tape", pressure transducer, water level sounder/level indicator, etc. should be capable of measuring to 0.01 foot accuracy. Recording pressure transducers, mounted above the pump, are especially helpful in tracking water levels during pumping operations, but their use must include check measurements with a water level "tape" at the start and end of each sampling event.

F. Flow measurement supplies

Graduated cylinder (size according to flow rate) and stopwatch usually will suffice.

Large graduated bucket used to record total water purged from the well.

G. Interface probe

To be used to check on the presence of free phase liquids (LNAPL, or DNAPL) before purging begins (as needed).

H. Power source (generator, nitrogen tank, battery, etc.)

When a gasoline generator is used, locate it downwind and at least 30 feet from the well so that the exhaust fumes do not contaminate samples.

I. Indicator field parameter monitoring instruments

Use of a multi-parameter instrument capable of measuring pH, oxidation/reduction potential (ORP), dissolved oxygen (DO), specific conductance, temperature, and coupled with a flow-through-cell is required when measuring all indicator field parameters, except turbidity. Turbidity is collected using a separate instrument. Record equipment/instrument identification (manufacturer, and model number).

Transparent, small volume flow-through-cells (e.g., 250 mLs or less) are preferred. This allows observation of air bubbles and sediment buildup in the cell, which can interfere with the operation of the monitoring instrument probes, to be easily detected. A small volume cell facilitates rapid turnover of water in the cell between measurements of the indicator field parameters.

It is recommended to use a flow-through-cell and monitoring probes from the same manufacturer and model to avoid incompatibility between the probes and flow-through-cell.

Turbidity samples are collected before the flow-through-cell. A "T" connector coupled with a valve is connected between the pump's tubing and flow-through-cell. When a turbidity measurement is required, the valve is opened to allow the groundwater to flow into a container. The valve is closed and the container sample is then placed in the turbidimeter.

Standards are necessary to perform field calibration of instruments. A minimum of two standards are needed to bracket the instrument measurement range for all parameters except ORP which use a Zobell solution as a standard. For dissolved oxygen, a wet sponge used for the 100% saturation and a zero dissolved oxygen solution are used for the calibration.

Barometer (used in the calibration of the Dissolved Oxygen probe) and the conversion formula to convert the barometric pressure into the units of measure used by the Dissolved Oxygen meter are needed.

J. Decontamination supplies

Includes (for example) non-phosphate detergent, distilled/deionized water, isopropyl alcohol, etc.

K. Record keeping supplies

Logbook(s), well purging forms, chain-of-custody forms, field instrument calibration forms, etc.

L. Sample bottles

M. Sample preservation supplies (as required by the analytical methods)

N. Sample tags or labels

O. PID or FID instrument

If appropriate, to detect VOCs for health and safety purposes, and provide qualitative field evaluations.

P. Miscellaneous Equipment

Equipment to keep the sampling apparatus shaded in the summer (e.g., umbrella) and from freezing in the winter. If the pump's tubing is allowed to heat up in the warm weather, the cold groundwater may degas as it is warmed in the tubing.

EQUIPMENT/INSTRUMENT CALIBRATION

Prior to the sampling event, perform maintenance checks on the equipment and instruments according to the manufacturer's manual and/or applicable SOP. This will ensure that the equipment/instruments are working properly before they are used in the field.

Prior to sampling, the monitoring instruments must be calibrated and the calibration documented. The instruments are calibrated using U.S Environmental Protection Agency Region 1 *Calibration of Field Instruments (temperature, pH, dissolved oxygen, conductivity/specific conductance, oxidation/reduction [ORP], and turbidity),* January 19, 2010, or latest version or from one of the methods listed in 40CFR136, 40CFR141 and SW-846.

The instruments shall be calibrated at the beginning of each day. If the field measurement falls outside the calibration range, the instrument must be re-calibrated so that all measurements fall within the calibration range. At the end of each day, a calibration check is performed to verify that instruments remained in calibration throughout the day. This check is performed while the instrument is in measurement mode, not calibration mode. If the field instruments are being used to monitor the natural attenuation parameters, then a calibration check at mid-day is highly recommended to ensure that the instruments did not drift out of calibration. Note: during the day if the instrument reads zero or a negative number for dissolved oxygen, pH, specific conductance, or turbidity (negative value only), this indicates that the instrument drifted out of calibration or the instrument is malfunctioning. If this situation occurs the data from this instrument will need to be qualified or rejected.

PRELIMINARY SITE ACTIVITIES (as applicable)

Check the well for security (damage, evidence of tampering, missing lock, etc.) and record pertinent observations (include photograph as warranted).

If needed lay out sheet of clean polyethylene for monitoring and sampling equipment, unless equipment is elevated above the ground (e.g., on a table, etc.).

Remove well cap and if appropriate measure VOCs at the rim of the well with a PID or FID instrument and record reading in field logbook or on the well purge form.

If the well casing does not have an established reference point (usually a V-cut or indelible mark in the well casing), make one. Describe its location and record the date of the mark in the logbook (consider a photographic record as well). All water level measurements must be recorded relative to this reference point (and the altitude of this point should be determined using techniques that are appropriate to site's DQOs.

If water-table or potentiometric surface map(s) are to be constructed for the sampling event, perform synoptic water level measurement round (in the shortest possible time) before any purging and sampling activities begin. If possible, measure water level depth (to 0.01 ft.) and total well depth (to 0.1 ft.) the day before sampling begins, in order to allow for re-settlement of any particulates in the water column. This is especially important for those wells that have not been recently sampled because sediment buildup in the well may require the well to be redeveloped. If measurement of total well depth is not made the day before, it should be measured after sampling of the well is complete. All measurements must be taken from the established referenced point. Care should be taken to minimize water column disturbance.

Check newly constructed wells for the presence of LNAPLs or DNAPLs before the initial sampling round. If none are encountered, subsequent check measurements with an interface probe may not be necessary unless analytical data or field analysis signal a worsening situation. This SOP cannot be used in the presence of LNAPLs or DNAPLs. If NAPLs are present, the project team must decide upon an alternate sampling method. All project modifications must be approved and documented prior to implementation.

If available check intake depth and drawdown information from previous sampling event(s) for each well. Duplicate, to the extent practicable, the intake depth and extraction rate (use final pump dial setting information) from previous event(s). If changes are made in the intake depth or extraction rate(s) used during previous sampling event(s), for either portable or dedicated extraction devices, record new values, and explain reasons for the changes in the field logbook.

PURGING AND SAMPLING PROCEDURE

Purging and sampling wells in order of increasing chemical concentrations (known or anticipated) are preferred.

