458 EAST 99th STREET
KINGS COUNTY
BROOKLYN, NEW YORK

SITE MANAGEMENT PLAN

NYSDEC Site Number: C224254

Prepared for:

458 East Owners, LLC
458 East 99th Street
Brooklyn, New York 11236

Prepared by:

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Revisions to Final Approved Site Management Plan:

Revision No.	Date Submitted	Summary of Revision	NYSDEC Approval Date

FEBRUARY 2025

CERTIFICATION STATEMENT

I, Noelle M. Clarke, P.E., certify that I am currently a NYS registered professional engineer and that this Site Management 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 Green Remediation (DER-31).

_________________________ P.E.

_________________________DATE

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SITE MANAGEMENT PLAN

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List of Acronyms

AS	Air Sparging
ASP	Analytical Services Protocol
BCA	Brownfield Cleanup Agreement
BCP	Brownfield Cleanup Program
BMP	Best Management Practice
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CAMP	Community Air Monitoring Plan
C/D	Construction and Demolition
CFR	Code of Federal Regulation
CLP	Contract Laboratory Program
COC	Certificate of Completion
CO2	Carbon Dioxide
CP	Commissioner Policy
DER	Division of Environmental Remediation
DUSR	Data Usability Summary Report
EC	Engineering Control
ECL	Environmental Conservation Law
ELAP	Environmental Laboratory Approval Program
ERP	Environmental Restoration Program
EWP	Excavation Work Plan
GHG	Greenhouse Gas
GWE&T	Groundwater Extraction and Treatment
HASP	Health and Safety Plan
IC	Institutional Control
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYCRR	New York Codes, Rules and Regulations
O&M	Operation and Maintenance
OM&M	Operation, Maintenance and Monitoring
OSHA	Occupational Safety and Health Administration
OU	Operable Unit
P.E. or PE	Professional Engineer
PFAS	Per- and Polyfluoroalkyl Substances
PID	Photoionization Detector
PRP	Potentially Responsible Party
PRR	Periodic Review Report
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
QEP	Qualified Environmental Professional
RAO	Remedial Action Objective
RAWP	Remedial Action Work Plan
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RP	Remedial Party

RSO	Remedial System Optimization
SAC	State Assistance Contract
SCG	Standards, Criteria and Guidelines
SCO	Soil Cleanup Objective
SMP	Site Management Plan
SOP	Standard Operating Procedures
SOW	Statement of Work
SPDES	State Pollutant Discharge Elimination System
SSD	Sub-slab Depressurization
SVE	Soil Vapor Extraction
SVI	Soil Vapor Intrusion
TAL	Target Analyte List
TCL	Target Compound List
TCLP	Toxicity Characteristic Leachate Procedure
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank
VCA	Voluntary Cleanup Agreement
VCP	Voluntary Cleanup Program

ES EXECUTIVE SUMMARY

The following provides a brief summary of the controls implemented for the Site, as well as the inspections, monitoring, maintenance and reporting activities required by this Site Management Plan:

Site Identification:	NYSDEC BCP Site No. C224254 458 East 99th Street, Brooklyn, NY 11236
Institutional Controls:	1. The property may be used for commercial use;
	2. All ECs must be operated and maintained as specified in this SMP.
	3. All ECs must be inspected at a frequency and in a manner defined in the SMP.
	4. The use of groundwater underlying the property is prohibited without necessary water quality treatment as determined by the New York State Department of Health (NYSDOH) or the New York City Department of Environmental Protection (NYCDEP) to render it safe for use as drinking water or for industrial purposes, and the user must first notify and obtain written approval to do so from the Department.
	5. Data and information pertinent to Site management must be reported at the frequency and in a manner as defined in this SMP.
	6. All future activities that will disturb remaining contaminated material must be conducted in accordance with this SMP.
	7. Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in this SMP.
	8. Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical component of the remedy shall be performed as defined in this SMP.

Site Identification:	NYSDEC BCP Site No. C224254 458 East 99th Street, Brooklyn, NY 11236
	9. Access to the Site must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice to the property owner to assure compliance with the restrictions identified by the Environmental Easement.
	10. Vegetable gardens and farming on the Site are prohibited.
	11. An evaluation shall be performed to determine the need for further investigation and remediation should large scale redevelopment occur, if any of the existing structures are demolished, or if the subsurface is otherwise made accessible.
Engineering Controls:	1. Sub-Slab Depressurization System (SSDS) / Soil Vapor Extraction System (SVES)

Inspections:	Frequency
1. Site-Wide Inspection	Annually
2. SSDS/SVES Visual Inspection	Quarterly
Monitoring:	
1. Routine SSDS/SVES Detailed Operation Inspection	Quarterly (sub-slab monitoring point vacuum readings)
2. Soil Vapor Intrusion Sampling	Upon request to shut down the SSDS/SVES
Maintenance:	
1. Routine SSDS/SVES Detailed Operation Inspection	Quarterly
2. Non-Routine SSDS/SVES Detailed Operation Inspection	As needed

Site Identification: NYSDEC BCP Site No. C224254
458 East 99th Street, Brooklyn, NY 11236

Reporting:	
1. SSDS/SVES Operating Log	Quarterly Operating Log provided Annually in the Periodic Review Report
2. Periodic Review Report	First report 16 months after COC is issued, then annually, or as determined by NYSDEC

Further descriptions of the above requirements are provided in detail in the latter sections of this Site Management Plan.

1.0 INTRODUCTION

1.1 General

This Site Management Plan (SMP) is a required element of the remedial program for the 458 East 99th Street Site located in Brooklyn, New York (hereinafter referred to as the "Site"). See Figure 1. The Site is currently in the New York State (NYS) Brownfield Cleanup Program (BCP), Site No. C224254, which is administered by New York State Department of Environmental Conservation (NYSDEC or Department).

The previous remedial party, 458 East 99th Street LLC, entered into a Brownfield Cleanup Agreement (BCA) on April 2, 2020 with the NYSDEC to remediate the site. An amendment to substitute a new Remedial Party, 458 East Owners, LLC, for the previous Remedial Party was executed on March 1, 2023. A figure showing the site location and boundaries of this site is provided in Figure 2. The boundaries of the site are more fully described in the metes and bounds site description that is part of the Environmental Easement provided in Appendix A.

After completion of the remedial work, some contamination was left at this site, which is hereafter referred to as "remaining contamination". Institutional and Engineering Controls (ICs and ECs) have been incorporated into the site remedy to control exposure to remaining contamination to ensure protection of public health and the environment. An Environmental Easement granted to the NYSDEC, and recorded with the Kings County Clerk, requires compliance with this SMP and all ECs and ICs placed on the site.

This SMP was prepared to manage remaining contamination at the site until the Environmental Easement is extinguished in accordance with ECL Article 71, Title 36. This plan has been approved by the NYSDEC, and compliance with this plan is required by the grantor of the Environmental Easement and the grantor's successors and assigns. This SMP may only be revised with the approval of the NYSDEC.

It is important to note that:

- This SMP details the site-specific implementation procedures that are required by the Environmental Easement. Failure to properly implement the SMP is a violation of the Environmental Easement, which is grounds for revocation of the Certificate of Completion (COC); and
- Failure to comply with this SMP is also a violation of Environmental Conservation Law, 6 NYCRR Part 375 and the BCA (Index #C224254-01-20; Site #C224254) for the site, and thereby subject to applicable penalties.

All reports associated with the site can be viewed by contacting the NYSDEC or its successor agency managing environmental issues in New York State. A list of contacts for persons involved with the site is provided in Appendix B of this SMP.

This SMP was prepared by Roux Environmental Engineering and Geology, D.P.C. (Roux), on behalf of 458 East Owners, LLC, in accordance with the requirements of the NYSDEC's DER-10 ("Technical Guidance for Site Investigation and Remediation"), dated May 2010 (updated April 2019), and the guidelines provided by the NYSDEC. This SMP addresses the means for implementing the ICs and/or ECs that are required by the Environmental Easement for the site.

1.2 Revisions and Alterations

Revisions and alterations to this plan will be proposed in writing to the NYSDEC's project manager. The NYSDEC can also make changes to the SMP or request revisions from the remedial party. Revisions will be necessary upon, but not limited to, the following occurring: a change in media monitoring requirements, upgrades to or shutdown of a remedial system, post-remedial removal of contaminated sediment or soil, or other significant change to the site conditions. All approved alterations must conform with Article 145 Section 7209 of the Education Law regarding the application of professional seals and alterations. For example, any changes to as-built drawings must be stamped by a New York State Professional Engineer. In accordance with the Environmental Easement for the site, the NYSDEC project manager will provide a notice of any approved changes to the SMP, and append these notices to the SMP that is retained in its files.

1.3 Notifications

Notifications will be submitted by the property owner to the NYSDEC, as needed, in accordance with NYSDEC's DER – 10 for the following reasons:

1. 60-day advance notice of any proposed changes in site use that are required under the terms of the BCA, 6 NYCRR Part 375 and/or Environmental Conservation Law.
2. 7-day advance notice of any field activity associated with the remedial program.
3. 15-day advance notice of any proposed ground-intrusive activity pursuant to the Excavation Work Plan. If the ground-intrusive activity qualifies as a change of use as defined in 6 NYCRR Part 375, the above mentioned 60-day advance notice is also required.
4. Notice within 48 hours of any damage or defect to the foundation, structures or EC that reduces or has the potential to reduce the effectiveness of an EC, and likewise, any action to be taken to mitigate the damage or defect.
5. Notice within 48 hours of any non-routine maintenance activities.
6. Verbal notice by noon of the following day of any emergency, such as a fire; flood; or earthquake that reduces or has the potential to reduce the effectiveness of ECs in place at the site, with written confirmation within 7 days that includes a summary of actions taken, or to be taken, and the potential impact to the environment and the public.
7. Follow-up status reports on actions taken to respond to any emergency event requiring ongoing responsive action submitted to the NYSDEC within 45 days describing and documenting actions taken to restore the effectiveness of the ECs.

Any change in the ownership of the site or the responsibility for implementing this SMP will include the following notifications:

1. At least 60 days prior to the change, the NYSDEC will be notified in writing of the proposed change. This will include a certification that the prospective purchaser/Remedial Party has been provided with a copy of the BCA, and all approved work plans and reports, including this SMP.

2. Within 15 days after the transfer of all or part of the site, the new owner's name, contact representative, and contact information will be confirmed in writing to the NYSDEC.

Table 1 on the following page includes contact information for the above notifications. The information on this table will be updated as necessary to provide accurate contact information. A full listing of site-related contact information is provided in Appendix B.

Table 1: Notifications*

Name	**Contact Information**	**Required Notification****
Marlen Salazar NYSDEC Project Manager	(718) 482-7129 marlen.salazar@dec.ny.gov	All Notifications
Cris-Sandra Maycock NYSDEC Project Manager's Supervisor	(XXX) XXX-XXXX cris-sandra.maycock@dec.ny.gov	All Notifications
Kelly Lewandowski NYSDEC Site Control	(518) 402-9569 kelly.lewandowski@dec.ny.gov	Notifications 1 and 8
Aaron Keegan NYSDOH Project Manager	(XXX) XXX-XXXX aaron.keegan@health.ny.gov	Notifications 4, 6, and 7

* Note: Notifications are subject to change and will be updated as necessary.

** Note: Numbers in this column reference the numbered bullets in the notification list in this section.

2.0 SUMMARY OF PREVIOUS INVESTIGATIONS AND REMEDIAL ACTIONS

2.1 Site Location and Description

The site is located in Brooklyn, Kings County, New York and is identified as Block 8131 and Lot 56 on the Kings County Tax Map (see Figure 2). The site is an approximately 0.14-acre area and the immediate surrounding area is occupied by commercial, industrial, and manufacturing businesses including a printing shop, an automobile repair shop, iron works, etc. The Site is directly bounded by East 99th Street to the east, and manufacturing businesses immediately to the north, south and west (see Figure 2 – Site Layout Map). The boundaries of the site are more fully described in Appendix A –Environmental Easement. The owner/operator of the site parcel(s) at the time of issuance of this SMP is/are:

458 East Owners, LLC; owner contact Wolfgang Michelitsch

2.2 Physical Setting

2.2.1 Land Use

The Site consists of the following: a one-story masonry and steel office/woodworking shop/warehouse building, with on grade concrete slab covering approximately 5,000 square feet of the Site. An approximately 10-foot-wide concrete alley covers the remaining 1,000 square feet of the Site. No structures are present in the alley. The Site is zoned M1-1 Industrial and Manufacturing and is currently utilized as an active woodworking shop.

The properties adjoining the Site and in the neighborhood surrounding the Site immediately to the north, east, south and west primarily include a mix of commercial, industrial and manufacturing properties.

2.2.2 Geology

A review of the United States Geological Survey (USGS) Central Park, New York 7.5-minute series topographic quadrangle map and Site-specific survey indicated that the topography of the Site and surrounding area slopes gently to the southeast toward Jamaica Bay. The elevation of the Site is approximately 15 feet referenced to North American Vertical Datum of 1988 (NAVD 88).

Based on the previous environmental reports and investigations completed by Roux and other consultants, the Site is generally underlain by fill (consisting of sand, gravel, brick, concrete) to depths ranging from 0.5 to 4 feet below land surface (ft bls). Fill materials overlie native fine to coarse sand with some gravel and silt. Light to dark grey organic-rich silt were observed at several locations at depths of approximately 10 to 15 ft bls once the groundwater table was encountered between 9 to 11 ft bls.

Site specific boring logs are provided in Appendix C.

2.2.3 Hydrogeology

According to the water-level data collected during the remedial investigation (RI) in November 2021, the elevation of the water table surface at the Site ranges from 4.86 ft NAVD 88 at GW-4D located in the northeast portion of Site to approximately 4.98 ft NAVD 88 at GW-6D located in the southeastern portion of the Site. Based on the surface elevation of the Site, groundwater depth ranged from 8.90 ft bls to 9.98 ft bls. The gradient of groundwater is generally flat across Site, but it is presumed, based on topography, that the groundwater flows east-southeasterly towards Jamaica Bay.

A groundwater flow map is shown in Figure 3. Groundwater elevation data is provided in Table 2. Groundwater monitoring well construction logs are provided in Appendix C.

2.3 Investigation and Remedial History

The following narrative provides a remedial history timeline and a brief summary of the available project records to document key investigative and remedial milestones for the Site. Full titles for each of the reports referenced below are provided in Section 8.0 – References.

Based on a review of previous environmental reports and documentation, including historic Sanborn Fire Insurance Maps, the Site was undeveloped vacant land prior to construction of the existing one-story building in 1952 that remains present today. A variety of operations, including Abe's Radio, Bagels by Bell, and Pinnacle Lift of NY, have occupied the Site since construction of the existing building. Notably, historical records for the Site revealed that the building was occupied from 1966 through 1973 by a dry-cleaning chemical warehousing operation.

The following environmental investigations that have been performed at the Site are discussed in detail in the sections below.

- Phase I Environmental Site Assessment (ESA), prepared by Middleton Environmental, Inc. (Middleton), dated January 19, 2012.
- Phase I ESA, prepared by EFI Global, Inc (EFI), dated May 18, 2016.
- Phase II Limited Subsurface Investigation Report, prepared by EFI, dated June 14, 2016.
- Limited Soil Vapor Intrusion Investigation, prepared by Long Island Analytical Laboratories (LIAL), performed on December 28, 2016.
- Remedial Investigation Report (RIR)/Remedial Action Work Plan (RAWP) prepared by Roux, dated June 29, 2023.

2.3.1 Phase I ESA – Middelton, January 19, 2012

Middleton completed a Phase I ESA for the Site in 2012 and reported that there was no evidence of recognized environmental conditions (RECs) in connection with the Site, no evidence of the presence or possible presence of contaminated substances that could indicate a historical release, and that no further investigation (subsurface or otherwise) was warranted.

2.3.2 Phase I ESA – EFI, May 18, 2016

EFI completed a Phase I ESA in 2016 as part of the due diligence process to facilitate a real estate transaction. The following RECs are summarized below:

- Historical records identified that the Site was occupied by a dry-cleaning chemicals warehouse from at least 1966 through at least 1973. It is not known if chlorinated solvents were stored (or spilled) at the Site.
- Building records identified an oil burner application for the Site dated 1952. No further details regarding former on-Site fuel oil storage was provided and it is possible that an underground storage tank (UST) was previously used at the Site.

EFI also identified the following related condition of concern:

- Based on the 1952 date of construction, building materials may contain asbestos. The suspect asbestos-containing materials (ACM) consist of non-friable floor tile mastic and wallboard assemblies; and friable drop acoustical ceiling tiles. In addition, although not observed, roofing materials are suspected to contain ACM. According to the EPA, while suspect or ACM may be managed in place under an operations and maintenance program, sampling would be required to document the presence or absence of ACM.

2.3.3 Phase II Limited Subsurface Investigation Report – EFI, June 14, 2016

EFI was commissioned to conduct a Phase II limited subsurface investigation to assess adverse impacts to the environmental quality of the Site because of the RECs identified in their Phase I ESA. The investigation included assessment of sub-slab soil formations and groundwater at three selected and presumed up and down gradient locations on the Site. The results of investigative efforts and laboratory analysis of the acquired soil (see samples SB-1 through SB-3) and groundwater (see samples GW-1 through GW-3), which were analyzed solely for volatile organic compounds (VOCs) by EPA Method 8260, revealed the following:

1. The Site is blanketed by approximately 1 foot of brown/black fill material, which is in turn underlain by brown medium to fine sand to the deepest depths investigated, i.e., 12 feet below grade surface (bgs).

2. The observed depth to groundwater, at the time of the investigation, was 11 feet bgs.
3. VOCs were not detected in soil sample SB-1 based on field screening with a photoionization detector (PID); detectable VOC concentrations on the PID were present in soil samples SB-2 and SB-3, ranging between 0.1 and 0.9 parts per million (ppm).
4. Concentrations of selected VOC constituents in soil samples SB-1 through SB-3, all of which were below their respective unrestricted use, protection of groundwater, residential, and commercial soil cleanup objectives as defined by NYSDEC 6 New York Code of Rules and Regulations (NYCRR) Part 375.
5. Concentrations of selected VOC constituents in groundwater samples GW-1 through GW-3 were below their respective NYSDEC Class GA Ambient Water Quality Standards and Guidance Values (AWQSGVs) defined in NYSDEC 6NYCRR Part 703 with the exception of: (i) tetrachloroethene (PCE) in groundwater samples GW-1, GW-2, and GW-3; and (ii) 1,1-dichloroethane (1,1- DCA), and cis-1,2-dichloroethene (cis-1,2-DCE) in groundwater sample GW-3.

The source of the identified impacts to the groundwater beneath the Site could not be attributed to overlying soil formations in the areas investigated. Nevertheless, EFI concluded that the source for the marginally compromised groundwater condition was likely Site-specific. Notably, EFI's investigation did not include assessment of soil vapor intrusion concerns associated with historic land usage or identified VOC impacts to the groundwater beneath the Site.

2.3.4 Limited Soil Vapor Intrusion Investigation – LIAL, December 28, 2016

LIAL of Holbrook, NY was commissioned to conduct a soil vapor intrusion assessment at the Site during December 2016. The noted assessment, conducted in general conformance with the New York State Department of Health (NYSDOH) "Guidance for Evaluating Soil Vapor Intrusion in the State of New York," dated October 2006, included collection and laboratory analysis of sub-slab soil vapor, corresponding indoor air, and outside ambient air samples for VOC analysis by United State Environmental Protection Agency (USEPA) Method TO-15. The results of that investigation revealed the following:

a. All targeted VOC constituents in indoor and outside (control) air samples were below their respective air guidance values.

b. A comparison of the acquired sub-slab sample with the corresponding indoor air sample, utilizing the decision-making matrices appended to the NYSDOH guidance document, mandated the following actions:

1. PCE and Trichloroethene (TCE) – Mitigate***
2. Methylene chloride (CH_2Cl_2) – Monitor***
3. Carbon Tetrachloride (CT) – No Action
4. 1,1,1-Trichloroethane (1,1,1-TCA) – No Action
5. Vinyl chloride (VC) – No Action
6. 1,1-dichlorethene (1,1-DCE) – No Action
7. Cis-1,2-DCE – No Action

***The detected concentrations of CH_2Cl_2, PCE, and TCE were below NYSDOH Indoor Air Guidance values.

2.3.5 RIR/RAWP – Roux, June 29, 2023

Roux completed the RI in accordance with the Remedial Investigation Work Plan (RIWP), prepared by Roux, dated June 29, 2023. Environmental data collected during the 2021 RI was used to delineate the nature and extent of contamination on-Site and to qualitatively assess the potential exposure of receptors to Site contaminants. Using the findings of the prior investigations, the preliminary Areas of Concern (AOCs) that were investigated were the presence of VOCs (namely chlorinated volatile organic compounds [CVOCs]) in groundwater and sub-slab soil vapor. The completed RI included the advancement of three soil borings (collection of nine soil samples), the installation of ten permanent groundwater monitoring wells (collection of ten groundwater samples), and installation of five temporary soil vapor points (collection of five soil vapor samples, five co-located indoor air samples, and one outdoor sample).

Soil samples were analyzed for VOCs, SVOCs, Pesticides, PCBs, Metals, and Emerging Contaminants (21 Per- and Polyfluoroalkyl Substances [PFAS] and 1-4-dioxane) in accordance with the NYSDEC June 2021 Groundwater Sampling for Emerging Contaminants Guidance. Groundwater samples were analyzed for VOCs, SVOCs, Metals, and Emerging Contaminants. Soil vapor samples were analyzed for VOCs. The findings of the RI are summarized in the sections below.

Groundwater Level Conditions

According to water-level data collected on November 18, 2021, the elevation of the water table surface at the Site ranged from 4.86 ft NAVD 88 at GW-4D to 4.98 ft NAVD 88 at GW-6D, which equates to a groundwater depth of 8.90 ft bls to 9.98 ft bls. The gradient of groundwater is generally flat across the Site, but it is presumed, based on topography, that the groundwater flows southeast towards Jamaica Bay.

Soil Conditions

The nine soil samples collected were compared to the following NYSDEC Subpart 375-6 Soil Cleanup Objectives (SCOs) to evaluate Site-wide soil quality and determine the contamination in soil, if present:

- NYSDEC Unrestricted Use SCOs (UUSCOs);
- NYSDEC Commercial SCOs (CSCOs); and
- NYSDEC Protection of Groundwater SCOs (PGWSCOs).

Three of the nine soil samples had detections exceeding the NYSDEC UUSCOs, CSCOs and/or PGWSCOs for one or more parameters. Sample B-4 (0.5-2.5 feet bgs) exceeded the UUSCO and PGWSCO for PCE and of the UUSCO for Lead. Sample B-4 (10-12 feet bgs) exceeded the UUSCO for Arsenic. Sample B-6 (0.5-2.5 feet bgs) exceeded the UUSCOs for 4,4’-DDE and 4,4’ DDT. There were no exceedances of SVOCs, PCBs, or PFAS in any of the samples. Laboratory analytical data are provided in Tables 3 through 8. Soil boring locations with soil sample exceedances are shown in Figure 4.

Groundwater Conditions

The ten groundwater samples were compared to NYSDEC AWQSGVs for Class GA groundwater to evaluate groundwater quality and to determine the contamination in groundwater, if present. Nine of the ten groundwater samples had detections above the NYSDEC AWQSGVs for one or more parameters.

VOCs were detected above the AWQSGVs at all wells except GW-5D. The VOCs detected above AWQSGVs include 1,1,1-TCA, 1,1-Dichloroethane (1,1-DCA), 1,1-DCE, 1,2-Dichloroethane (1,2-DCA), Chloroethane, Cis-1,2-DCE, PCE, TCE and VC.

One or more total metals exceeded AWQSGVs at all wells. These included Iron, Manganese, Sodium and Lead. Lead was only detected at GW-8S.

One or more dissolved metals exceeded AWQSGVs at all wells. These included Iron, Manganese, and Sodium. PFAS compounds Perfluorooctanesulfonic Acid (PFOS) and/or Perfluorooctanoic Acid (PFOA) exceeded AWQSGVs at all wells except GW-7D. None of the samples contained exceedances of SVOCs.

Data Evaluation

Analytes that exceeded NYSDEC PGWSCOs in Site-wide soil were compared to analyte detections in Site-wide groundwater to assess whether, and to what extent, constituents detected in soil are impacting groundwater quality. The data indicated that VOCs in on-Site soil are not a source of the observed groundwater contamination as the soil exceedances do not correlate with the groundwater contamination. Since the concentrations of CVOCs are generally higher in the deep wells and on the upgradient side of the property, there is likely an off-Site source of groundwater contamination. Metals detected above AWQSGVs are primarily naturally occurring. Some metals detected in soil at concentrations above NYSDEC UUSCOs were not detected above PGWSCOs, indicating that the metal in soil is not a source of groundwater contamination at the Site. PFAS was detected only in groundwater and there is no documented use of PFAS at the Site or known historical Site use. Therefore, PFAS concentrations are likely due to background levels of these compounds in New York City, or are indicative of a potential off-Site source. Laboratory analytical data generated from groundwater is summarized in Tables 9 through 12. Groundwater monitoring well locations with groundwater exceedances are shown in Figure 5.

Soil Vapor Conditions

A total of five soil vapor samples, one duplicate soil vapor sample, five indoor air samples, and one outdoor air sample were collected during the 2021 RI. Analytical data for soil vapor VOCs indicated there were detections of 35 different VOCs across the Site. Laboratory analytical data is summarized in Table 13. Soil vapor sample detections are shown in Figure 6. The following chlorinated compounds are discussed because they are included in the NYSDOH Guidance in effect at the time the RIR/RAWP was approved (additional compounds have since been added):

<u>Matrix A Compounds</u>

- TCE was detected in five soil vapor samples, ranging in concentration from 25 to 440 J (estimated value) micrograms per cubic meter (µg/m3), with a maximum detection in soil vapor sample SSSV-4. TCE was not detected in indoor or outdoor air samples. Following the NYSDOH Guidance Matrices, the soil vapor concentration of TCE exceeds the NYSDOH Guidance Matrix A value of 60 µg/m3 and mitigation is recommended.
- Carbon tetrachloride was detected in four soil vapor samples, ranging in concentration from 0.83 J to 30 µg/m3, with a maximum detection in soil vapor sample SSSV-3, in five indoor air samples ranging in concentration from 0.37 to 0.44 µg/m3, with a maximum detection in indoor air sample IA-3, and in the outdoor air sample OA-1 at a concentration of 0.39 µg/m3. Following the NYSDOH Guidance Matrix A values, these concentrations recommend monitoring.
- 1,1-DCE was not detected in any samples.
- Cis-1,2-DCE was detected in one soil vapor sample, at a concentration of 3.7 J µg/m3, at SSSV-4. Following the NYSDOH Guidance Matrix A values, no further action (NFA) is recommended.

<u>Matrix B Compounds</u>

- Methylene chloride was detected in four soil vapor samples, ranging in concentration from 0.61 J to 16 J µg/m3, with a maximum detection in soil vapor sample SSSV-4, in five indoor air samples ranging in concentration from 2 to 8.8 µg/m3, with a maximum detection in indoor air sample IA-3, and in the outdoor air sample OA-1 at a concentration of 1.6 J µg/m3. Following the NYSDOH Guidance Matrix B values, these concentrations recommend NFA.
- PCE was detected in five soil vapor samples, ranging in concentration from 300 D (dilution value) to 16,000 J µg/m3, with a maximum detection in soil

vapor sample SSSV-4, in five indoor air samples ranging in concentration from 2.1 to 3.9 µg/m3, with a maximum detection in indoor air sample IA-1, and in the outdoor air sample OA-1 at a concentration of 0.22 J µg/m3. The soil vapor concentration of PCE exceeds the NYSDOH Guidance Matrix B value of 100 µg/m3 as well as some of the indoor air sample concentrations (Matrix B value of 3-10 µg/m3) and mitigation is recommended.

- 1,1,1-TCA was detected in four soil vapor samples, ranging in concentration from 2 J µg/m3 to 61 µg/m3, with a maximum detection in soil vapor sample SSSV-2. Following the NYSDOH Guidance Matrix B values, NFA is recommended.

<u>Matrix C Compound</u>

- Vinyl chloride was not detected in any samples.

In addition to the NYSDOH matrices compounds discussed above, it should be noted that various chemicals to support the commercial woodworking operations on-Site were being stored on-Site and are used frequently. The presence and frequent use of these chemicals likely contributed to some of the VOC detections in the indoor air samples, most notably sample IA-2. A chemical inventory was performed as part of this RI and the NYSDOH questionnaire and inventory list are supplied in Appendix G of the RIR/RAWP.

<u>Matrix D Compounds</u>

- 1,2,4-Trimethylbenzene was detected in two soil vapor samples, ranging in concentration from 0.64 J to 1 J µg/m3, with a maximum detection in soil vapor sample SSSV-2, in five indoor air samples ranging in concentration from 0.82 J to 2.3 µg/m3, with a maximum detection in indoor air sample IA-2, and in the outdoor air sample OA-1 at a concentration of 0.35 J µg/m3. Following the NYSDOH Guidance Matrix D values, NFA is recommended.
- 1,3,5-Trimethylbenzene was detected in two soil vapor samples, ranging in concentration from 0.22 J to 0.35 J µg/m3, with a maximum detection in soil vapor sample SSSV-2, in five indoor air samples ranging in concentration from 0.3 J to 0.78 J µg/m3, with a maximum detection in indoor air sample IA-2. Following NYSDOH Guidance Matrix D values, NFA is recommended.
- Isooctane was detected in two soil vapor samples, ranging in concentration from 0.4 J to 1.2 µg/m3, with a maximum detection in soil vapor sample SSSV-2, in five indoor air samples ranging in concentration from 0.39 J to 0.47 J µg/m3, with maximum detections in indoor air samples IA-3 and IA-4, and in the outdoor air sample OA-1 at a concentration of 0.46 J µg/m3. Following the NYSDOH Guidance Matrix D values, NFA is recommended.