The use of dedicated pumps is recommended to minimize artificial mobilization and entrainment of particulates each time the well is sampled. Note that the use of dedicated sampling equipment can also significantly reduce the time needed to complete each

sampling event, will promote consistency in the sampling, and may reduce sampling bias by having the pump's intake at a constant depth.

A. Initial Water Level

Measure the water level in the well before installing the pump if a non-dedicated pump is being used. The initial water level is recorded on the purge form or in the field logbook.

B. Install Pump

Lower pump, safety cable, tubing and electrical lines slowly (to minimize disturbance) into the well to the appropriate depth (may not be the mid-point of the screen/open interval). The Sampling and Analysis Plan/Quality Assurance Project Plan should specify the sampling depth (used previously), or provide criteria for selection of intake depth for each new well. If possible keep the pump intake at least two feet above the bottom of the well, to minimize mobilization of particulates present in the bottom of the well.

Pump tubing lengths, above the top of well casing should be kept as short as possible to minimize heating the groundwater in the tubing by exposure to sun light and ambient air temperatures. Heating may cause the groundwater to degas, which is unacceptable for the collection of samples for VOC and dissolved gases analyses.

C. Measure Water Level

Before starting pump, measure water level. Install recording pressure transducer, if used to track drawdowns, to initialize starting condition.

D. Purge Well

From the time the pump starts purging and until the time the samples are collected, the purged water is discharged into a graduated bucket to determine the total volume of groundwater purged. This information is recorded on the purge form or in the field logbook.

Start the pump at low speed and slowly increase the speed until discharge occurs. Check water level. Check equipment for water leaks and if present fix or replace the affected equipment. Try to match pumping rate used during previous sampling event(s). Otherwise, adjust pump speed until there is little or no water level drawdown. If the minimal drawdown that can be achieved exceeds 0.3 feet, but remains stable, continue purging.

Monitor and record the water level and pumping rate every five minutes (or as appropriate) during purging. Record any pumping rate adjustments (both time and flow rate). Pumping rates should, as needed, be reduced to the minimum capabilities of the pump to ensure stabilization of the water level. Adjustments are best made in the first fifteen minutes of pumping in order to help minimize purging time. During pump start-up, drawdown may exceed the 0.3 feet target and then "recover" somewhat as pump flow adjustments are made. Purge volume calculations should utilize stabilized drawdown value, not the initial drawdown. If the initial water level is above the top of the screen do not allow the water level to fall into the well screen. The final purge volume must be greater than the stabilized drawdown volume plus the pump's tubing volume. If the drawdown has exceeded 0.3 feet and stabilizes, calculate the volume of water between the initial water level and the stabilized water level. Add the volume of the water which occupies the pump's tubing to this calculation. This combined volume of water needs to be purged from the well after the water level has stabilized before samples are collected.

Avoid the use of constriction devices on the tubing to decrease the flow rate because the constrictor will cause a pressure difference in the water column. This will cause the groundwater to degas and result in a loss of VOCs and dissolved gasses in the groundwater samples.

Note: the flow rate used to achieve a stable pumping level should remain constant while monitoring the indicator parameters for stabilization and while collecting the samples.

Wells with low recharge rates may require the use of special pumps capable of attaining very low pumping rates (e.g., bladder, peristaltic), and/or the use of dedicated equipment. For new monitoring wells, or wells where the following situation has not occurred before, if the recovery rate to the well is less than 50 mL/min., or the well is being essentially dewatered during purging, the well should be sampled as soon as the water level has recovered sufficiently to collect the volume needed for all anticipated samples. The project manager or field team leader will need to make the decision when samples should be collected, how the sample is to be collected, and the reasons recorded on the purge form or in the field logbook. A water level measurement needs to be performed and recorded before samples are collected. If the project manager decides to collect the samples using the pump, it is best during this recovery period that the pump intake tubing not be removed, since this will aggravate any turbidity problems. Samples in this specific situation may be collected without stabilization of indicator field parameters. Note that field conditions and efforts to overcome problematic situations must be recorded in order to support field decisions to deviate from normal procedures described in this SOP. If this type of problematic situation persists in a well, then water sample collection should be changed to a passive or no-purge method, if consistent with the site's DQOs, or have a new well installed.

E. Monitor Indicator Field Parameters

After the water level has stabilized, connect the "T" connector with a valve and the flow-through-cell to monitor the indicator field parameters. If excessive turbidity is anticipated or encountered with the pump startup, the well may be purged for a while without connecting up the flow-through-cell, in order to minimize particulate buildup in the cell (This is a judgment call made by the sampler). Water level drawdown measurements should be made as usual. If possible, the pump may be installed the day before purging to allow particulates that were disturbed during pump insertion to settle.

During well purging, monitor indicator field parameters (turbidity, temperature, specific conductance, pH, ORP, DO) at a frequency of five minute intervals or greater. The pump's flow rate must be able to "turn over" at least one flow-through-cell volume between measurements (for a 250 mL flow-through-cell with a flow rate of 50 mLs/min., the monitoring frequency would be every five minutes; for a 500 mL flow-through-cell it would be every ten minutes). If the cell volume cannot be replaced in the five minute interval, then the time between measurements must be increased accordingly. Note: during the early phase of purging emphasis should be put on minimizing and stabilizing pumping stress, and recording those adjustments followed by stabilization of indicator parameters. Purging is considered complete and sampling may begin when all the above indicator field parameters have stabilized. Stabilization is considered to be achieved when three consecutive readings are within the following limits:

Turbidity (10% for values greater than 5 NTU; if three Turbidity values are less than 5 NTU, consider the values as stabilized),
Dissolved Oxygen (10% for values greater than 0.5 mg/L, if three Dissolved Oxygen values are less than 0.5 mg/L, consider the values as stabilized),
Specific Conductance (3%),
Temperature (3%),
pH (± 0.1 unit),
Oxidation/Reduction Potential (±10 millivolts).

All measurements, except turbidity, must be obtained using a flow-through-cell. Samples for turbidity measurements are obtained before water enters the flow-through-cell. Transparent flow-through-cells are preferred, because they allow field personnel to watch for particulate build-up within the cell. This build-up may affect indicator field parameter values measured within the cell. If the cell needs to be cleaned during purging operations, continue pumping and disconnect cell for cleaning, then reconnect after cleaning and continue monitoring activities. Record start and stop times and give a brief description of cleaning activities.

The flow-through-cell must be designed in a way that prevents gas bubble entrapment in the cell. Placing the flow-through-cell at a 45 degree angle with the port facing upward can help remove bubbles from the flow-through-cell (see Appendix B Low-Flow Setup Diagram). All during the measurement process, the flow-through-cell must remain free of any gas bubbles. Otherwise, the monitoring probes may act erratically. When the pump is turned off or cycling on/off (when using a bladder pump), water in the cell must not drain out. Monitoring probes must remain submerged in water at all times.