- Benzene was detected in two soil vapor samples, both concentrations were 0.44 J µg/m3, with detections in soil vapor samples SSSV-2 and SSSV-5, in five indoor air samples ranging in concentration from 0.48 J to 0.6 J µg/m3, with a maximum detection in indoor air sample IA-2, and in the outdoor air sample OA-1 at a concentration of 0.46 J µg/m3. Following the NYSDOH Guidance Matrix D values, NFA is recommended.
- Cyclohexane was detected in four soil vapor samples, ranging in concentration from 0.16 J to 2.9 J µg/m3, with a maximum detection in soil vapor sample SSSV-4, in five indoor air samples ranging in concentration from 0.2 J to 0.89 µg/m3, with a maximum detection in indoor air sample IA-3, and in the outdoor air sample OA-1 at a concentration of 0.16 J µg/m3. Following the NYSDOH Guidance Matrix D values, NFA is recommended.
- Ethylbenzene was detected in two soil vapor samples, ranging in concentration from 0.9 to 1.6 µg/m3, with a maximum detection in soil vapor sample SSSV-2, in five indoor air samples ranging in concentration from 0.51 J to 2.4 µg/m3, with a maximum detection in indoor air sample IA-2. Following the NYSDOH Guidance Matrix D values, NFA is recommended.
- Naphthalene was not detected in any samples.
- O-Xylene was detected in two soil vapor samples, ranging in concentration from 0.96 to 1.3 µg/m3, with a maximum detection in soil vapor sample SSSV-2, in five indoor air samples ranging in concentration from 0.61 J to 2.8 µg/m3, with a maximum detection in indoor air sample IA-2. Following the NYSDOH Guidance Matrix D values, NFA is recommended.

Matrix E Compounds

- m,p-Xylene was detected in three soil vapor samples, ranging in concentration from 3.7 to 6.7 µg/m3, with a maximum detection in soil vapor sample SSSV-2, in five indoor air samples ranging in concentration from 2.1 J to 11 µg/m3, with a maximum detection in indoor air sample IA-2, and in the outdoor air sample OA-1 at a concentration of 1.3 J µg/m3. Following the NYSDOH Guidance Matrix E values, NFA is recommended.
- Heptane was detected in two soil vapor samples, ranging in concentration from 0.41 J to 1.2 µg/m3, with a maximum detection in soil vapor sample SSSV-2, in four indoor air samples ranging in concentration from 0.45 J to 0.61 J µg/m3, with a maximum detection in indoor air sample IA-2. Following the NYSDOH Guidance Matrix E values, NFA is recommended.
- Hexane was detected in four soil vapor samples, ranging in concentration from 1.1 J to 10 J µg/m3, with a maximum detection in soil vapor sample SSSV-4, in five indoor air samples ranging in concentration from 1 J to 5.1 µg/m3, with a maximum detection in indoor air sample IA-3, and in the outdoor air sample OA-1 at a concentration of 1 J µg/m3. Following the NYSDOH Guidance Matrix E values, NFA is recommended.

Matrix F Compounds

- Toluene was detected in five soil vapor samples, ranging in concentration from 12 to 46 µg/m3, with a maximum detection in soil vapor sample SSSV-2, in five indoor air samples ranging in concentration from 7.1 to 46 µg/m3, with a maximum detection in indoor air sample IA-2, and in the outdoor air sample OA-1 at a concentration of 3.7 µg/m3. Following the NYSDOH Guidance Matrix F values, NFA is recommended.

Placeholder for Soil Vapor Data to be collected in 1Q 2025.

2.4 Remedial Action Objectives

The Remedial Action Objectives (RAOs) for the Site as listed in the Decision Document dated July 14, 2023 are as follows:

Groundwater

RAOs for Public Health Protection

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

RAOs for Environmental Protection

- Remove the source of ground or surface water contamination.

Soil

RAOs for Public Health Protection

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

RAOs for Environmental Protection

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

Soil Vapor

RAOs for Public Health Protection

- Mitigate impacts to public health resulting from existing, or the potential for, soil vapor intrusion into buildings at a site.

2.5 Remaining Contamination

2.5.1 Soil

After the Remedial Action, there were no exceedances of CSCOs and therefore a Site Cover System was not required as part of the remedy. One SVE point was installed along the north side of the property (SVE-1) to address the area where PCE exceeding UUSCOs/PGWSCOs was found in shallow soil. RI sampling indicated that soil did exceed UUSCOs but detections were below their respective CSCOs by multiple orders of magnitude, in most cases, and Site soil was left in place with the exception of the areas that were excavated as part of the SSDS/SVES installation.

Tables 3 through 8 and Figure 4 summarize the results of all soil samples collected that exceed the SCOs after completion of remedial action.

2.5.2 Groundwater

As discussed in section 2.3 all wells except GW-5D exceeded AWQSGVs for VOCs, all wells exceeded AWQSGVs for metals (total and dissolved) and all wells except GW-7D exceeded AWQSGVs for PFAS. No direct link to an on-Site release of VOCs was identified and it does not appear an on-Site source is directly impacting the groundwater quality. There is no plan for any groundwater sampling as groundwater RAOs were met through the installation of the SSDS/SVES.

Tables 9 through 12 and Figure 5 summarize the results of all samples of groundwater that exceed the SCGs prior to completion of the remedial action.

2.5.3 Soil Vapor

As discussed in section 2.3, several VOCs were detected in soil vapor samples during the 2021 RI. Specifically, there were TCE and PCE levels at five soil vapor points that required mitigation based on the NYSDOH matrices. The mitigation of the potential for soil vapor intrusion through installation and operation of an active SSDS/SVES system within the building will prevent future exposure to soil vapor.

Table 13 and Figure 6 summarize the results of all samples of soil vapor that exceed the SCGs after completion of the remedial action.

3.0 INSTITUTIONAL AND ENGINEERING CONTROL PLAN

3.1 General

Since remaining contamination exists at the site, Institutional Controls (ICs) and Engineering Controls (ECs) are required to protect human health and the environment. This IC/EC Plan describes the procedures for the implementation and management of all IC/ECs at the site. The IC/EC Plan is one component of the SMP and is subject to revision by the NYSDEC project manager.

This plan provides:

- A description of all IC/ECs on the site;
- The basic implementation and intended role of each IC/EC;
- A description of the key components of the ICs set forth in the Environmental Easement;
- A description of the controls to be evaluated during each required inspection and periodic review;
- A description of plans and procedures to be followed for implementation of IC/ECs, such as the implementation of the Excavation Work Plan (EWP) (as provided in Appendix I) for the proper handling of remaining contamination that may be disturbed during maintenance or redevelopment work on the site; and
- Any other provisions necessary to identify or establish methods for implementing the IC/ECs required by the site remedy, as determined by the NYSDEC project manager.

3.2 Institutional Controls

A series of ICs is required by the Decision Document to: (1) implement, maintain and monitor Engineering Control systems; (2) prevent future exposure to remaining contamination; and (3) limit the use and development of the site to commercial (or industrial) uses only. Adherence to these ICs on the site is required by the Environmental

Easement and will be implemented under this SMP. ICs identified in the Environmental Easement may not be discontinued without an amendment to or extinguishment of the Environmental Easement. The IC boundaries are shown on Figure 2. These ICs are:

- The property may be used for: commercial (or industrial) use;
- All ECs must be operated and maintained as specified in this SMP;
- All ECs must be inspected at a frequency and in a manner defined in the SMP;
- The use of groundwater underlying the property is prohibited without necessary water quality treatment as determined by the Environmental Easement, NYSDOH or the New York City Department of Health and Mental Hygiene to render it safe for use as drinking water or for industrial purposes, and the user must first notify and obtain written approval to do so from the Department;
- Groundwater and other environmental or public health monitoring, if any, must be performed as defined in this SMP;
- Data and information pertinent to site management must be reported at the frequency and in a manner as defined in this SMP;
- All future activities that will disturb remaining contaminated material must be conducted in accordance with this SMP;
- Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in this SMP;
- Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical component of the remedy shall be performed as defined in this SMP;
- Access to the site must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice to the property owner to assure compliance with the restrictions identified by the Environmental Easement;
- The potential for vapor intrusion must be evaluated for any new buildings (excluding the existing building) developed in the area within the IC boundaries noted on Figure 2, and any potential impacts that are identified must be monitored or mitigated;
- Vegetable gardens and farming on the site are prohibited; and

3.3 Engineering Controls

3.3.1 Sub-slab Depressurization System /Soil Vapor Extraction System

The SSDS/SVES components were installed immediately beneath the building foundation slab near the four corners of the building interior.

The SSDS/SVES includes a network of trenches of 4-inch perforated polyvinyl chloride (PVC) piping within 4-foot-wide gravel bedding trenches wrapped in filter fabric. There are a total of four areas where SSDS/SVES components were installed; three SSDS suction pits located near the southwest, southeast, and northeast corners of the Site and one SVE point located in the northern portion of the building around where soil boring B-4, which had PCE concentrations in soil exceeding UUSCOS and PGWSCOs, was completed during the 2021 RI. Each trench transitions to solid PVC piping that runs horizontally below grade towards the respective building perimeter where the piping is then routed vertically and transitions to 4-inch cast iron riser piping extending to the roof. The exhaust point on the roof extends a minimum of four feet above the roof line and is located a minimum of ten feet from the property boundary or building air intakes (i.e., HVAC). The riser connected to the three SSDS suction pits each have a dedicated in-line fan (RadonAway #GX5A In-Line Fan) and the riser connected to the SVE point has a dedicated in-line fan (RadonAway #HS2750 In-Line Fan). A larger fan was used for the SVE point in order to remove potential source material from the area with PCE in soil at concentrations above PGWSCOs. VOC contamination sorbed into the soil is transferred to the vapor phase and is removed by the SVE blower. The fans will operate continuously. Three sub-slab monitoring points were installed to monitor effectiveness of the SSDS/SVES on a periodic basis described herein. Start up and system performance verification procedure are described in Section 5.3.1.

Procedures for operating and maintaining the SSDS/SVES are documented in the Operation and Maintenance Plan (Section 5.0 of this SMP). As-built drawings, signed and sealed by a PE who is licensed and registered in New York State, are included in Appendix

E – SSDS/SVES As-Built and Component Manual. Figure 7 shows the location of the ECs for the site.

3.3.2 Criteria for Completion of Remediation/Termination of Remedial Systems

Generally, remedial processes are considered completed when monitoring indicates that the remedy has achieved the remedial action objectives identified by the decision document. The framework for determining when remedial processes are complete is provided in Section 6.4 of NYSDEC DER-10. Unless waived by the NYSDEC, confirmation samples of applicable environmental media are required before terminating any remedial actions at the site. Confirmation samples require Category B deliverables and a Data Usability Summary Report (DUSR).

The remedial party will also conduct any needed site restoration activities, such as asphalt patching and decommissioning treatment system equipment. Also, the remedial party will ensure that no ongoing erosion is occurring on the site.

3.3.3.1 – Sub-Slab Depressurization System/Soil Vapor Extraction System

The SSDS/SVES will not be discontinued unless prior written approval is granted by the NYSDEC and the NYSDOH project managers. If monitoring data indicates that the SSDS/SVES may no longer be required, a proposal to discontinue the SSDS/SVES will be submitted by the remedial party to the NYSDEC and NYSDOH project managers.

4.0 MONITORING AND SAMPLING PLAN

4.1 General

This Monitoring and Sampling Plan describes the measures for evaluating the overall performance and effectiveness of the remedy. This Monitoring and Sampling Plan may only be revised with the approval of the NYSDEC project manager. Details regarding the sampling procedures, data quality usability objectives, analytical methods, etc. for all samples collected as part of site management for the site are included in the Quality Assurance Project Plan provided in Appendix F.

This Monitoring and Sampling Plan describes the methods to be used for:

- Sampling and analysis of all appropriate media (e.g., groundwater, indoor air, soil vapor, soils);
- Assessing compliance with applicable NYSDEC SCGs; and
- Evaluating site information periodically to confirm that the remedy continues to be effective in protecting public health and the environment;

To adequately address these issues, this Monitoring and Sampling Plan provides information on:

- Sampling locations, protocol and frequency;
- Information on all designed monitoring systems;
- Analytical sampling program requirements;
- Inspection and maintenance requirements for monitoring wells; and
- Annual inspection and periodic certification.

Reporting requirements are provided in Section 7.0 of this SMP.

4.2 Site – wide Inspection

Site-wide inspections will be performed on an annual basis. These periodic inspections must be conducted when the ground surface is visible (i.e. no snow cover). Site-wide inspections will be performed by a Professional Engineer (PE) who is licensed and registered in New York State, or a qualified person who directly reports to a PE who is licensed and registered in New York State. Modification to the frequency or duration of the inspections will require approval from the NYSDEC project manager. Site-wide inspections will also be performed after all severe weather conditions that may affect ECs or monitoring devices. During these inspections, an inspection form will be completed as provided in Appendix G – Site Management Forms. The form will compile sufficient information to assess the following:

- Compliance with all ICs, including site usage;
- An evaluation of the condition and continued effectiveness of ECs;
- General site conditions at the time of the inspection;
- The site management activities being conducted including, where appropriate, confirmation sampling and a health and safety inspection; and
- Confirm that site records are up to date.

Inspections of all remedial components installed at the site will be conducted. A comprehensive site-wide inspection will be conducted and documented according to the SMP schedule, regardless of the frequency of the Periodic Review Report. The inspections will determine and document the following:

- Whether ECs continue to perform as designed;
- If these controls continue to be protective of human health and the environment;
- Compliance with requirements of this SMP and the Environmental Easement;
- Achievement of remedial performance criteria; and
- If site records are complete and up to date.

Reporting requirements are outlined in Section 7.0 of this plan.

Inspections will also be performed in the event of an emergency. If an emergency, such as a natural disaster or an unforeseen failure of any of the ECs occurs that reduces or has the potential to reduce the effectiveness of ECs in place at the site, verbal notice to the NYSDEC project manager must be given by noon of the following day. In addition, an inspection of the site will be conducted within 5 days of the event to verify the effectiveness of the IC/ECs implemented at the site by a qualified environmental professional, as defined in 6 NYCCR Part 375. Written confirmation must be provided to the NYSDEC project manager within 7 days of the event that includes a summary of actions taken, or to be taken, and the potential impact to the environment and the public. The remedial party will submit follow-up status reports to the NYSDEC within 45 days of the event on actions taken to respond to any emergency event requiring ongoing responsive action, describing and documenting actions taken to restore the effectiveness of the ECs.

4.3 Treatment System Monitoring and Sampling

4.3.1 SSDS/SVES Monitoring

Monitoring of the SSDS/SVES will be performed on a routine basis, as identified in Table 15 Remedial System Monitoring Requirements and Schedule (see below). The monitoring of remedial systems must be conducted by a Professional Engineer (PE) who is licensed and registered in New York State, or a qualified person who directly reports to a PE who is licensed and registered in New York State. Modification to the frequency or sampling requirements will require approval from the NYSDEC project manager. A visual inspection of the complete system will be conducted during each monitoring event. Unscheduled inspections and/or sampling may take place when a suspected failure of the SSDS/SVES has been reported or an emergency occurs that is deemed likely to affect the operation of the system. SSDS/SVES components to be monitored include, but are not limited to, the components included in Table 15 below.

Table 15 – Remedial System Monitoring Requirements and Schedule

SSDS/SVES Component	Monitoring Parameter	Operating Range	Monitoring Schedule
Vapor Monitoring Points	Pressure	< -0.004 inches of water column (in. w.c.)	Quarterly
SSDS/SVES Riser Sample Ports	Pressure	< -3 in. w.c.	Quarterly
Exposed Piping, Fans, Appurtenances	Visual Inspection	N/A	Quarterly

A complete list of components to be inspected is provided in the Inspection Checklist, provided in Appendix G – Site Management Forms. If any equipment readings are not within their specified operation range, any equipment is observed to be malfunctioning or the system is not performing within specifications; maintenance and repair, as per the Operation and Maintenance Plan, is required immediately.

4.3.2 SSDS/SVES Sampling

Samples were collected on July 22, 2024 from the effluent of the SSDS/SVES after startup to determine if treatment is necessary. Each effluent discharge stack was sampled for VOCs via EPA Method TO-15 and assessed in accordance with the Guidance on Air Emissions of VOCs at DER Remediation Sites prepared by the DER and the Division of Air Resources (DAR). Sampling results indicated that treatment is not required. Sampling results and analysis are provided in the FER.

Detailed sample collection and analytical procedures and protocols are provided in Appendix G – Quality Assurance Project Plan.

4.3.3 Soil Vapor Intrusion Sampling

Soil vapor intrusion sampling, including concurrent sampling of soil vapor and indoor air at collocated monitoring points and an ambient outdoor air sample, will be conducted:

- upon request to shut down the SSDS/SVES

Modification to the frequency or sampling requirements will require approval from the NYSDEC project manager.

The network of on-site sub-slab soil vapor intrusion sample locations, which is comprised of three sub-slab vapor monitoring points, and collocated indoor air sample locations has been designed based on the soil vapor sample results obtained during the RI (biased toward the highest levels of contamination observed) and spaced throughout the existing Site building. The sub-slab vapor monitoring point locations and typical details are shown in the as-built drawing located in Appendix E.

The sampling frequency may only be modified with the approval of the NYSDEC project manager. This SMP will be modified to reflect changes in sampling plans approved by the NYSDEC project manager.

Deliverables for the soil vapor intrusion sampling program are specified in Section 7.0 – Reporting Requirements.

4.3.4 Monitoring and Sampling Protocol

All sampling activities will be recorded in a field book and associated sampling log as provided in Appendix G – Site Management Forms. Other observations (e.g., soil vapor monitoring point integrity) will be noted on the sampling log. The sampling log will serve as the inspection form for the monitoring network. Additional detail regarding monitoring and sampling protocols are provided in the site-specific Field Activities Plan provided as Appendix F of this document.

5.0 OPERATION AND MAINTENANCE PLAN

5.1 General

This Operation and Maintenance Plan provides a brief description of the measures necessary to operate, monitor and maintain the mechanical components of the remedy selected for the site. This Operation and Maintenance Plan:

- Includes the procedures necessary to allow individuals unfamiliar with the site to operate and maintain the SSDS/SVES;
- Will be updated periodically to reflect changes in site conditions or the manner in which the SSDS/SVES are operated and maintained.

Further detail regarding the Operation and Maintenance of the SSDS/SVES is provided in Appendix E – SSDS/SVES As-Built and Component Manual and Appendix H – Site Management Forms. A copy of the relevant SSDS/SVES specifications and troubleshooting information, along with the complete SMP, is to be maintained at the site. These specifications are not to be used as a stand-alone document, but as a component document of this SMP.

5.2 Remedial System (or other Engineering Control) Performance Criteria

The SSDS in-line fan assemblies each include a RadonAway Model #GX5A in-line fan and the SVES in-line fan assembly includes a RadonAway Model #HS2750 in-line Fan. All assemblies are equipped with a protective fan guard and condensate bypass to reduce the potential for weather damage to occur. The fans will operate continuously and each riser is equipped with a vacuum indicator alarm providing for notification of a shut-down incident to the Owner. The SSDS will provide vacuum influence below the building slab that will be monitored quarterly at the sub-slab vapor monitoring points using a micro-manometer to ensure a pressure of -0.004 in. w.c. (vacuum) or less is achieved.

5.3 Operation and Maintenance of the SSDS/SVES

The following sections provide a description of the operations and maintenance of SSDS/SVES. Cut-sheets and as-built drawings for SSDS/SVES are provided in Appendix E – SSDS/SVES As-Built and Component Manual.

5.3.1 System Start-Up and Testing

On June 11, 2024, the SSDS/SVES in-line fan assemblies were installed as per the manufacturer's recommendations (Appendix E) and were tested during start-up. In order to verify the effectiveness of the SSDS/SVES at mitigating soil vapor intrusion, post-mitigation vacuum monitoring at the soil vapor monitoring points was performed to verify that the extent of the building footprint is depressurized, as described below. The SSDS/SVES verification was performed during startup and will continue quarterly to assess the performance of the remedy.

During the start-up testing, the soil vapor monitoring points were used to confirm the presence of sub-slab vacuum. The soil vapor monitoring points were checked with a micromanometer to confirm the SSDS is operating properly (i.e., maintaining a pressure of -0.004 in. w.c. or less). Results of monitoring point pressure tests indicated that all three monitoring points achieved a pressure of -0.004 in. w.c. or less.

Monitoring Point	Pressure (in. w.c.) on June 11, 2024	Comment
SV-1	-0.658	Located in northeast section of building, in between SVE-1 and SP-1
SV-2	-0.079	Located in center of building, around equidistant from SP-1, SP-2, SP-3, and SVE-1.
SV-3	-1.240	Located in southwest section of building, in between SP-2 and SP-3

Effluent air samples were collected from the SSDS/SVES riser sample ports on July 22, 2024, and were analyzed by Eurofins TestAmerica in Burlington, Vermont for TO-15 analysis and results indicated concentrations of VOCs. Results were evaluated in accordance with "Guidance on Air Emissions of VOCs at DER Remediation Sites" developed by the DER and the DAR and were compared to the Part 212-2.2 Table 2 High Toxicity Air Contaminant (HTAC) Mass Emission List. Per the DER/DAR analysis, the estimated contamination emissions rates are below HTAC values, therefore soil vapor treatment is not required prior to discharge.

Analytical data collected from the effluent, the DER/DAR air emissions analysis, a photograph log of observations made during the SSDS installation, start-up testing, and the SSDS start-up testing log (including vacuum testing results), are also provided in Appendix E.

The system testing described above will be conducted if, in the course of the SSDS/SVES lifetime, the system goes down or significant changes are proposed/made to the system and the system must be restarted.

5.3.2 Routine System Operation and Maintenance

The routine maintenance activities include quarterly visual inspections, operating data collection (quarterly monitoring point vacuum measurements) and general maintenance. In the field, special attention will be paid to the condition of the in-line fans and appurtenances, and the above slab discharge piping and supports. The connections around the blower fans should be verified to be tight and leak-free. Special attention should be given to any unusual or excessive noise or vibrations from the piping and in-line fans. The piping and valves will be inspected for leaks. The Owner/building occupants will report any alarm conditions that may occur between routine visits to the Engineer of Record.

All equipment maintenance will be performed in accordance with the manufacturer's instructions located in Appendix E.

Table 16 provides a summary and schedule of routine maintenance.

Table 16 – Monitoring, Inspection, and Sampling and Schedule

Monitoring Program	Frequency*
Site-Wide Inspection	Annually. First inspection no more than 15 months after issuance of the COC. After emergencies (e.g. fire or flood) and after a severe weather event.
SSDS/SVES Visual Inspection	Quarterly
Routine SSDS/SVES Detailed Operation Inspection	Quarterly SSDS/SVES vacuum measurements at sub-slab monitoring points and riser sampling ports.
Non-Routine SSDS/SVES Detailed Operation Inspection	As needed for troubleshooting, following manufacturer's specifications. After an alarm condition is noted by the Owner/building occupants.
Soil Vapor Intrusion Sampling	One event upon request to shut down the SSDS/SVES.

* The frequency of events will be conducted as specified above until otherwise approved by NYSDEC and NYSDOH.

5.3.3 Non-Routine Operation and Maintenance

Non-Routine operation and maintenance will occur on an as needed basis based on the condition of the systems (e.g., alarm condition, damage from weather event or otherwise, age of the system, etc.). All troubleshooting and repairs will be performed in accordance with the manufacturer's specifications.

5.3.4 System Monitoring Devices and Alarms

The SSDS/SVES has a warning device to indicate that the system is not operating properly. In the event that warning device is activated, the Owner/building occupants will notify the Engineer of Record and applicable maintenance and repairs will be conducted, as specified in the manufacturer's recommendations, and the SSDS/SVES will be restarted. Operational problems will be noted in the Periodic Review Report to be prepared for that reporting period.

6.0 PERIODIC ASSESSMENTS/EVALUATIONS

6.1 Climate Change Vulnerability Assessment

Increases in both the severity and frequency of storms/weather events, an increase in sea level elevations along with accompanying flooding impacts, shifting precipitation patterns and wide temperature fluctuation, resulting from global climactic change and instability, have the potential to significantly impact the performance, effectiveness and protectiveness of a given site and associated remedial systems. Vulnerability assessments provide information so that the site and associated remedial systems are prepared for the impacts of the increasing frequency and intensity of severe storms/weather events and associated flooding.

This section provides a current vulnerability assessment that evaluates the vulnerability of the site and/or engineering controls to severe storms/weather events and associated flooding. This section also identifies vulnerability assessment updates that will be conducted for the site in Periodic Review Reports.

Since the building at the Site encompasses coverage of the majority of the property and a concrete alley covers the remainder of the property, most potential areas of vulnerabilities can be considered little to no risk.

- Flood Plain: Site is located within a FEMA Zone X (Area of Minimal Flood Hazard), and therefore the Site has little to no risk.
- Site Drainage and Storm Water Management: Site is covered entirely by the building or the concrete alley to the north and is connected to NYC sewer system, and therefore the Site has little to no risk.
- Erosion: Site is covered entirely by the building or concrete alley and will have no areas susceptible to erosion, and therefore the Site has little to no risk.
- High Wind: Site is covered entirely by building or concrete alley and will have no areas abnormally susceptible to damage from wind or falling objects, and therefore the Site has little to no risk.
- Electricity: Site is covered almost entirely by the building in accordance with NYC Building Code and will have typical susceptibility to infrequent power loss, dips or surges, and therefore the Site has little to no risk.

- Spill/Contaminant Release: Site is covered entirely by the building or concrete slab in accordance with NYC Building Code and will have no areas abnormally susceptible to spills or containment release due to storm-related damage caused by flooding, erosion, high winds or loss of power, and therefore the Site has little to no risk.
- Wildfires: The immediate area surrounding the Site is not wooded and therefore the Site has little to no risk.

6.2 Green Remediation Evaluation

NYSDEC's DER-31 Green Remediation requires that green remediation concepts and techniques be considered during all stages of the remedial program including site management, with the goal of improving the sustainability of the cleanup and summarizing the net environmental benefit of any implemented green technology. This section provides an environmental footprint analysis of the remedy, as implemented at the time of this SMP. This section of the SMP also provides a summary of green remediation evaluations to be completed for the site during site management and reported in Periodic Review Reports (PRRs).

Green remediation principles and techniques were implemented to the extent feasible in the design, implementation, and Site management of the remedy per DER-31. The primary green remediation principles that were incorporated into the Site's remediation, to the degree possible, are as follows:

a. Consideration of the environmental impacts of treatment technologies and remedy stewardship over the long term;

b. Reduction of direct and indirect greenhouse gases and other emissions;

c. Increase in energy efficiency and minimizing use of non-renewable energy;

d. Conservation and efficient management of resources and materials;

e. Reduction of waste and increase in recycling and reuse of materials, which would otherwise be considered a waste;

f. Integration of the remedy with the end use where possible and encouragement of green and sustainable re-development.

Discussion and Measurement of Environmental Impacts

The remedial actions incorporated green sustainable remediation measures, such as:

- Appropriately sized in-line fans were designed and installed for the SSDS/SVES that will require minimal electrical current to operate continuously.
- Post start-up sampling confirmed that the emissions were within the acceptable range.
- The construction crew carpooled to the Site to save on greenhouse gas emissions.

6.2.1 Timing of Green Remediation Evaluations

For major remedial system components, green remediation evaluations and corresponding modifications will be undertaken as part of a formal Remedial System Optimization (RSO), or at any time that the NYSDEC project manager feels appropriate, (e.g., during significant maintenance events or in conjunction with storm recovery activities).

Modifications resulting from green remediation evaluations will be routinely implemented and scheduled to occur during planned/routine operation and maintenance activities after approval from the DER project manager. Reporting of these modifications will be presented in the PRR.

6.2.2 Remedial Systems

Remedial systems will be operated properly considering the current site conditions to conserve materials and resources to the greatest extent possible. Appropriately sized in-line fans were designed and installed for the SSDS/SVES that will require minimal electrical current to operate continuously. Spent materials will be sent for recycling, as appropriate.

6.2.3 Building Operations

Structures including buildings and sheds will be operated and maintained to provide for the most efficient operation of the remedy, while minimizing energy, waste generation and water consumption.

6.2.4 Frequency of System Checks, Sampling and Other Periodic Activities

Transportation to and from the Site, use of consumables in relation to visiting the Site in order to conduct system checks and/or collect samples, and shipping samples to a laboratory for analyses have direct and/or inherent energy costs. The schedule and/or means of these periodic activities have been prepared so that these tasks can be accomplished in a manner that does not impact remedy protectiveness but reduces expenditure of energy or resources.

6.3 Remedial System Optimization

A Remedial System Optimization (RSO) study will be conducted any time that the NYSDEC project manager or the remedial party requests in writing that an in-depth evaluation of the remedy is needed. An RSO may be appropriate if any of the following occur:

- The remedial actions have not met or are not expected to meet RAOs in the time frame estimated in the Decision Document;
- The management and operation of the remedial system is exceeding the estimated costs;
- The remedial system is not performing as expected or as designed;
- Previously unidentified source material may be suspected;
- Plume shift has potentially occurred;
- Site conditions change due to development, change of use, change in groundwater use, etc.;

- There is an anticipated transfer of the site management to another remedial party or agency; and
- A new and applicable remedial technology becomes available.

An RSO will provide a critique of a site's conceptual model, give a summary of past performance, document current cleanup practices, summarize progress made toward the site's cleanup goals, gather additional performance or media specific data and information and provide recommendations for improvements to enhance the ability of the present system to reach RAOs or to provide a basis for changing the remedial strategy.

The RSO study will focus on overall site cleanup strategy, process optimization and management with the intent of identifying impediments to cleanup and improvements to site operations to increase efficiency, cost effectiveness and remedial time frames. Green remediation technology and principals are to be considered when performing the RSO.

7.0. REPORTING REQUIREMENTS

7.1 Site Management Reports

All site management inspection, maintenance and monitoring events will be recorded on the appropriate site management forms provided in Appendix G. These forms are subject to NYSDEC revision. All site management inspection, maintenance, and monitoring events will be conducted by a Professional Engineer (PE) who is licensed and registered in New York State, or a qualified person who directly reports to a PE who is licensed and registered in New York State.

All applicable inspection forms and other records, including media sampling data and system maintenance reports, generated for the site during the reporting period will be provided in electronic format to the NYSDEC in accordance with the requirements of Table 17 and summarized in the Periodic Review Report.

Table 17: Schedule of Interim Monitoring/Inspection Reports

Task/Report	**Reporting Frequency***
SSDS/SVES Visual Inspection	Quarterly (to be included in the Periodic Review Report)
Routine SSDS/SVES Detailed Operation Inspection	Quarterly (to be included in the Periodic Review Report)
Periodic Review Report	Annually, or as otherwise determined by the NYSDEC

* The frequency of events will be conducted as specified until otherwise approved by the NYSDEC project manager.