F. Collect Water Samples

When samples are collected for laboratory analyses, the pump's tubing is disconnected from the "T" connector with a valve and the flow-through-cell. The samples are collected directly from the pump's tubing. Samples must not be collected from the flow-through-cell or from the "T" connector with a valve.

VOC samples are normally collected first and directly into pre-preserved sample containers. However, this may not be the case for all sampling locations; the SAP/QAPP should list the order in which the samples are to be collected based on the project's objective(s). Fill all sample containers by allowing the pump discharge to flow gently down the inside of the container with minimal turbulence.

If the pump's flow rate is too high to collect the VOC/dissolved gases samples, collect the other samples first. Lower the pump's flow rate to a reasonable rate and collect the VOC/dissolved gases samples and record the new flow rate.

During purging and sampling, the centrifugal/peristaltic pump tubing must remain filled with water to avoid aeration of the groundwater. It is recommended that 1/4 inch or 3/8 inch (inside diameter) tubing be used to help insure that the sample tubing remains water filled. If the pump tubing is not completely filled to the sampling point, use the following procedure to collect samples: collect non-VOC/dissolved gases samples first, then increase flow rate slightly until the water completely fills the tubing, collect the VOC/dissolved gases samples, and record new drawdown depth and flow rate.

For bladder pumps that will be used to collect VOC or dissolved gas samples, it is recommended that the pump be set to deliver long pulses of water so that one pulse will fill a 40 mL VOC vial.

Use pre-preserved sample containers or add preservative, as required by analytical methods, to the samples immediately after they are collected. Check the analytical methods (e.g. EPA SW-846, 40 CFR 136, water supply, etc.) for additional information on preservation.

If determination of filtered metal concentrations is a sampling objective, collect filtered water samples using the same low flow procedures. The use of an in-line filter (transparent housing preferred) is required, and the filter size (0.45 μm is commonly used) should be based on the sampling objective. Pre-rinse the filter with groundwater prior to sample collection. Make sure the filter is free of air bubbles before samples are collected. Preserve the filtered water sample immediately. Note: filtered water samples are not an acceptable substitute for unfiltered samples when the monitoring objective is to obtain chemical concentrations of total mobile contaminants in groundwater for human health or ecological risk calculations.

Label each sample as collected. Samples requiring cooling will be placed into a cooler with ice or refrigerant for delivery to the laboratory. Metal samples after acidification to a pH less than 2 do not need to be cooled.

G. Post Sampling Activities

If a recording pressure transducer is used to track drawdown, re-measure water level with tape.

After collection of samples, the pump tubing may be dedicated to the well for re-sampling (by hanging the tubing inside the well), decontaminated, or properly discarded.

Before securing the well, measure and record the well depth (to 0.1 ft.), if not measured the day before purging began. Note: measurement of total well depth annually is usually sufficient after the initial low stress sampling event. However, a greater frequency may be needed if the well has a "silting" problem or if confirmation of well identity is needed.

Secure the well.

DECONTAMINATION

Decontaminate sampling equipment prior to use in the first well and then following sampling of each well. Pumps should not be removed between purging and sampling operations. The pump, tubing, support cable and electrical wires which were in contact with the well should be decontaminated by one of the procedures listed below.

The use of dedicated pumps and tubing will reduce the amount of time spent on decontamination of the equipment. If dedicated pumps and tubing are used, only the initial sampling event will require decontamination of the pump and tubing.

Note if the previous equipment blank data showed that contaminant(s) were present after using the below procedure or the one described in the SAP/QAPP, a more vigorous procedure may be needed.

Procedure 1

Decontaminating solutions can be pumped from either buckets or short PVC casing sections through the pump and tubing. The pump may be disassembled and flushed with the decontaminating solutions. It is recommended that detergent and alcohol be used sparingly in the decontamination process and water flushing steps be extended to ensure that any sediment trapped in the pump is removed. The pump exterior and electrical wires must be rinsed with the decontaminating solutions, as well. The procedure is as follows:

Flush the equipment/pump with potable water.

Flush with non-phosphate detergent solution. If the solution is recycled, the solution must be changed periodically.

Flush with potable or distilled/deionized water to remove all of the detergent solution. If the water is recycled, the water must be changed periodically.

Optional - flush with isopropyl alcohol (pesticide grade; must be free of ketones {e.g., acetone}) or with methanol. This step may be required if the well is highly contaminated or if the equipment blank data from the previous sampling event show that the level of contaminants is significant.

Flush with distilled/deionized water. This step must remove all traces of alcohol (if used) from the equipment. The final water rinse must not be recycled.

Procedure 2

Steam clean the outside of the submersible pump.

Pump hot potable water from the steam cleaner through the inside of the pump. This can be accomplished by placing the pump inside a three or four inch diameter PVC pipe with end cap. Hot water from the steam cleaner jet will be directed inside the PVC pipe and the pump exterior will be cleaned. The hot water from the steam cleaner will then be pumped from the PVC pipe through the pump and collected into another container. Note: additives or solutions should not be added to the steam cleaner.

Pump non-phosphate detergent solution through the inside of the pump. If the solution is recycled, the solution must be changed periodically.

Pump potable water through the inside of the pump to remove all of the detergent solution. If the solution is recycled, the solution must be changed periodically.

Pump distilled/deionized water through the pump. The final water rinse must not be recycled.

FIELD QUALITY CONTROL

Quality control samples are required to verify that the sample collection and handling process has not compromised the quality of the groundwater samples. All field quality control samples must be prepared the same as regular investigation samples with regard to sample volume, containers, and preservation. Quality control samples include field duplicates, equipment blanks, matrix spike/matrix spike duplicates, trip blanks (VOCs), and temperature blanks.

FIELD LOGBOOK

A field log shall be kept to document all groundwater field monitoring activities (see Appendix C, example table), and record the following for each well:

Site name, municipality, state.

Well identifier, latitude-longitude or state grid coordinates.

Measuring point description (e.g., north side of PVC pipe).

Well depth, and measurement technique.

Well screen length.

Pump depth.

Static water level depth, date, time and measurement technique.

Presence and thickness of immiscible liquid (NAPL) layers and detection method.

Pumping rate, drawdown, indicator parameters values, calculated or measured total volume pumped, and clock time of each set of measurements.

Type of tubing used and its length.

Type of pump used.

Clock time of start and end of purging and sampling activity.

Types of sample bottles used and sample identification numbers.

Preservatives used.

Parameters requested for analyses.

Field observations during sampling event.

Name of sample collector(s).

Weather conditions, including approximate ambient air temperature.

QA/QC data for field instruments.

Any problems encountered should be highlighted.