All interim monitoring/inspections reports will include, at a minimum:

- Date of event or reporting period;
- Name, company, and position of person(s) conducting monitoring/inspection activities;
- Description of the activities performed;

- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents noted (included either on the checklist/form or on an attached sheet);
- Type of samples collected (e.g., sub-slab vapor, indoor air, outdoor air);
- Copies of all field forms completed (e.g., well sampling logs, chain-of-custody documentation);
- Sampling results in comparison to appropriate standards/criteria;
- A figure illustrating sample type and sampling locations;
- Copies of all laboratory data sheets and the required laboratory data deliverables required for all points sampled (to be submitted electronically in the NYSDEC-identified format);
- Any observations, conclusions, or recommendations; and
- A determination as to whether contaminant conditions have changed since the last reporting event.

Routine maintenance event reporting forms will include, at a minimum:

- Date of event;
- Name, company, and position of person(s) conducting maintenance activities;
- Description of maintenance activities performed;
- Any modifications to the system;
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents noted (included either on the checklist/form or on an attached sheet); and
- Other documentation such as copies of invoices for maintenance work, receipts for replacement equipment, etc., (attached to the checklist/form).

Non-routine maintenance event reporting forms will include, at a minimum:

- Date of event;
- Name, company, and position of person(s) conducting non-routine maintenance/repair activities;
- Description of non-routine activities performed;

- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents (included either on the form or on an attached sheet); and
- Other documentation such as copies of invoices for repair work, receipts for replacement equipment, etc. (attached to the checklist/form).

Data will be reported in digital format as determined by the NYSDEC. Currently, data is to be supplied electronically and submitted to the NYSDEC EQuIS™ database in accordance with the requirements found at this link http://www.dec.ny.gov/chemical/62440.html.

7.2 Periodic Review Report

A Periodic Review Report (PRR) will be submitted to the NYSDEC project manager beginning sixteen (16) months after the Certificate of Completion is issued. After submittal of the initial Periodic Review Report, the next PRR shall be submitted annually to the NYSDEC project manager or at another frequency as may be required by the NYSDEC project manager. In the event that the site is subdivided into separate parcels with different ownership, a single Periodic Review Report will be prepared that addresses the site described in Appendix A -Environmental Easement. The report will be prepared in accordance with NYSDEC's DER-10 and submitted within 30 days of the end of each certification period. Media sampling results will also be incorporated into the Periodic Review Report. The report will include:

- Identification, assessment and certification of all ECs/ICs required by the remedy for the site.
- Results of the required annual site inspections, fire inspections and severe condition inspections, if applicable.
- Description of any change of use, import of materials, or excavation that occurred during the certifying period.
- All applicable site management forms and other records generated for the site during the reporting period in the NYSDEC-approved electronic format, if not previously submitted.

- Identification of any wastes generated during the reporting period, along with waste characterization data, manifests, and disposal documentation.

- A summary of any discharge monitoring data and/or information generated during the reporting period, with comments and conclusions.

- Data summary tables and graphical representations of contaminants of concern by media soil vapor, indoor air, etc.), which include a listing of all compounds analyzed, along with the applicable standards, with all exceedances highlighted. These tables and figures will include a presentation of past data as part of an evaluation of contaminant concentration trends, including but not limited to:
  - O&M data summary tables;
- Results of all analyses, copies of all laboratory data sheets, and the required laboratory data deliverables for all samples collected during the reporting period will be submitted in digital format as determined by the NYSDEC. Currently, data is supplied electronically and submitted to the NYSDEC EQuIS^{TM} database in accordance with the requirements found at this link: http://www.dec.ny.gov/chemical/62440.html.

- A site evaluation, which includes the following:

  - The compliance of the remedy with the requirements of the site-specific Decision Document;

  - The operation and the effectiveness of all treatment units, etc., including identification of any needed repairs or modifications;

  - Any new conclusions or observations regarding site contamination based on inspections or data generated by the Monitoring and Sampling Plan for the media being monitored;

  - Recommendations regarding any necessary changes to the remedy and/or Monitoring and Sampling Plan;

  - An update to the climate change vulnerability assessment if site or external conditions have changed since the previous assessment, and recommendations to address vulnerabilities.

  - A summary of the Green Remediation evaluation, including a quantitative and qualitative overview of a site's environmental impacts and recommendations to improve the remedy’s environmental footprint will be provided if requested by the NYSDEC. The PRR will include the completed Summary of Green Remediation Metrics form if requested by the NYSDEC.

  - The overall performance and effectiveness of the remedy.

- A performance summary for all treatment systems at the site during the calendar year, including information such as:
  - The number of days the system operated for the reporting period;
  - A description of breakdowns and/or repairs along with an explanation for any significant downtime;
  - A description of the resolution of performance problems;
  - Alarm conditions;
  - Trends in equipment failure;
  - A summary of the performance, effluent and/or effectiveness monitoring; and
  - Comments, conclusions, and recommendations based on data evaluation. Recommendations must address how receptors would be impacted. Recommendations can include:
    - Proposals to address efficiency and costs such as: instituting remote operation, system changes to decrease maintenance costs and downtime, and system changes to decrease energy use; and
    - Proposals to modify or shut down a treatment system due to remediation completion, system performance or changed conditions. System shutdowns are addressed in Section 6.4 of DER-10.

7.2.1 Certification of Institutional and Engineering Controls

Following the last inspection of the reporting period, a Professional Engineer licensed to practice and registered in New York State will prepare, and include in the Periodic Review Report, the following certification as per the requirements of NYSDEC DER-10:

"For each institutional or engineering control identified for the site, I certify that all of the following statements are true:

- *The inspection of the site to confirm the effectiveness of the institutional and engineering controls required by the remedial program was performed under my direction;*

- *The institutional control and/or engineering control employed at this site is unchanged from the date the control was put in place, or last approved by the Department;*
- *Nothing has occurred that would impair the ability of the control to protect the public health and environment;*
- *Nothing has occurred that would constitute a violation or failure to comply with any site management plan for this control;*
- *Access to the site will continue to be provided to the Department to evaluate the remedy, including access to evaluate the continued maintenance of this control;*
- *If a financial assurance mechanism is required under the oversight document for the site, the mechanism remains valid and sufficient for the intended purpose under the document;*
- *Use of the site is compliant with the environmental easement;*
- *The engineering control systems are performing as designed and are effective;*
- *To the best of my knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the site remedial program and generally accepted engineering practices; and*
- *The information presented in this report is accurate and complete.*

I certify that all information and statements in this certification form are true. I understand that a false statement made herein is punishable as a Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law. I, [name], of [business address], am certifying as [Owner/Remedial Party or Owner's/Remedial Party's Designated Site Representative]."

"I certify that the New York State Education Department has granted a Certificate of Authorization to provide Professional Engineering services to the firm that prepared this Periodic Review Report."

- For BCP projects, every five years the following certification will be added: *The assumptions made in the qualitative exposure assessment remain valid.*

The signed certification will be included in the Periodic Review Report.

The Periodic Review Report will be submitted, in electronic format, to the NYSDEC project manager and the NYSDOH project manager. The Periodic Review Report may also need to be submitted in hard-copy format if requested by the NYSDEC project manager.

7.3 Corrective Measures Work Plan

If any component of the remedy is found to have failed, or if the periodic certification cannot be provided due to the failure of an institutional or engineering control or failure to conduct site management activities, a Corrective Measures Work Plan will be submitted to the NYSDEC project manager for approval. This plan will explain the failure and provide the details and schedule for performing work necessary to correct the failure. Unless an emergency condition exists, no work will be performed pursuant to the Corrective Measures Work Plan until it has been approved by the NYSDEC project manager.

7.4 Remedial System Optimization Report

If an RSO is to be performed (see Section 6.3), upon completion of an RSO, an RSO report must be submitted to the NYSDEC project manager for approval. A general outline for the RSO report is provided in Appendix J. The RSO report will document the research/ investigation and data gathering that was conducted, evaluate the results and facts obtained, present a revised conceptual site model and present recommendations. RSO recommendations are to be implemented upon approval from the NYSDEC. Additional work plans, design documents, HASPs etc., may still be required to implement the recommendations, based upon the actions that need to be taken. A final engineering report and update to the SMP may also be required.

The RSO report will be submitted, in electronic format, to the NYSDEC project manager and the NYSDOH project manager.

8.0 REFERENCES

6 NYCRR Part 375, Environmental Remediation Programs. December 14, 2006.

NYSDEC DER-10 – “Technical Guidance for Site Investigation and Remediation”. May 3, 2010, updated April 9, 2019.

NYSDEC, 1998. Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1. June 1998 (April 2000 addendum).

Limited Soil Vapor Intrusion Investigation, prepared by Long Island Analytical Laboratories, dated December 28, 2016.

NYSDOH, Guidance for Evaluating Soil Vapor Intrusion in the State of New York, October 2006, updated May 2017, updated February 2024.

Phase I ESA prepared by Middleton, dated January 19, 2012.

Phase I ESA prepared by EF, dated May 18, 2016.

Phase II Limited Subsurface Investigation Report prepared by EFI, dated June 14, 2016.

RIWP prepared by Roux, dated August 27, 2021.

RIR/RAWP by Roux, dated June 29, 2023.

TABLES

Table 2. Groundwater Gauging Data, 458 East 99th Street, Brooklyn, New York

Monitoring Well Identification	Measurement Date	Measuring Point Elevation (feet NAVD 88)	Depth to Water (feet below measuring point)
GW-4S	11/18/2021	13.99	9.05
GW-4D	11/18/2021	13.94	9.08
GW-5S	11/18/2021	14.87	9.98
GW-5D	11/18/2021	14.81	9.94
GW-6S	11/18/2021	13.81	8.90
GW-6D	11/18/2021	13.92	8.94
GW-7S	11/18/2021	13.93	8.98
GW-7D	11/18/2021	13.90	8.95
GW-8S	11/18/2021	14.24	9.30
GW-8D	11/18/2021	14.13	9.27

Notes:

NAVD 1988 - North American Vertical Datum of 1988

Notes Utilized Throughout Tables

Soil Tables

J - Estimated value
U - Indicates that the compound was analyzed for but not detected
P - The RPD between the results for the two columns exceeds the method-specified criteria
RPD - Relative Percent Difference
T - Indicates that a quality control parameter has exceeded laboratory limits
ft bls - Feet below land surface
FD - Duplicate sample
µg/kg - Micrograms per kilogram
mg/kg - Milligrams per kilogram
NYSDEC - New York State Department of Environmental Conservation
SCO - Soil Cleanup Objectives
-- No SCO available
Bold data indicates that parameter was detected above the NYSDEC Part 375 Unrestricted Use SCO
Shaded data indicates that parameter was detected above the NYSDEC Part 375 Commercial SCO
Red data indicates that parameter was detected above the NYSDEC Part 375 Protection of Groundwater SCO

Per- and Polyfluoroalkyl Substances

GV - Guidance Values
Bold data indicates that parameter exceeded the NYSDEC Unrestricted Use Guidance Values
Shaded data indicates that parameter exceeded the NYSDEC Commercial Guidance Values
Red data indicates that parameter exceeded the NYSDEC Protection of Groundwater Guidance Values
Undetected results reflect Minimum Detection Limits

Groundwater Tables

J - Estimated Value
U - Compound was analyzed for but not detected
D - A secondary analysis after dilution due to exceedance of the calibration range in the original sample.
T - Indicates that a quality control parameter has exceeded laboratory limits
EMPC - The results do not meet all criteria for a confirmed identification. The quantitative value represents the Estimated Maximum Possible Concentration of the analyte in the sample
FD - Duplicate
µg/L - Micrograms per liter
NYSDEC - New York State Department of Environmental Conservation
AWQSGVs - Ambient Water-Quality Standards and Guidance Values
-- No NYSDEC AWQSGV available
Bold data indicates that parameter was detected above the NYSDEC AWQSGVs

Notes Utilized Throughout Tables	
Soil Vapor/Ambient Air	
J -	Estimated value
U -	Indicates that the compound was analyzed for but not detected
D -	Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte
T -	Indicates that a quality control parameter has exceeded laboratory limits
FD -	Duplicate sample
ug/m^3 -	Micrograms per cubic meter
Bold data indicates that parameter was detected	

Table 3. Summary of Volatile Organic Compounds in Soil, 458 East 99th Street, Brooklyn, New York

				Sample Designation:	B-4	B-4	B-4
				Sample Date:	10/09/2021	10/09/2021	10/09/2021
				Sample Depth (ft bls):	0.5 - 2.5	10 - 12	23 - 25
				Normal Sample or Field Duplicate:	N	N	N
Parameters	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units			
1,1,1-Trichloroethane (TCA)	0.68	500	0.68	MG/KG	0.13 U	0.0012 U	0.0015 U
1,1,2,2-Tetrachloroethane	--	--	--	MG/KG	0.13 U	0.0012 U	0.0015 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	MG/KG	0.13 U	0.0012 U	0.0015 U
1,1,2-Trichloroethane	--	--	--	MG/KG	0.13 U	0.0012 U	0.0015 U
1,1-Dichloroethane	0.27	240	0.27	MG/KG	0.13 U	0.0012 U	0.0015 U
1,1-Dichloroethene	0.33	500	0.33	MG/KG	0.13 U	0.0012 U	0.0015 U
1,2,3-Trichlorobenzene	--	--	--	MG/KG	0.13 UT	0.0012 U	0.0015 U
1,2,4-Trichlorobenzene	--	--	--	MG/KG	0.13 UT	0.0012 U	0.0015 U
1,2-Dibromo-3-Chloropropane	--	--	--	MG/KG	0.13 U	0.0012 U	0.0015 U
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	MG/KG	0.13 U	0.0012 U	0.0015 U
1,2-Dichlorobenzene	1.1	500	1.1	MG/KG	0.13 U	0.0012 U	0.0015 U
1,2-Dichloroethane	0.02	30	0.02	MG/KG	0.13 U	0.0012 U	0.0015 U
1,2-Dichloropropane	--	--	--	MG/KG	0.13 U	0.0012 U	0.0015 U
1,3-Dichlorobenzene	2.4	280	2.4	MG/KG	0.13 U	0.0012 U	0.0015 U
1,4-Dichlorobenzene	1.8	130	1.8	MG/KG	0.13 U	0.0012 U	0.0015 U
2-Hexanone	--	--	--	MG/KG	0.65 U	0.0061 U	0.0073 U
Acetone	0.05	500	0.05	MG/KG	0.65 U	0.031	0.011
Benzene	0.06	44	0.06	MG/KG	0.13 U	0.0012 U	0.0015 U
Bromochloromethane	--	--	--	MG/KG	0.13 U	0.0012 U	0.0015 U
Bromodichloromethane	--	--	--	MG/KG	0.13 U	0.0012 U	0.0015 U
Bromoform	--	--	--	MG/KG	0.13 U	0.0012 U	0.0015 U
Bromomethane	--	--	--	MG/KG	0.13 U	0.0024 U	0.0029 U
Carbon Disulfide	--	--	--	MG/KG	0.13 U	0.0012 U	0.0015 U
Carbon Tetrachloride	0.76	22	0.76	MG/KG	0.13 U	0.0012 U	0.0015 U
Chlorobenzene	1.1	500	1.1	MG/KG	0.13 U	0.0012 U	0.0015 U
Chloroethane	--	--	--	MG/KG	0.13 U	0.0012 U	0.0015 U
Chloroform	0.37	350	0.37	MG/KG	0.13 U	0.0012 U	0.0015 U
Chloromethane	--	--	--	MG/KG	0.13 U	0.0012 U	0.0015 U
Cis-1,2-Dichloroethylene	0.25	500	0.25	MG/KG	0.13 U	0.0012 U	0.0015 U
Cis-1,3-Dichloropropene	--	--	--	MG/KG	0.13 U	0.0012 U	0.0015 U
Cyclohexane	--	--	--	MG/KG	0.13 U	0.0012 U	0.0015 U
Dibromochloromethane	--	--	--	MG/KG	0.13 U	0.0012 U	0.0015 U

Table 3. Summary of Volatile Organic Compounds in Soil, 458 East 99th Street, Brooklyn, New York

				Sample Designation:	**B-4**	**B-4**	**B-4**
				Sample Date:	**10/09/2021**	**10/09/2021**	**10/09/2021**
				Sample Depth (ft bls):	**0.5 - 2.5**	**10 - 12**	**23 - 25**
				Normal Sample or Field Duplicate:	**N**	**N**	**N**
Parameters	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units			
Dichlorodifluoromethane	--	--	--	MG/KG	0.13 U	0.0012 U	0.0015 U
Ethylbenzene	1	390	1	MG/KG	0.13 U	0.0012 U	0.0015 U
Isopropylbenzene (Cumene)	--	--	--	MG/KG	0.13 U	0.0012 U	0.0015 U
m,p-Xylene	--	--	--	MG/KG	0.17	0.0012 U	0.0015 U
Methyl Acetate	--	--	--	MG/KG	0.65 U	0.0061 U	0.0073 U
Methyl Ethyl Ketone (2-Butanone)	0.12	500	0.12	MG/KG	0.65 U	0.0055 J	0.0073 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	MG/KG	0.65 U	0.0061 U	0.0073 U
Methylcyclohexane	--	--	--	MG/KG	0.13 U	0.0012 U	0.0015 U
Methylene Chloride	0.05	500	0.05	MG/KG	0.13 U	0.0024 U	0.0029 U
O-Xylene (1,2-Dimethylbenzene)	--	--	--	MG/KG	0.13 U	0.0012 U	0.0015 U
Styrene	--	--	--	MG/KG	0.13 U	0.0012 U	0.0015 U
Tert-Butyl Methyl Ether	0.93	500	0.93	MG/KG	0.13 U	0.0012 U	0.0015 U
Tetrachloroethene (PCE)	**1.3**	150	1.3	MG/KG	**18**	0.0012 U	0.0015 U
Toluene	0.7	500	0.7	MG/KG	0.13 U	0.0012 U	0.0015 U
Trans-1,2-Dichloroethene	0.19	500	0.19	MG/KG	0.13 U	0.0012 U	0.0015 U
Trans-1,3-Dichloropropene	--	--	--	MG/KG	0.13 U	0.0012 U	0.0015 U
Trichloroethene (TCE)	0.47	200	0.47	MG/KG	0.28	0.0012 U	0.0015 U
Trichlorofluoromethane	--	--	--	MG/KG	0.13 U	0.0012 U	0.0015 U
Vinyl Chloride	0.02	13	0.02	MG/KG	0.13 U	0.0012 U	0.0015 U

Table 3. Summary of Volatile Organic Compounds in Soil, 458 East 99th Street, Brooklyn, New York

				Sample Designation:	B-5	B-5	B-5
				Sample Date:	10/10/2021	10/10/2021	10/10/2021
				Sample Depth (ft bls):	0.5 - 2.5	10 - 12	23 - 25
				Normal Sample or Field Duplicate:	N	N	N
Parameters	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units			
1,1,1-Trichloroethane (TCA)	0.68	500	0.68	MG/KG	0.00093 U	0.0011 U	0.0011 U
1,1,2,2-Tetrachloroethane	--	--	--	MG/KG	0.00093 U	0.0011 U	0.0011 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	MG/KG	0.00093 U	0.0011 U	0.0011 U
1,1,2-Trichloroethane	--	--	--	MG/KG	0.00093 U	0.0011 U	0.0011 U
1,1-Dichloroethane	0.27	240	0.27	MG/KG	0.00093 U	0.0011 U	0.0019
1,1-Dichloroethene	0.33	500	0.33	MG/KG	0.00093 U	0.0011 U	0.0011 U
1,2,3-Trichlorobenzene	--	--	--	MG/KG	0.00093 U	0.0011 U	0.0011 U
1,2,4-Trichlorobenzene	--	--	--	MG/KG	0.00093 U	0.0011 U	0.0011 U
1,2-Dibromo-3-Chloropropane	--	--	--	MG/KG	0.00093 U	0.0011 U	0.0011 U
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	MG/KG	0.00093 U	0.0011 U	0.0011 U
1,2-Dichlorobenzene	1.1	500	1.1	MG/KG	0.00093 U	0.0011 U	0.0011 U
1,2-Dichloroethane	0.02	30	0.02	MG/KG	0.00093 U	0.0011 U	0.0011 U
1,2-Dichloropropane	--	--	--	MG/KG	0.00093 U	0.0011 U	0.0011 U
1,3-Dichlorobenzene	2.4	280	2.4	MG/KG	0.00093 U	0.0011 U	0.0011 U
1,4-Dichlorobenzene	1.8	130	1.8	MG/KG	0.00093 U	0.0011 U	0.0011 U
2-Hexanone	--	--	--	MG/KG	0.0046 U	0.0054 U	0.0054 U
Acetone	0.05	500	0.05	MG/KG	0.011	0.015	0.025
Benzene	0.06	44	0.06	MG/KG	0.00093 U	0.0011 U	0.0011 U
Bromochloromethane	--	--	--	MG/KG	0.00093 U	0.0011 U	0.0011 U
Bromodichloromethane	--	--	--	MG/KG	0.00093 U	0.0011 U	0.0011 U
Bromoform	--	--	--	MG/KG	0.00093 U	0.0011 U	0.0011 U
Bromomethane	--	--	--	MG/KG	0.0019 U	0.0021 U	0.0022 U
Carbon Disulfide	--	--	--	MG/KG	0.00093 U	0.0011 U	0.0011 U
Carbon Tetrachloride	0.76	22	0.76	MG/KG	0.00093 U	0.0011 U	0.0011 U
Chlorobenzene	1.1	500	1.1	MG/KG	0.00093 U	0.0011 U	0.0011 U
Chloroethane	--	--	--	MG/KG	0.00093 U	0.0011 U	0.0011 U
Chloroform	0.37	350	0.37	MG/KG	0.00093 U	0.0011 U	0.0011 U
Chloromethane	--	--	--	MG/KG	0.00093 U	0.0011 U	0.0011 U
Cis-1,2-Dichloroethylene	0.25	500	0.25	MG/KG	0.00093 U	0.0011 U	0.0014
Cis-1,3-Dichloropropene	--	--	--	MG/KG	0.00093 U	0.0011 U	0.0011 U
Cyclohexane	--	--	--	MG/KG	0.00093 U	0.0011 U	0.0011 U
Dibromochloromethane	--	--	--	MG/KG	0.00093 U	0.0011 U	0.0011 U

Table 3. Summary of Volatile Organic Compounds in Soil, 458 East 99th Street, Brooklyn, New York

				Sample Designation:	B-5	B-5	B-5
				Sample Date:	10/10/2021	10/10/2021	10/10/2021
				Sample Depth (ft bls):	0.5 - 2.5	10 - 12	23 - 25
				Normal Sample or Field Duplicate:	N	N	N
Parameters	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units			
Dichlorodifluoromethane	--	--	--	MG/KG	0.00093 U	0.0011 U	0.0011 U
Ethylbenzene	1	390	1	MG/KG	0.00093 U	0.0011 U	0.0011 U
Isopropylbenzene (Cumene)	--	--	--	MG/KG	0.00093 U	0.0011 U	0.0011 U
m,p-Xylene	--	--	--	MG/KG	0.00093 U	0.0011 U	0.0011 U
Methyl Acetate	--	--	--	MG/KG	0.0046 U	0.0054 U	0.0054 U
Methyl Ethyl Ketone (2-Butanone)	0.12	500	0.12	MG/KG	0.0046 U	0.0054 U	0.0054 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	MG/KG	0.0046 U	0.0054 U	0.0054 U
Methylcyclohexane	--	--	--	MG/KG	0.00093 U	0.0011 U	0.0011 U
Methylene Chloride	0.05	500	0.05	MG/KG	0.0019 U	0.0021 U	0.0022 U
O-Xylene (1,2-Dimethylbenzene)	--	--	--	MG/KG	0.00093 U	0.0011 U	0.0011 U
Styrene	--	--	--	MG/KG	0.00093 U	0.0011 U	0.0011 U
Tert-Butyl Methyl Ether	0.93	500	0.93	MG/KG	0.00093 U	0.0011 U	0.0011 U
Tetrachloroethene (PCE)	**1.3**	150	1.3	MG/KG	0.012	0.0019	0.0011 UJ
Toluene	0.7	500	0.7	MG/KG	0.00093 U	0.0011 U	0.0011 U
Trans-1,2-Dichloroethene	0.19	500	0.19	MG/KG	0.00093 U	0.0011 U	0.0011 U
Trans-1,3-Dichloropropene	--	--	--	MG/KG	0.00093 U	0.0011 U	0.0011 U
Trichloroethene (TCE)	0.47	200	0.47	MG/KG	0.00093 U	0.0011 U	0.00072 J
Trichlorofluoromethane	--	--	--	MG/KG	0.00093 U	0.0011 U	0.0011 U
Vinyl Chloride	0.02	13	0.02	MG/KG	0.00093 U	0.0011 U	0.0011 U

Table 3. Summary of Volatile Organic Compounds in Soil, 458 East 99th Street, Brooklyn, New York

				Sample Designation:	B-5	B-6	B-6
				Sample Date:	10/10/2021	10/09/2021	10/09/2021
				Sample Depth (ft bls):	23 - 25	0.5 - 2.5	9 - 11
				Normal Sample or Field Duplicate:	FD	N	N
Parameters	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units			
1,1,1-Trichloroethane (TCA)	0.68	500	0.68	MG/KG	0.0011 U	0.0013 UJ	0.0012 U
1,1,2,2-Tetrachloroethane	--	--	--	MG/KG	0.0011 U	0.0013 UJ	0.0012 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	MG/KG	0.0011 U	0.0013 UJ	0.0012 U
1,1,2-Trichloroethane	--	--	--	MG/KG	0.0011 U	0.0013 UJ	0.0012 U
1,1-Dichloroethane	0.27	240	0.27	MG/KG	0.0014	0.0013 UJ	0.0012 U
1,1-Dichloroethene	0.33	500	0.33	MG/KG	0.0011 U	0.0013 UJ	0.0012 U
1,2,3-Trichlorobenzene	--	--	--	MG/KG	0.0011 U	0.0013 UJ	0.0012 U
1,2,4-Trichlorobenzene	--	--	--	MG/KG	0.0011 U	0.0013 UJ	0.0012 U
1,2-Dibromo-3-Chloropropane	--	--	--	MG/KG	0.0011 U	0.0013 UJ	0.0012 U
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	MG/KG	0.0011 U	0.0013 UJ	0.0012 U
1,2-Dichlorobenzene	1.1	500	1.1	MG/KG	0.0011 U	0.0013 UJ	0.0012 U
1,2-Dichloroethane	0.02	30	0.02	MG/KG	0.0011 U	0.0013 UJ	0.0012 U
1,2-Dichloropropane	--	--	--	MG/KG	0.0011 U	0.0013 UJ	0.0012 U
1,3-Dichlorobenzene	2.4	280	2.4	MG/KG	0.0011 U	0.0013 UJ	0.0012 U
1,4-Dichlorobenzene	1.8	130	1.8	MG/KG	0.0011 U	0.0013 UJ	0.0012 U
2-Hexanone	--	--	--	MG/KG	0.0057 U	0.0065 UJ	0.0059 U
Acetone	0.05	500	0.05	MG/KG	0.022	0.0076 J-	0.0098
Benzene	0.06	44	0.06	MG/KG	0.0011 U	0.0013 UJ	0.0012 U
Bromochloromethane	--	--	--	MG/KG	0.0011 U	0.0013 UJ	0.0012 U
Bromodichloromethane	--	--	--	MG/KG	0.0011 U	0.0013 UJ	0.0012 U
Bromoform	--	--	--	MG/KG	0.0011 U	0.0013 UJ	0.0012 U
Bromomethane	--	--	--	MG/KG	0.0023 U	0.0026 UJ	0.0024 U
Carbon Disulfide	--	--	--	MG/KG	0.00052 J	0.0013 UJ	0.0012 U
Carbon Tetrachloride	0.76	22	0.76	MG/KG	0.0011 U	0.0013 UJ	0.0012 U
Chlorobenzene	1.1	500	1.1	MG/KG	0.0011 U	0.0013 UJ	0.0012 U
Chloroethane	--	--	--	MG/KG	0.0011 U	0.0013 UJ	0.0012 U
Chloroform	0.37	350	0.37	MG/KG	0.0011 U	0.0013 UJ	0.0012 U
Chloromethane	--	--	--	MG/KG	0.0011 U	0.0013 UJ	0.0012 U
Cis-1,2-Dichloroethylene	0.25	500	0.25	MG/KG	0.0012	0.0013 UJ	0.0012 U
Cis-1,3-Dichloropropene	--	--	--	MG/KG	0.0011 U	0.0013 UJ	0.0012 U
Cyclohexane	--	--	--	MG/KG	0.0011 U	0.0013 UJ	0.0012 U
Dibromochloromethane	--	--	--	MG/KG	0.0011 U	0.0013 UJ	0.0012 U

Table 3. Summary of Volatile Organic Compounds in Soil, 458 East 99th Street, Brooklyn, New York

				Sample Designation:	B-5	B-6	B-6
				Sample Date:	10/10/2021	10/09/2021	10/09/2021
				Sample Depth (ft bls):	23 - 25	0.5 - 2.5	9 - 11
				Normal Sample or Field Duplicate:	FD	N	N
Parameters	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units			
Dichlorodifluoromethane	--	--	--	MG/KG	0.0011 U	0.0013 UJ	0.0012 U
Ethylbenzene	1	390	1	MG/KG	0.0011 U	0.0013 UJ	0.0012 U
Isopropylbenzene (Cumene)	--	--	--	MG/KG	0.0011 U	0.0013 UJ	0.0012 U
m,p-Xylene	--	--	--	MG/KG	0.0011 U	0.0013 UJ	0.0012 U
Methyl Acetate	--	--	--	MG/KG	0.0057 U	0.0065 UJ	0.0059 U
Methyl Ethyl Ketone (2-Butanone)	0.12	500	0.12	MG/KG	0.0057 U	0.0065 UJ	0.0059 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	MG/KG	0.0057 U	0.0065 UJ	0.0059 U
Methylcyclohexane	--	--	--	MG/KG	0.0011 U	0.0013 UJ	0.0012 U
Methylene Chloride	0.05	500	0.05	MG/KG	0.0023 U	0.0026 UJ	0.0024 U
O-Xylene (1,2-Dimethylbenzene)	--	--	--	MG/KG	0.0011 U	0.0013 UJ	0.0012 U
Styrene	--	--	--	MG/KG	0.0011 U	0.0013 UJ	0.0012 U
Tert-Butyl Methyl Ether	0.93	500	0.93	MG/KG	0.0011 U	0.0013 UJ	0.0012 U
Tetrachloroethene (PCE)	**1.3**	150	1.3	MG/KG	0.013 J	0.012 J-	0.0027
Toluene	0.7	500	0.7	MG/KG	0.0011 U	0.0013 UJ	0.0012 U
Trans-1,2-Dichloroethene	0.19	500	0.19	MG/KG	0.0011 U	0.0013 UJ	0.0012 U
Trans-1,3-Dichloropropene	--	--	--	MG/KG	0.0011 U	0.0013 UJ	0.0012 U
Trichloroethene (TCE)	0.47	200	0.47	MG/KG	0.0005 J	0.0013 UJ	0.0012 U
Trichlorofluoromethane	--	--	--	MG/KG	0.0011 U	0.0013 UJ	0.0012 U
Vinyl Chloride	0.02	13	0.02	MG/KG	0.0011 U	0.0013 UJ	0.0012 U