Description of all sampling/monitoring equipment used, including trade names, model number, instrument identification number, diameters, material composition, etc.

DATA REPORT

Data reports are to include laboratory analytical results, QA/QC information, field indicator parameters measured during purging, field instrument calibration information, and whatever other field logbook information is needed to allow for a full evaluation of data usability.

Note: the use of trade, product, or firm names in this sampling procedure is for descriptive purposes only and does not constitute endorsement by the U.S. EPA.

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APPENDIX A
PERISTALTIC PUMPS

Before selecting a peristaltic pump to collect groundwater samples for VOCs and/or dissolved gases (e.g., methane, carbon dioxide, etc.) consideration should be given to the following:

- The decision of whether or not to use a peristaltic pump is dependent on the intended use of the data.
- If the additional sampling error that may be introduced by this device is NOT of concern for the VOC/dissolved gases data's intended use, then this device may be acceptable.
- If minor differences in the groundwater concentrations could effect the decision, such as to continue or terminate groundwater cleanup or whether the cleanup goals have been reached, then this device should NOT be used for VOC/dissolved gases sampling. In these cases, centrifugal or bladder pumps are a better choice for more accurate results.

EPA and USGS have documented their concerns with the use of the peristaltic pumps to collect water sample in the below documents.

- "Suction Pumps are not recommended because they may cause degassing, pH modification, and loss of volatile compounds" *A Compendium of Superfund Field Operations Methods*, EPA/540/P-87/001, December 1987.
- "The agency does not recommend the use of peristaltic pumps to sample ground water particularly for volatile organic analytes" *RCRA Ground-Water Monitoring Draft Technical Guidance*, EPA Office of Solid Waste, November 1992.
- "The peristaltic pump is limited to shallow applications and can cause degassing resulting in alteration of pH, alkalinity, and volatiles loss", *Low-flow (Minimal drawdown) Ground-Water Sampling Procedures*, by Robert Puls & Michael Barcelona, April 1996, EPA/540/S-95/504.
- "Suction-lift pumps, such as peristaltic pumps, can operate at a very low pumping rate; however, using negative pressure to lift the sample can result in the loss of volatile analytes", USGS Book 9 Techniques of Water-Resources Investigation, Chapter A4. (Version 2.0, 9/2006).

APPENDIX B

SUMMARY OF SAMPLING INSTRUCTIONS

These instructions are for using an adjustable rate, submersible pump or a peristaltic pump with the pump's intake placed at the midpoint of a 10 foot or less well screen or an open interval. The water level in the monitoring well is above the top of the well screen or open interval, the ambient temperature is above 32°F, and the equipment is not dedicated. Field instruments are already calibrated. The equipment is setup according to the diagram at the end of these instructions.

1. Review well installation information. Record well depth, length of screen or open interval, and depth to top of the well screen. Determine the pump's intake depth (e.g., mid-point of screen/open interval).

2. On the day of sampling, check security of the well casing, perform any safety checks needed for the site, lay out a sheet of polyethylene around the well (if necessary), and setup the equipment. If necessary a canopy or an equivalent item can be setup to shade the pump's tubing and flow-through-cell from the sun light to prevent the sun light from heating the groundwater.

3. Check well casing for a reference mark. If missing, make a reference mark. Measure the water level (initial) to 0.01 ft. and record this information.

4. Install the pump's intake to the appropriate depth (e.g., midpoint) of the well screen or open interval. Do not turn-on the pump at this time.

5. Measure water level and record this information.

6. Turn-on the pump and discharge the groundwater into a graduated waste bucket. Slowly increase the flow rate until the water level starts to drop. Reduce the flow rate slightly so the water level stabilizes. Record the pump's settings. Calculate the flow rate using a graduated container and a stop watch. Record the flow rate. Do not let the water level drop below the top of the well screen.

If the groundwater is highly turbid or colored, continue to discharge the water into the bucket until the water clears (visual observation); this usually takes a few minutes. The turbid or colored water is usually from the well being disturbed during the pump installation. If the water does not clear, then you need to make a choice whether to continue purging the well (hoping that it will clear after a reasonable time) or continue to

the next step. Note, it is sometimes helpful to install the pump the day before the sampling event so that the disturbed materials in the well can settle out.

If the water level drops to the top of the well screen during the purging of the well, stop purging the well, and do the following:

> Wait for the well to recharge to a sufficient volume so samples can be collected. This may take awhile (pump maybe removed from well, if turbidity is not a problem). The project manager will need to make the decision when samples should be collected and the reasons recorded in the site's log book. A water level measurement needs to be performed and recorded before samples are collected. When samples are being collected, the water level must not drop below the top of the screen or open interval. Collect the samples from the pump's tubing. Always collect the VOCs and dissolved gases samples first. Normally, the samples requiring a small volume are collected before the large volume samples are collected just in case there is not sufficient water in the well to fill all the sample containers. All samples must be collected, preserved, and stored according to the analytical method. Remove the pump from the well and decontaminate the sampling equipment.

If the water level has dropped 0.3 feet or less from the initial water level (water level measure before the pump was installed); proceed to Step 7. If the water level has dropped more than 0.3 feet, calculate the volume of water between the initial water level and the stabilized water level. Add the volume of the water which occupies the pump's tubing to this calculation. This combined volume of water needs to be purged from the well after the water level has stabilized before samples are be collected.

7. Attach the pump's tubing to the "T" connector with a valve (or a three-way stop cock). The pump's tubing from the well casing to the "T" connector must be as short as possible to prevent the groundwater in the tubing from heating up from the sun light or from the ambient air. Attach a short piece of tubing to the other end of the end of the "T" connector to serve as a sampling port for the turbidity samples. Attach the remaining end of the "T" connector to a short piece of tubing and connect the tubing to the flow-through-cell bottom port. To the top port, attach a small piece of tubing to direct the water into a calibrated waste bucket. Fill the cell with the groundwater and remove all gas bubbles from the cell. Position the flow-through-cell in such a way that if gas bubbles enter the cell they can easily exit the cell. If the ports are on the same side of the cell and the cell is cylindrical shape, the cell can be placed at a 45-degree angle with the ports facing upwards; this position should keep any gas bubbles entering the cell away from the monitoring probes and allow the gas bubbles to exit the cell easily (see Low-Flow Setup Diagram). Note,

make sure there are no gas bubbles caught in the probes' protective guard; you may need to shake the cell to remove these bubbles.

8. Turn-on the monitoring probes and turbidity meter.

9. Record the temperature, pH, dissolved oxygen, specific conductance, and oxidation/reduction potential measurements. Open the valve on the "T" connector to collect a sample for the turbidity measurement, close the valve, do the measurement, and record this measurement. Calculate the pump's flow rate from the water exiting the flow-through-cell using a graduated container and a stop watch, and record the measurement. Measure and record the water level. Check flow-through-cell for gas bubbles and sediment; if present, remove them.

10. Repeat Step 9 every 5 minutes or as appropriate until monitoring parameters stabilized. Note at least one flow-through-cell volume must be exchanged between readings. If not, the time interval between readings will need to be increased. Stabilization is achieved when three consecutive measurements are within the following limits:

Turbidity (10% for values greater than 5 NTUs; if three Turbidity values are less than 5 NTUs, consider the values as stabilized),
Dissolved Oxygen (10% for values greater than 0.5 mg/L, if three Dissolved Oxygen values are less than 0.5 mg/L, consider the values as stabilized),
Specific Conductance (3%),
Temperature (3%),
pH (± 0.1 unit),
Oxidation/Reduction Potential (±10 millivolts).

If these stabilization requirements do not stabilize in a reasonable time, the probes may have been coated from the materials in the groundwater, from a buildup of sediment in the flow-through-cell, or a gas bubble is lodged in the probe. The cell and the probes will need to be cleaned. Turn-off the probes (not the pump), disconnect the cell from the "T" connector and continue to purge the well. Disassemble the cell, remove the sediment, and clean the probes according to the manufacturer's instructions. Reassemble the cell and connect the cell to the "T" connector. Remove all gas bubbles from the cell, turn-on the probes, and continue the measurements. Record that the time the cell was cleaned.

11. When it is time to collect the groundwater samples, turn-off the monitoring probes, and disconnect the pump's tubing from the "T" connector. If you are using a centrifugal or peristaltic pump check the pump's tubing to determine if the tubing is completely filled with water (no air space).

All samples must be collected and preserved according to the analytical method. VOCs and dissolved gases samples are normally collected first and directly into pre-preserved sample containers. However, this may not be the case for all sampling locations; the SAP/QAPP should list the order in which the samples are to be collected based on the project's objective(s). Fill all sample containers by allowing the pump discharge to flow gently down the inside of the container with minimal turbulence.

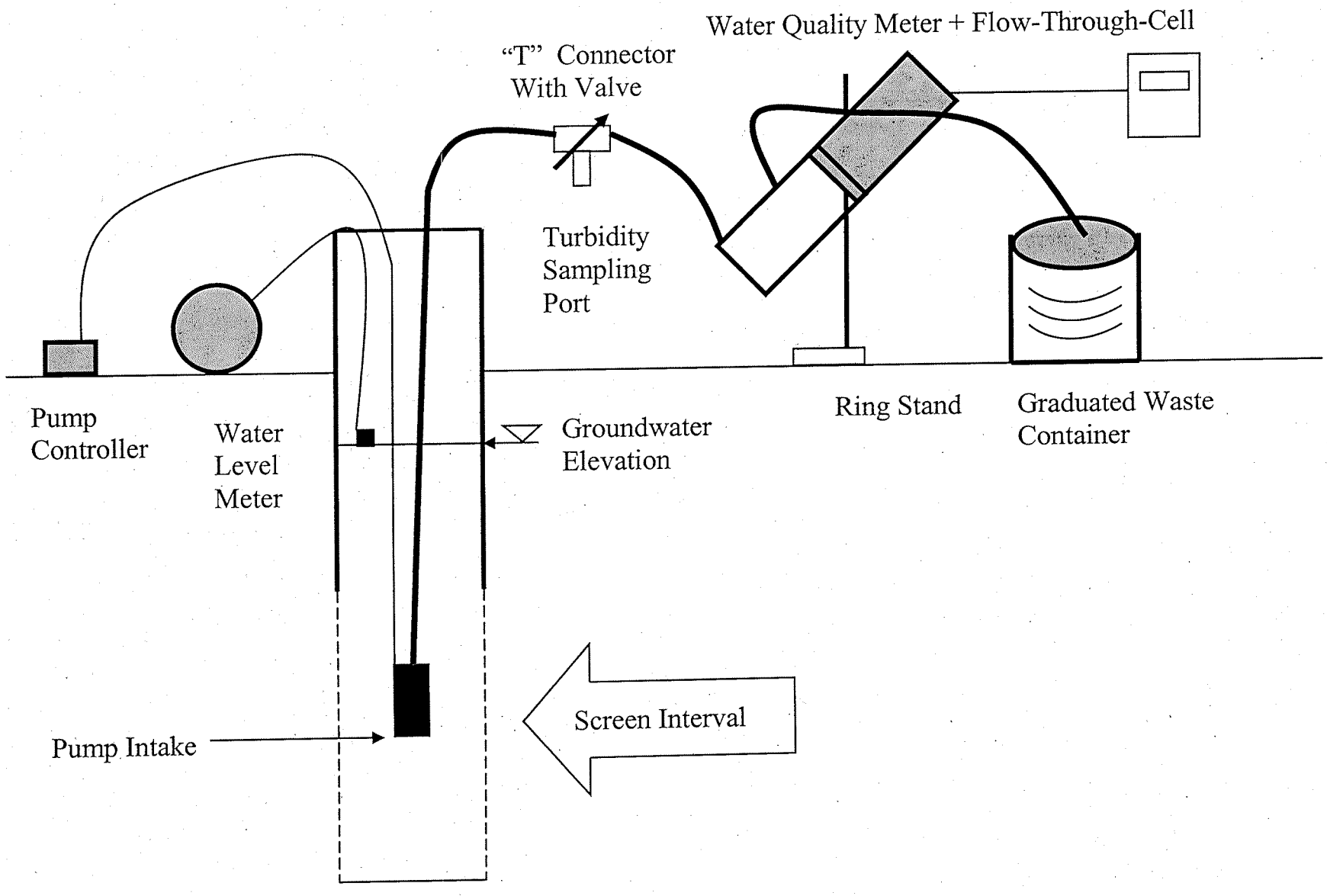
If the pump's tubing is not completely filled with water and the samples are being collected for VOCs and/or dissolved gases analyses using a centrifugal or peristaltic pump, do the following:

> All samples must be collected and preserved according to the analytical method. The VOCs and the dissolved gases (e.g., methane, ethane, ethene, and carbon dioxide) samples are collected last. When it becomes time to collect these samples increase the pump's flow rate until the tubing is completely filled. Collect the samples and record the new flow rate.

12. Store the samples according to the analytical method.

13. Record the total purged volume (graduated waste bucket). Remove the pump from the well and decontaminate the sampling equipment.