Table 3. Summary of Volatile Organic Compounds in Soil, 458 East 99th Street, Brooklyn, New York

				Sample Designation:	**B-6**
				Sample Date:	**10/09/2021**
				Sample Depth (ft bls):	**23 - 25**
				Normal Sample or Field Duplicate:	**N**
Parameters	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	
1,1,1-Trichloroethane (TCA)	0.68	500	0.68	MG/KG	0.0012 U
1,1,2,2-Tetrachloroethane	--	--	--	MG/KG	0.0012 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	MG/KG	0.0012 U
1,1,2-Trichloroethane	--	--	--	MG/KG	0.0012 U
1,1-Dichloroethane	0.27	240	0.27	MG/KG	0.0012 U
1,1-Dichloroethene	0.33	500	0.33	MG/KG	0.0012 U
1,2,3-Trichlorobenzene	--	--	--	MG/KG	0.0012 U
1,2,4-Trichlorobenzene	--	--	--	MG/KG	0.0012 U
1,2-Dibromo-3-Chloropropane	--	--	--	MG/KG	0.0012 U
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	MG/KG	0.0012 U
1,2-Dichlorobenzene	1.1	500	1.1	MG/KG	0.0012 U
1,2-Dichloroethane	0.02	30	0.02	MG/KG	0.0012 U
1,2-Dichloropropane	--	--	--	MG/KG	0.0012 U
1,3-Dichlorobenzene	2.4	280	2.4	MG/KG	0.0012 U
1,4-Dichlorobenzene	1.8	130	1.8	MG/KG	0.0012 U
2-Hexanone	--	--	--	MG/KG	0.0062 U
Acetone	0.05	500	0.05	MG/KG	0.015
Benzene	0.06	44	0.06	MG/KG	0.0012 U
Bromochloromethane	--	--	--	MG/KG	0.0012 U
Bromodichloromethane	--	--	--	MG/KG	0.0012 U
Bromoform	--	--	--	MG/KG	0.0012 U
Bromomethane	--	--	--	MG/KG	0.0025 U
Carbon Disulfide	--	--	--	MG/KG	0.0012 U
Carbon Tetrachloride	0.76	22	0.76	MG/KG	0.0012 U
Chlorobenzene	1.1	500	1.1	MG/KG	0.0012 U
Chloroethane	--	--	--	MG/KG	0.0012 U
Chloroform	0.37	350	0.37	MG/KG	0.0012 U
Chloromethane	--	--	--	MG/KG	0.0012 U
Cis-1,2-Dichloroethylene	0.25	500	0.25	MG/KG	0.0012 U
Cis-1,3-Dichloropropene	--	--	--	MG/KG	0.0012 U
Cyclohexane	--	--	--	MG/KG	0.0012 U
Dibromochloromethane	--	--	--	MG/KG	0.0012 U

Table 3. Summary of Volatile Organic Compounds in Soil, 458 East 99th Street, Brooklyn, New York

				Sample Designation:	**B-6**
				Sample Date:	**10/09/2021**
				Sample Depth (ft bls):	**23 - 25**
				Normal Sample or Field Duplicate:	**N**
Parameters	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	
Dichlorodifluoromethane	--	--	--	MG/KG	0.0012 U
Ethylbenzene	1	390	1	MG/KG	0.0012 U
Isopropylbenzene (Cumene)	--	--	--	MG/KG	0.0012 U
m,p-Xylene	--	--	--	MG/KG	0.0012 U
Methyl Acetate	--	--	--	MG/KG	0.0062 U
Methyl Ethyl Ketone (2-Butanone)	0.12	500	0.12	MG/KG	0.0062 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	MG/KG	0.0062 U
Methylcyclohexane	--	--	--	MG/KG	0.0012 U
Methylene Chloride	0.05	500	0.05	MG/KG	0.0025 U
O-Xylene (1,2-Dimethylbenzene)	--	--	--	MG/KG	0.0012 U
Styrene	--	--	--	MG/KG	0.0012 U
Tert-Butyl Methyl Ether	0.93	500	0.93	MG/KG	0.0012 U
Tetrachloroethene (PCE)	**1.3**	150	1.3	MG/KG	0.0012 U
Toluene	0.7	500	0.7	MG/KG	0.0012 U
Trans-1,2-Dichloroethene	0.19	500	0.19	MG/KG	0.0012 U
Trans-1,3-Dichloropropene	--	--	--	MG/KG	0.0012 U
Trichloroethene (TCE)	0.47	200	0.47	MG/KG	0.00064 J
Trichlorofluoromethane	--	--	--	MG/KG	0.0012 U
Vinyl Chloride	0.02	13	0.02	MG/KG	0.0012 U

Table 4. Summary of Semivolatile Organic Compounds in Soil, 458 East 99th Street, Brooklyn, New York

Sample Designation:					B-4	B-4	B-4
Sample Date:					10/09/2021	10/09/2021	10/09/2021
Sample Depth (ft bls):					0.5 - 2.5	10 - 12	23 - 25
Normal Sample or Field Duplicate:					N	N	N
Parameters	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units			
1,2,4,5-Tetrachlorobenzene	--	--	--	MG/KG	0.36 U	0.4 U	0.41 U
1,4-Dioxane (P-Dioxane)	0.1	130	0.1	MG/KG	0.036 U	0.04 U	0.041 U
2,3,4,6-Tetrachlorophenol	--	--	--	MG/KG	0.36 U	0.4 U	0.41 U
2,4,5-Trichlorophenol	--	--	--	MG/KG	0.36 U	0.4 U	0.41 U
2,4,6-Trichlorophenol	--	--	--	MG/KG	0.15 U	0.16 U	0.16 U
2,4-Dichlorophenol	--	--	--	MG/KG	0.15 U	0.16 U	0.16 U
2,4-Dimethylphenol	--	--	--	MG/KG	0.36 U	0.4 U	0.41 U
2,4-Dinitrophenol	--	--	--	MG/KG	0.29 U	0.32 U	0.33 U
2,4-Dinitrotoluene	--	--	--	MG/KG	0.073 U	0.082 U	0.083 U
2,6-Dinitrotoluene	--	--	--	MG/KG	0.073 U	0.082 U	0.083 U
2-Chloronaphthalene	--	--	--	MG/KG	0.36 U	0.4 U	0.41 U
2-Chlorophenol	--	--	--	MG/KG	0.36 U	0.4 U	0.41 U
2-Methylnaphthalene	--	--	--	MG/KG	0.36 U	0.4 U	0.41 U
2-Methylphenol (O-Cresol)	0.33	500	0.33	MG/KG	0.36 U	0.4 U	0.41 U
2-Nitroaniline	--	--	--	MG/KG	0.36 U	0.4 U	0.41 U
2-Nitrophenol	--	--	--	MG/KG	0.36 U	0.4 U	0.41 U
3,3'-Dichlorobenzidine	--	--	--	MG/KG	0.15 U	0.16 U	0.16 U
3-Nitroaniline	--	--	--	MG/KG	0.36 U	0.4 U	0.41 U
4,6-Dinitro-2-Methylphenol	--	--	--	MG/KG	0.29 U	0.32 U	0.33 U
4-Bromophenyl Phenyl Ether	--	--	--	MG/KG	0.36 U	0.4 U	0.41 U
4-Chloro-3-Methylphenol	--	--	--	MG/KG	0.36 U	0.4 U	0.41 U
4-Chloroaniline	--	--	--	MG/KG	0.36 U	0.4 U	0.41 U
4-Chlorophenyl Phenyl Ether	--	--	--	MG/KG	0.36 U	0.4 U	0.41 U
4-Methylphenol (P-Cresol)	0.33	500	0.33	MG/KG	0.36 U	0.4 U	0.41 U
4-Nitroaniline	--	--	--	MG/KG	0.36 U	0.4 U	0.41 U
4-Nitrophenol	--	--	--	MG/KG	0.73 U	0.82 U	0.83 U
Acenaphthene	20	500	98	MG/KG	0.36 U	0.4 U	0.41 U
Acenaphthylene	100	500	107	MG/KG	0.36 U	0.4 U	0.41 U
Acetophenone	--	--	--	MG/KG	0.36 U	0.4 U	0.41 U
Anthracene	100	500	1000	MG/KG	0.36 U	0.4 U	0.41 U
Atrazine	--	--	--	MG/KG	0.15 U	0.16 U	0.16 U
Benzaldehyde	--	--	--	MG/KG	0.36 UJ	0.4 UJ	0.41 UJ

Table 4. Summary of Semivolatile Organic Compounds in Soil, 458 East 99th Street, Brooklyn, New York

				Sample Designation:	B-4	B-4	B-4
				Sample Date:	10/09/2021	10/09/2021	10/09/2021
				Sample Depth (ft bls):	0.5 - 2.5	10 - 12	23 - 25
				Normal Sample or Field Duplicate:	N	N	N
Parameters	NYSDEC Part 375 Unresticted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units			
Benzo(A)Anthracene	1	5.6	1	MG/KG	0.021 J	0.04 U	0.041 U
Benzo(A)Pyrene	1	1	22	MG/KG	0.022 J	0.04 U	0.041 U
Benzo(B)Fluoranthene	1	5.6	1.7	MG/KG	0.026 J	0.04 U	0.041 U
Benzo(G,H,I)Perylene	100	500	1000	MG/KG	0.014 J	0.4 U	0.41 U
Benzo(K)Fluoranthene	0.8	56	1.7	MG/KG	0.011 J	0.04 U	0.041 U
Benzyl Butyl Phthalate	--	--	--	MG/KG	0.36 U	0.4 U	0.41 U
Biphenyl (Diphenyl)	--	--	--	MG/KG	0.36 U	0.4 U	0.41 U
Bis(2-Chloroethoxy) Methane	--	--	--	MG/KG	0.36 U	0.4 U	0.41 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	MG/KG	0.036 U	0.04 U	0.041 U
Bis(2-Chloroisopropyl) Ether	--	--	--	MG/KG	0.36 U	0.4 U	0.41 U
Bis(2-Ethylhexyl) Phthalate	--	--	--	MG/KG	0.36 U	0.4 U	0.41 U
Caprolactam	--	--	--	MG/KG	0.36 U	0.4 U	0.41 U
Carbazole	--	--	--	MG/KG	0.36 U	0.4 U	0.41 U
Chrysene	1	56	1	MG/KG	0.023 J	0.4 U	0.41 U
Dibenz(A,H)Anthracene	0.33	0.56	1000	MG/KG	0.036 U	0.04 U	0.041 U
Dibenzofuran	7	350	210	MG/KG	0.36 U	0.4 U	0.41 U
Diethyl Phthalate	--	--	--	MG/KG	0.36 U	0.4 U	0.41 U
Dimethyl Phthalate	--	--	--	MG/KG	0.36 U	0.4 U	0.41 U
Di-N-Butyl Phthalate	--	--	--	MG/KG	0.016 J	0.4 U	0.41 U
Di-N-Octylphthalate	--	--	--	MG/KG	0.36 U	0.4 U	0.41 U
Fluoranthene	100	500	1000	MG/KG	0.035 J	0.4 U	0.41 U
Fluorene	30	500	386	MG/KG	0.36 U	0.4 U	0.41 U
Hexachlorobenzene	0.33	6	3.2	MG/KG	0.036 U	0.04 U	0.041 U
Hexachlorobutadiene	--	--	--	MG/KG	0.073 U	0.082 U	0.083 U
Hexachlorocyclopentadiene	--	--	--	MG/KG	0.36 U	0.4 U	0.41 U
Hexachloroethane	--	--	--	MG/KG	0.036 U	0.04 U	0.041 U
Indeno(1,2,3-C,D)Pyrene	0.5	5.6	8.2	MG/KG	0.015 J	0.04 U	0.041 U
Isophorone	--	--	--	MG/KG	0.15 U	0.16 U	0.16 U
Naphthalene	12	500	12	MG/KG	0.016 J	0.4 U	0.41 U
Nitrobenzene	--	--	--	MG/KG	0.036 U	0.04 U	0.041 U
N-Nitrosodi-N-Propylamine	--	--	--	MG/KG	0.036 U	0.04 U	0.041 U
N-Nitrosodiphenylamine	--	--	--	MG/KG	0.36 U	0.4 U	0.41 U

Table 4. Summary of Semivolatile Organic Compounds in Soil, 458 East 99th Street, Brooklyn, New York

				Sample Designation:	**B-4**	**B-4**	**B-4**
				Sample Date:	**10/09/2021**	**10/09/2021**	**10/09/2021**
				Sample Depth (ft bls):	**0.5 - 2.5**	**10 - 12**	**23 - 25**
				Normal Sample or Field Duplicate:	**N**	**N**	**N**
Parameters	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units			
Pentachlorophenol	0.8	6.7	0.8	MG/KG	0.29 U	0.32 U	0.33 U
Phenanthrene	100	500	1000	MG/KG	0.019 J	0.4 U	0.41 U
Phenol	0.33	500	0.33	MG/KG	0.36 U	0.4 U	0.41 U
Pyrene	100	500	1000	MG/KG	0.034 J	0.4 U	0.41 U

Table 4. Summary of Semivolatile Organic Compounds in Soil, 458 East 99th Street, Brooklyn, New York