Low-Flow Setup Diagram



APPENDIX C
EXAMPLE (Minimum Requirements)
WELL PURGING-FIELD WATER QUALITY MEASUREMENTS FORM

Location (Site/Facility Name)_____
Well Number_____ Date_____
Field Personnel_____
Sampling Organization_____
Identify MP_____

Depth to _____/_____ of screen
(below MP) top bottom
Pump Intake at (ft. below MP)_____
Purging Device; (pump type)_____
Total Volume Purged _____

Clock Time 24 HR	Water Depth below MP ft	Pump Dial[1]	Purge Rate ml/min	Cum. Volume Purged liters	Temp. °C	Spec. Cond.[2] µS/cm	pH	ORP[3] mv	DO mg/L	Turb-idity NTU	Comments
Stabilization Criteria					3%	3%	±0.1	± 10 mv	10%	10%	

1. Pump dial setting (for example: hertz, cycles/min, etc).
2. µSiemens per cm(same as µmhos/cm)at 25 °C.
3. Oxidation reduction potential (ORP)

APPENDIX B

NYSDEC January 2021 Guidance Document

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

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

January 2021

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
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
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

Citation and Page Number	Current Text	Corrected Text	Date
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
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

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

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.

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 F) 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

Currently, New York State Department of Health's Environmental Laboratory Approval Program (ELAP) does not offer certification for PFAS in matrices other than finished drinking water. However, laboratories analyzing environmental samples for PFAS (e.g., soil, sediments, and groundwater) under DER's Part 375 remedial programs need to hold ELAP certification for PFOA and PFOS in drinking water by EPA Method 537, 537.1, ISO 25101, or Method 533. Laboratories should adhere to the guidelines and 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). 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).

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. 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.

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]

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 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.

Water Sample Results

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. 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

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

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.

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]	1.1	3.7

[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 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).

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.

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 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.

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 LC-MS/MS for PFAS using methodologies based on EPA Method 537.1
- 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
- Laboratory should have ELAP certification for PFOA and PFOS in drinking water by EPA Method 537, 537.1, EPA Method 533, or ISO 25101
- 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 methodologies based on EPA Method 537.1.

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 methodologies based on EPA Method 537.1.

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 methodologies based on EPA Method 537.1.

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

NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

GENERAL FISH HANDLING PROCEDURES FOR CONTAMINANT ANALYSES

A. Original copies of all continuity of evidence (i.e., Chain of Custody) and collection record forms must accompany delivery of fish to the lab. A copy shall be directed to the Project Leader or as appropriate, Wayne Richter. All necessary forms will be supplied by the Bureau of Ecosystem Health. Because some samples may be used in legal cases, it is critical that each section is filled out completely. Each Chain of Custody form has three main sections:

   1. The top box is to be filled out **and signed** by the person responsible for the fish collection (e.g., crew leader, field biologist, researcher). This person is responsible for delivery of the samples to DEC facilities or personnel (e.g., regional office or biologist).

   2. The second section is to be filled out **and signed** by the person responsible for the collections while being stored at DEC, before delivery to the analytical lab. This may be the same person as in (1), but it is still required that they complete the section. Also important is the **range of identification numbers** (i.e., tag numbers) included in the sample batch.

   3. Finally, the bottom box is to record any transfers between DEC personnel and facilities. Each subsequent transfer should be **identified, signed, and dated**, until laboratory personnel take possession of the fish.

B. The following data are required on each **Fish Collection Record** form:

   1. Project and Site Name.

   2. DEC Region.

   3. All personnel (and affiliation) involved in the collection.

   4. Method of collection (gill net, hook and line, etc.)

   5. Preservation Method.

C. The following data are to be taken on each fish collected and recorded on the **Fish Collection Record** form:

   1. Tag number - Each specimen is to be individually jaw tagged at time of collection with a unique number. Make sure the tag is turned out so that the number can be read without opening the bag. Use tags in sequential order. For small fish or composite samples place the tag inside the bag with the samples. The Bureau of Ecosystem Health can supply the tags.

   2. Species identification (please be explicit enough to enable assigning genus and species). Group fish by species when processing.

   3. Date collected.

   4. Sample location (waterway and nearest prominent identifiable landmark).

   5. Total length (nearest mm or smallest sub-unit on measuring instrument) and weight (nearest g or

smallest sub-unit of weight on weighing instrument). Take all measures as soon as possible with calibrated, protected instruments (e.g. from wind and upsets) and prior to freezing.

6. Sex - fish may be cut enough to allow sexing or other internal investigation, but do not eviscerate. Make any incision on the right side of the belly flap or exactly down the midline so that a left-side fillet can be removed.

D. General data collection recommendations:

1. It is helpful to use an ID or tag number that will be unique. It is best to use metal striped bass or other uniquely numbered metal tags. If uniquely numbered tags are unavailable, values based on the region, water body and year are likely to be unique: for example, R7CAY11001 for Region 7, Cayuga Lake, 2011, fish 1. If the fish are just numbered 1 through 20, we have to give them new numbers for our database, making it more difficult to trace your fish to their analytical results and creating an additional possibility for errors.

2. Process and record fish of the same species sequentially. Recording mistakes are less likely when all fish from a species are processed together. Starting with the bigger fish species helps avoid missing an individual.

3. If using Bureau of Ecosystem Health supplied tags or other numbered tags, use tags in sequence so that fish are recorded with sequential Tag Numbers. This makes data entry and login at the lab and use of the data in the future easier and reduces keypunch errors.

4. Record length and weight as soon as possible after collection and before freezing. Other data are recorded in the field upon collection. An age determination of each fish is optional, but if done, it is recorded in the appropriate “Age” column.

5. For composite samples of small fish, record the number of fish in the composite in the Remarks column. Record the length and weight of each individual in a composite. All fish in a composite sample should be of the same species and members of a composite should be visually matched for size.

6. Please submit photocopies of topographic maps or good quality navigation charts indicating sampling locations. GPS coordinates can be entered in the Location column of the collection record form in addition to or instead for providing a map. These records are of immense help to us (and hopefully you) in providing documented location records which are not dependent on memory and/or the same collection crew. In addition, they may be helpful for contaminant source trackdown and remediation/control efforts of the Department.

7. When recording data on fish measurements, it will help to ensure correct data recording for the data recorder to call back the numbers to the person making the measurements.

E. Each fish is to be placed in its own individual plastic bag. For small fish to be analyzed as a composite, put all of the fish for one composite in the same bag but use a separate bag for each composite. It is important to individually bag the fish to avoid difficulties or cross contamination when processing the fish for chemical analysis. Be sure to include the fish’s tag number inside the bag, preferably attached to the fish with the tag number turned out so it can be read. Tie or otherwise secure the bag closed. **The Bureau of Ecosystem Health will supply the bags.** If necessary, food grade bags may be procured from a suitable vendor (e.g., grocery store). It is preferable to redundantly label each bag with a manila tag tied between the knot and the body of the bag. This tag should be labeled with the project name, collection location, tag number, collection date, and fish species. If scales are collected, the scale envelope should be labeled with

the same information.

F. Groups of fish, by species, are to be placed in one large plastic bag per sampling location. **The Bureau of Ecosystem Health will supply the larger bags.** Tie or otherwise secure the bag closed. Label the site bag with a manila tag tied between the knot and the body of the bag. The tag should contain: project, collection location, collection date, species and **tag number ranges**. Having this information on the manila tag enables lab staff to know what is in the bag without opening it.

G. Do not eviscerate, fillet or otherwise dissect the fish unless specifically asked to. If evisceration or dissection is specified, the fish must be cut along the exact midline or on the right side so that the left side fillet can be removed intact at the laboratory. If filleting is specified, the procedure for taking a standard fillet (SOP PREPLAB 4) must be followed, including removing scales.

H. Special procedures for PFAS: Unlike legacy contaminants such as PCBs, which are rarely found in day to day life, PFAS are widely used and frequently encountered. Practices that avoid sample contamination are therefore necessary. While no standard practices have been established for fish, procedures for water quality sampling can provide guidance. The following practices should be used for collections when fish are to be analyzed for PFAS:

No materials containing Teflon.
No Post-it notes.
No ice packs; only water ice or dry ice.
Any gloves worn must be powder free nitrile.
No Gore-Tex or similar materials (Gore-Tex is a PFC with PFOA used in its manufacture).
No stain repellent or waterproof treated clothing; these are likely to contain PFCs.
Avoid plastic materials, other than HDPE, including clipboards and waterproof notebooks.
Wash hands after handling any food containers or packages as these may contain PFCs.
Keep pre-wrapped food containers and wrappers isolated from fish handling.
Wear clothing washed at least six times since purchase.
Wear clothing washed without fabric softener.
Staff should avoid cosmetics, moisturizers, hand creams and similar products on the day of sampling as many of these products contain PFCs (Fujii et al. 2013). Sunscreen or insect repellent should not contain ingredients with “fluor” in their name. Apply any sunscreen or insect repellent well downwind from all materials. Hands must be washed after touching any of these products.

I. All fish must be kept at a temperature <45° F (<8° C) immediately following data processing. As soon as possible, freeze at -20° C ± 5° C. Due to occasional freezer failures, daily freezer temperature logs are required. The freezer should be locked or otherwise secured to maintain chain of custody.

J. In most cases, samples should be delivered to the Analytical Services Unit at the Hale Creek field station. Coordinate delivery with field station staff and send copies of the collection records, continuity of evidence forms and freezer temperature logs to the field station. For samples to be analyzed elsewhere, non-routine collections or other questions, contact Wayne Richter, Bureau of Ecosystem Health, NYSDEC, 625 Broadway, Albany, New York 12233-4756, 518-402-8974, or the project leader about sample transfer. Samples will then be directed to the analytical facility and personnel noted on specific project descriptions.

K. A recommended equipment list is at the end of this document.

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DIVISION OF FISH AND WILDLIFE
FISH COLLECTION RECORD

Project and Site Name _____ DEC Region _____

Collections made by (include all crew) _____

Sampling Method: ☐Electrofishing ☐Gill netting ☐Trap netting ☐Trawling ☐Seining ☐Angling ☐Other _____

Preservation Method: ☐Freezing ☐Other _____ Notes (SWFDB survey number): _____

FOR LAB USE ONLY- LAB ENTRY NO.	COLLECTION OR TAG NO.	SPECIES	DATE TAKEN	LOCATION	AGE	SEX &/OR REPROD. CONDIT	LENGTH ( )	WEIGHT ( )	REMARKS

richter: revised 2011, 5/7/15, 10/4/16, 3/20/17; becker: 3/23/17, 4/26/19

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
CHAIN OF CUSTODY

I, _____, of _____ collected the
(Print Name) (Print Business Address)

following on _____, 20____ from _____
(Date) (Water Body)

in the vicinity of _____
(Landmark, Village, Road, etc.)

Town of _____, in _____ County.

Item(s) _____

_____

Said sample(s) were in my possession and handled according to standard procedures provided to me prior to collection. The sample(s) were placed in the custody of a representative of the New York State Department of Environmental Conservation on _____, 20_____.

_____ _____
Signature Date

I, _____, received the above mentioned sample(s) on the date specified and assigned identification number(s) _____ to the sample(s). I have recorded pertinent data for the sample(s) on the attached collection records. The sample(s) remained in my custody until subsequently transferred, prepared or shipped at times and on dates as attested to below.

_____ _____
Signature Date

SECOND RECIPIENT (Print Name)	TIME & DATE	PURPOSE OF TRANSFER
SIGNATURE	UNIT	
THIRD RECIPIENT (Print Name)	TIME & DATE	PURPOSE OF TRANSFER
SIGNATURE	UNIT	
FOURTH RECIPIENT (Print Name)	TIME & DATE	PURPOSE OF TRANSFER
SIGNATURE	UNIT	
RECEIVED IN LABORATORY BY (Print Name)	TIME & DATE	REMARKS
SIGNATURE	UNIT	
LOGGED IN BY (Print Name)	TIME & DATE	ACCESSION NUMBERS
SIGNATURE	UNIT	

richter: revised 21 April 2014; becker: 23 March 2017, 26 April, 2019

NOTICE OF WARRANTY

By signature to the chain of custody (reverse), the signatory warrants that the information provided is truthful and accurate to the best of his/her ability. The signatory affirms that he/she is willing to testify to those facts provided and the circumstances surrounding the same. Nothing in this warranty or chain of custody negates responsibility nor liability of the signatories for the truthfulness and accuracy of the statements provided.

HANDLING INSTRUCTIONS

On day of collection, collector(s) name(s), address(es), date, geographic location of capture (attach a copy of topographic map or navigation chart), species, number kept of each species, and description of capture vicinity (proper noun, if possible) along with name of Town and County must be indicated on reverse.

Retain organisms in manila tagged plastic bags to avoid mixing capture locations. Note appropriate information on each bag tag.

Keep samples as cool as possible. Put on ice if fish cannot be frozen within 12 hours. If fish are held more than 24 hours without freezing, they will not be retained or analyzed.

Initial recipient (either DEC or designated agent) of samples from collector(s) is responsible for obtaining and recording information on the collection record forms which will accompany the chain of custody. This person will seal the container using packing tape and writing his signature, the time and the date across the tape onto the container with indelible marker. Any time a seal is broken, for whatever purpose, the incident must be recorded on the Chain of Custody (reason, time, and date) in the purpose of transfer block. Container then is resealed using new tape and rewriting signature, with time and date.

EQUIPMENT LIST

Scale or balance of appropriate capacity for the fish to be collected.

Fish measuring board.

Plastic bags of an appropriate size for the fish to be collected and for site bags.

Individually numbered metal tags for fish.

Manila tags to label bags.

Small envelops, approximately 2” x 3.5”, if fish scales are to be collected.

Knife for removing scales.

Chain of custody and fish collection forms.

Clipboard.

Pens or markers.

Paper towels.

Dish soap and brush.

Bucket.

Cooler.

Ice.

Duct tape.

Appendix G – PFAS Analyte List

Group	Chemical Name	Abbreviation	CAS Number
Perfluoroalkyl sulfonates	Perfluorobutanesulfonic acid	PFBS	375-73-5
	Perfluorohexanesulfonic acid	PFHxS	355-46-4
	Perfluoroheptanesulfonic acid	PFHpS	375-92-8
	Perfluorooctanesulfonic acid	PFOS	1763-23-1
	Perfluorodecanesulfonic acid	PFDS	335-77-3
Perfluoroalkyl carboxylates	Perfluorobutanoic acid	PFBA	375-22-4
	Perfluoropentanoic acid	PFPeA	2706-90-3
	Perfluorohexanoic acid	PFHxA	307-24-4
	Perfluoroheptanoic acid	PFHpA	375-85-9
	Perfluorooctanoic acid	PFOA	335-67-1
	Perfluorononanoic acid	PFNA	375-95-1
	Perfluorodecanoic acid	PFDA	335-76-2
	Perfluoroundecanoic acid	PFUA/PFUdA	2058-94-8
	Perfluorododecanoic acid	PFDoA	307-55-1
	Perfluorotridecanoic acid	PFTriA/PFTrDA	72629-94-8
	Perfluorotetradecanoic acid	PFTA/PFTeDA	376-06-7
Fluorinated Telomer Sulfonates	6:2 Fluorotelomer sulfonate	6:2 FTS	27619-97-2
	8:2 Fluorotelomer sulfonate	8:2 FTS	39108-34-4
Perfluorooctane-sulfonamides	Perfluroroctanesulfonamide	FOSA	754-91-6
Perfluorooctane-sulfonamidoacetic acids	N-methyl perfluorooctanesulfonamidoacetic acid	N-MeFOSAA	2355-31-9
	N-ethyl perfluorooctanesulfonamidoacetic acid	N-EtFOSAA	2991-50-6

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

General

New York State Department of Environmental Conservation's Division of Environmental Remediation (DER) developed the following guidelines for laboratories analyzing environmental samples for PFAS under DER programs. If laboratories cannot adhere to the following guidelines, they should contact DER's Quality Assurance Officer, Dana Barbarossa, at dana.barbarossa@dec.ny.gov prior to analysis of samples.

Isotope Dilution

Isotope dilution techniques should be utilized for the analysis of PFAS in all media.

Extraction

For water samples, the entire sample bottle should be extracted, and the sample bottle rinsed with appropriate solvent to remove any residual PFAS.

For samples with high particulates, the samples should be handled in one of the following ways:

1. Spike the entire sample bottle with isotope dilution analytes (IDAs) prior to any sample manipulation. The sample can be passed through the SPE and if it clogs, record the volume that passed through.
2. If the sample contains too much sediment to attempt passing it through the SPE cartridge, the sample should be spiked with isotope dilution analytes, centrifuged and decanted.
3. If higher reporting limits are acceptable for the project, the sample can be diluted by taking a representative aliquot of the sample. If isotope dilution analytes will be diluted out of the sample, they can be added after the dilution. The sample should be homogenized prior to taking an aliquot.

If alternate sample extraction procedures are used, please contact the DER remedial program chemist prior to employing. Any deviations in sample preparation procedures should be clearly noted in the case narrative.

Signal to Noise Ratio

For all target analyte ions used for quantification, signal to noise ratio should be 3:1 or greater.

Blanks

There should be no detections in the method blanks above the reporting limits.

Ion Transitions

The ion transitions listed below should be used for the following PFAS:

PFOA	413 > 369
PFOS	499 > 80
PFHxS	399 > 80
PFBS	299 > 80
6:2 FTS	427 > 407
8:2 FTS	527 > 507
N-EtFOSAA	584 > 419
N-MeFOSAA	570 > 419

Branched and Linear Isomers

Standards containing both branched and linear isomers should be used when standards are commercially available. Currently, quantitative standards are available for PFHxS, PFOS, NMeFOSAA, and NEtFOSAA. As more standards become available, they should be incorporated in to the method. All isomer peaks present in the standard should be integrated and the areas summed. Samples should be integrated in the same manner as the standards.

Since a quantitative standard does not exist for branched isomers of PFOA, the instrument should be calibrated using just the linear isomer and a technical (qualitative) PFOA standard should be used to identify the retention time of the branched PFOA isomers in the sample. The total response of PFOA branched and linear isomers should be integrated in the samples and quantitated using the calibration curve of the linear standard.

Secondary Ion Transition Monitoring

Quantifier and qualifier ions should be monitored for all target analytes (PFBA and PFPeA are exceptions). The ratio of quantifier ion response to qualifier ion response should be calculated for each target analyte and the ratio compared to standards. Lab derived criteria should be used to determine if the ratios are acceptable.

Reporting

Detections below the reporting limit should be reported and qualified with a J qualifier.

The acid form of PFAS analytes should be reported. If the salt form of the PFAS was used as a stock standard, the measured mass should be corrected to report the acid form of the analyte.

Appendix I - 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 analytical results for projects within the Division of Environmental Remediation (DER) as well as aid in the preparation of a data usability summary report. 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 14 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 five 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%. Linear fit calibration curves should have an R^2 value greater than 0.990.

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
R^2 >0.990	J flag detects and UJ non detects
Low-level calibration check <50% or >150%	J flag detects and UJ non detects
Mid-level calibration check <70% or >130%	J flag detects and UJ non detects

Initial Calibration Verification

An initial calibration verification (ICV) standard should be from a second source (if available). The ICV should be at the same concentration as the mid-level standard of the calibration curve.

ICV recovery <70% or >130%	J flag detects and 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

Secondary Ion Transition Monitoring

Quantifier and qualifier ions should be monitored for all target analytes (PFBA and PFPeA are exceptions). The ratio of quantifier ion response to qualifier ion response should be calculated from the standards for each target analyte. Lab derived criteria should be used to determine if the ratios are acceptable. If the ratios fall outside of the laboratory criteria, qualify results as an estimated maximum concentration.

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.

Branched and Linear Isomers

Observed branched isomers in the sample that do not have a qualitative or quantitative standard should be noted and the analyte should be qualified as biased low in the final data review summary report. Note: The branched isomer peak should also be present in the secondary ion transition.

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.