Sample Designation:					B-5	B-5	B-5
Sample Date:					10/10/2021	10/10/2021	10/10/2021
Sample Depth (ft bls):					0.5 - 2.5	10 - 12	23 - 25
Normal Sample or Field Duplicate:					N	N	N
Parameters	NYSDEC Part 375 Unresticted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units			
1,2,4,5-Tetrachlorobenzene	--	--	--	MG/KG	0.35 U	0.41 U	0.4 U
1,4-Dioxane (P-Dioxane)	0.1	130	0.1	MG/KG	0.035 U	0.041 U	0.04 U
2,3,4,6-Tetrachlorophenol	--	--	--	MG/KG	0.35 U	0.41 U	0.4 U
2,4,5-Trichlorophenol	--	--	--	MG/KG	0.35 U	0.41 U	0.4 U
2,4,6-Trichlorophenol	--	--	--	MG/KG	0.14 U	0.16 U	0.16 U
2,4-Dichlorophenol	--	--	--	MG/KG	0.14 U	0.16 U	0.16 U
2,4-Dimethylphenol	--	--	--	MG/KG	0.35 U	0.41 U	0.4 U
2,4-Dinitrophenol	--	--	--	MG/KG	0.29 U	0.33 U	0.32 U
2,4-Dinitrotoluene	--	--	--	MG/KG	0.072 U	0.082 U	0.081 U
2,6-Dinitrotoluene	--	--	--	MG/KG	0.072 U	0.082 U	0.081 U
2-Chloronaphthalene	--	--	--	MG/KG	0.35 U	0.41 U	0.4 U
2-Chlorophenol	--	--	--	MG/KG	0.35 U	0.41 U	0.4 U
2-Methylnaphthalene	--	--	--	MG/KG	0.35 U	0.41 U	0.4 U
2-Methylphenol (O-Cresol)	0.33	500	0.33	MG/KG	0.35 U	0.41 U	0.4 U
2-Nitroaniline	--	--	--	MG/KG	0.35 UJ	0.41 UJ	0.4 UJ
2-Nitrophenol	--	--	--	MG/KG	0.35 U	0.41 U	0.4 U
3,3'-Dichlorobenzidine	--	--	--	MG/KG	0.14 U	0.16 U	0.16 U
3-Nitroaniline	--	--	--	MG/KG	0.35 U	0.41 U	0.4 U
4,6-Dinitro-2-Methylphenol	--	--	--	MG/KG	0.29 U	0.33 U	0.32 U
4-Bromophenyl Phenyl Ether	--	--	--	MG/KG	0.35 U	0.41 U	0.4 U
4-Chloro-3-Methylphenol	--	--	--	MG/KG	0.35 U	0.41 U	0.4 U
4-Chloroaniline	--	--	--	MG/KG	0.35 U	0.41 U	0.4 U
4-Chlorophenyl Phenyl Ether	--	--	--	MG/KG	0.35 U	0.41 U	0.4 U
4-Methylphenol (P-Cresol)	0.33	500	0.33	MG/KG	0.35 U	0.41 U	0.4 U
4-Nitroaniline	--	--	--	MG/KG	0.35 U	0.41 U	0.4 U
4-Nitrophenol	--	--	--	MG/KG	0.72 U	0.82 U	0.81 U
Acenaphthene	20	500	98	MG/KG	0.35 U	0.41 U	0.4 U
Acenaphthylene	100	500	107	MG/KG	0.35 U	0.41 U	0.4 U
Acetophenone	--	--	--	MG/KG	0.35 U	0.41 U	0.4 U
Anthracene	100	500	1000	MG/KG	0.35 U	0.41 U	0.4 U
Atrazine	--	--	--	MG/KG	0.14 U	0.16 U	0.16 U
Benzaldehyde	--	--	--	MG/KG	0.35 UJ	0.41 UJ	0.4 UJ

Table 4. Summary of Semivolatile Organic Compounds in Soil, 458 East 99th Street, Brooklyn, New York

				Sample Designation:	**B-5**	**B-5**	**B-5**
				Sample Date:	**10/10/2021**	**10/10/2021**	**10/10/2021**
				Sample Depth (ft bls):	**0.5 - 2.5**	**10 - 12**	**23 - 25**
				Normal Sample or Field Duplicate:	**N**	**N**	**N**
Parameters	NYSDEC Part 375 Unresticted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units			
Benzo(A)Anthracene	1	5.6	1	MG/KG	0.018 J	0.041 U	0.04 U
Benzo(A)Pyrene	1	1	22	MG/KG	0.015 J	0.041 U	0.04 U
Benzo(B)Fluoranthene	1	5.6	1.7	MG/KG	0.021 J	0.041 U	0.04 U
Benzo(G,H,I)Perylene	100	500	1000	MG/KG	0.35 U	0.41 U	0.4 U
Benzo(K)Fluoranthene	0.8	56	1.7	MG/KG	0.0072 J	0.041 U	0.04 U
Benzyl Butyl Phthalate	--	--	--	MG/KG	0.35 U	0.41 U	0.4 U
Biphenyl (Diphenyl)	--	--	--	MG/KG	0.35 U	0.41 U	0.4 U
Bis(2-Chloroethoxy) Methane	--	--	--	MG/KG	0.35 U	0.41 U	0.4 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	MG/KG	0.035 U	0.041 U	0.04 U
Bis(2-Chloroisopropyl) Ether	--	--	--	MG/KG	0.35 U	0.41 U	0.4 U
Bis(2-Ethylhexyl) Phthalate	--	--	--	MG/KG	0.35 U	0.41 U	0.4 U
Caprolactam	--	--	--	MG/KG	0.35 U	0.41 U	0.4 U
Carbazole	--	--	--	MG/KG	0.35 U	0.41 U	0.4 U
Chrysene	1	56	1	MG/KG	0.018 JT	0.41 UT	0.4 UT
Dibenz(A,H)Anthracene	0.33	0.56	1000	MG/KG	0.035 U	0.041 U	0.04 U
Dibenzofuran	7	350	210	MG/KG	0.35 U	0.41 U	0.4 U
Diethyl Phthalate	--	--	--	MG/KG	0.35 U	0.41 U	0.4 U
Dimethyl Phthalate	--	--	--	MG/KG	0.35 U	0.41 U	0.4 U
Di-N-Butyl Phthalate	--	--	--	MG/KG	0.029 J	0.41 U	0.4 U
Di-N-Octylphthalate	--	--	--	MG/KG	0.35 U	0.41 U	0.4 U
Fluoranthene	100	500	1000	MG/KG	0.024 J	0.41 U	0.4 U
Fluorene	30	500	386	MG/KG	0.35 U	0.41 U	0.4 U
Hexachlorobenzene	0.33	6	3.2	MG/KG	0.035 U	0.041 U	0.04 U
Hexachlorobutadiene	--	--	--	MG/KG	0.072 U	0.082 U	0.081 U
Hexachlorocyclopentadiene	--	--	--	MG/KG	0.35 U	0.41 U	0.4 U
Hexachloroethane	--	--	--	MG/KG	0.035 U	0.041 U	0.04 U
Indeno(1,2,3-C,D)Pyrene	0.5	5.6	8.2	MG/KG	0.035 U	0.041 U	0.04 U
Isophorone	--	--	--	MG/KG	0.14 U	0.16 U	0.16 U
Naphthalene	12	500	12	MG/KG	0.35 U	0.41 U	0.4 U
Nitrobenzene	--	--	--	MG/KG	0.035 U	0.041 U	0.04 U
N-Nitrosodi-N-Propylamine	--	--	--	MG/KG	0.035 U	0.041 U	0.04 U
N-Nitrosodiphenylamine	--	--	--	MG/KG	0.35 U	0.41 U	0.4 U

Table 4. Summary of Semivolatile Organic Compounds in Soil, 458 East 99th Street, Brooklyn, New York

				Sample Designation:	B-5	B-5	B-5
				Sample Date:	10/10/2021	10/10/2021	10/10/2021
				Sample Depth (ft bls):	0.5 - 2.5	10 - 12	23 - 25
				Normal Sample or Field Duplicate:	N	N	N
Parameters	NYSDEC Part 375 Unresticted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units			
Pentachlorophenol	0.8	6.7	0.8	MG/KG	0.29 U	0.33 U	0.32 U
Phenanthrene	100	500	1000	MG/KG	0.021 J	0.41 U	0.4 U
Phenol	0.33	500	0.33	MG/KG	0.35 U	0.41 U	0.4 U
Pyrene	100	500	1000	MG/KG	0.022 J	0.41 U	0.4 U

Table 4. Summary of Semivolatile Organic Compounds in Soil, 458 East 99th Street, Brooklyn, New York

				Sample Designation:	B-5	B-6	B-6
				Sample Date:	10/10/2021	10/09/2021	10/09/2021
				Sample Depth (ft bls):	23 - 25	0.5 - 2.5	9 - 11
				Normal Sample or Field Duplicate:	FD	N	N
Parameters	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units			
1,2,4,5-Tetrachlorobenzene	--	--	--	MG/KG	0.39 U	0.36 UJ	0.39 U
1,4-Dioxane (P-Dioxane)	0.1	130	0.1	MG/KG	0.039 U	0.036 U	0.039 U
2,3,4,6-Tetrachlorophenol	--	--	--	MG/KG	0.39 U	0.36 UJ	0.39 U
2,4,5-Trichlorophenol	--	--	--	MG/KG	0.39 U	0.36 UJ	0.39 U
2,4,6-Trichlorophenol	--	--	--	MG/KG	0.16 U	0.14 UJ	0.16 U
2,4-Dichlorophenol	--	--	--	MG/KG	0.16 U	0.14 UJ	0.16 U
2,4-Dimethylphenol	--	--	--	MG/KG	0.39 U	0.36 UJ	0.39 U
2,4-Dinitrophenol	--	--	--	MG/KG	0.31 U	0.29 UJ	0.32 U
2,4-Dinitrotoluene	--	--	--	MG/KG	0.079 U	0.073 UJ	0.08 U
2,6-Dinitrotoluene	--	--	--	MG/KG	0.079 U	0.073 UJ	0.08 U
2-Chloronaphthalene	--	--	--	MG/KG	0.39 U	0.36 UJ	0.39 U
2-Chlorophenol	--	--	--	MG/KG	0.39 U	0.36 UJ	0.39 U
2-Methylnaphthalene	--	--	--	MG/KG	0.39 U	0.36 UJ	0.39 U
2-Methylphenol (O-Cresol)	0.33	500	0.33	MG/KG	0.39 U	0.36 UJ	0.39 U
2-Nitroaniline	--	--	--	MG/KG	0.39 UJ	0.36 UJ	0.39 U
2-Nitrophenol	--	--	--	MG/KG	0.39 U	0.36 UJ	0.39 U
3,3'-Dichlorobenzidine	--	--	--	MG/KG	0.16 U	0.14 U	0.16 U
3-Nitroaniline	--	--	--	MG/KG	0.39 U	0.36 U	0.39 U
4,6-Dinitro-2-Methylphenol	--	--	--	MG/KG	0.31 U	0.29 UJ	0.32 U
4-Bromophenyl Phenyl Ether	--	--	--	MG/KG	0.39 U	0.36 UJ	0.39 U
4-Chloro-3-Methylphenol	--	--	--	MG/KG	0.39 U	0.36 UJ	0.39 U
4-Chloroaniline	--	--	--	MG/KG	0.39 U	0.36 U	0.39 U
4-Chlorophenyl Phenyl Ether	--	--	--	MG/KG	0.39 U	0.36 UJ	0.39 U
4-Methylphenol (P-Cresol)	0.33	500	0.33	MG/KG	0.39 U	0.36 UJ	0.39 U
4-Nitroaniline	--	--	--	MG/KG	0.39 U	0.36 UJ	0.39 U
4-Nitrophenol	--	--	--	MG/KG	0.79 U	0.73 U	0.8 U
Acenaphthene	20	500	98	MG/KG	0.39 U	0.36 UJ	0.39 U
Acenaphthylene	100	500	107	MG/KG	0.39 U	0.36 UJ	0.39 U
Acetophenone	--	--	--	MG/KG	0.39 U	0.36 UJ	0.39 U
Anthracene	100	500	1000	MG/KG	0.39 U	0.36 UJ	0.39 U
Atrazine	--	--	--	MG/KG	0.16 U	0.14 U	0.16 U
Benzaldehyde	--	--	--	MG/KG	0.39 UJ	0.36 UJ	0.39 UJ

Table 4. Summary of Semivolatile Organic Compounds in Soil, 458 East 99th Street, Brooklyn, New York

				Sample Designation:	**B-5**	**B-6**	**B-6**
				Sample Date:	**10/10/2021**	**10/09/2021**	**10/09/2021**
				Sample Depth (ft bls):	**23 - 25**	**0.5 - 2.5**	**9 - 11**
				Normal Sample or Field Duplicate:	**FD**	**N**	**N**
Parameters	NYSDEC Part 375 Unresticted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units			
Benzo(A)Anthracene	1	5.6	1	MG/KG	0.039 U	0.018 J-	0.039 U
Benzo(A)Pyrene	1	1	22	MG/KG	0.039 U	0.015 J-	0.039 U
Benzo(B)Fluoranthene	1	5.6	1.7	MG/KG	0.039 U	0.02 J-	0.039 U
Benzo(G,H,I)Perylene	100	500	1000	MG/KG	0.39 U	0.011 J-	0.39 U
Benzo(K)Fluoranthene	0.8	56	1.7	MG/KG	0.039 U	0.008 J-	0.039 U
Benzyl Butyl Phthalate	--	--	--	MG/KG	0.39 U	0.36 UJ	0.39 U
Biphenyl (Diphenyl)	--	--	--	MG/KG	0.39 U	0.36 UJ	0.39 U
Bis(2-Chloroethoxy) Methane	--	--	--	MG/KG	0.39 U	0.36 UJ	0.39 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	MG/KG	0.039 U	0.036 UJ	0.039 U
Bis(2-Chloroisopropyl) Ether	--	--	--	MG/KG	0.39 U	0.36 U	0.39 U
Bis(2-Ethylhexyl) Phthalate	--	--	--	MG/KG	0.39 U	0.023 J-	0.39 U
Caprolactam	--	--	--	MG/KG	0.39 U	0.36 U	0.39 U
Carbazole	--	--	--	MG/KG	0.39 U	0.36 UJ	0.39 U
Chrysene	1	56	1	MG/KG	0.39 UT	0.017 J-	0.39 U
Dibenz(A,H)Anthracene	0.33	0.56	1000	MG/KG	0.039 U	0.036 UJ	0.039 U
Dibenzofuran	7	350	210	MG/KG	0.39 U	0.36 UJ	0.39 U
Diethyl Phthalate	--	--	--	MG/KG	0.39 U	0.36 UJ	0.39 U
Dimethyl Phthalate	--	--	--	MG/KG	0.39 U	0.36 UJ	0.39 U
Di-N-Butyl Phthalate	--	--	--	MG/KG	0.39 U	0.022 J-	0.39 U
Di-N-Octylphthalate	--	--	--	MG/KG	0.39 U	0.36 U	0.39 U
Fluoranthene	100	500	1000	MG/KG	0.39 U	0.027 J-	0.39 U
Fluorene	30	500	386	MG/KG	0.39 U	0.36 UJ	0.39 U
Hexachlorobenzene	0.33	6	3.2	MG/KG	0.039 U	0.036 U	0.039 U
Hexachlorobutadiene	--	--	--	MG/KG	0.079 U	0.073 UJ	0.08 U
Hexachlorocyclopentadiene	--	--	--	MG/KG	0.39 U	0.36 U	0.39 U
Hexachloroethane	--	--	--	MG/KG	0.039 U	0.036 UJ	0.039 U
Indeno(1,2,3-C,D)Pyrene	0.5	5.6	8.2	MG/KG	0.039 U	0.036 U	0.039 U
Isophorone	--	--	--	MG/KG	0.16 U	0.14 UJ	0.16 U
Naphthalene	12	500	12	MG/KG	0.39 U	0.36 UJ	0.39 U
Nitrobenzene	--	--	--	MG/KG	0.039 U	0.036 UJ	0.039 U
N-Nitrosodi-N-Propylamine	--	--	--	MG/KG	0.039 U	0.036 UJ	0.039 U
N-Nitrosodiphenylamine	--	--	--	MG/KG	0.39 U	0.36 UJ	0.39 U

Table 4. Summary of Semivolatile Organic Compounds in Soil, 458 East 99th Street, Brooklyn, New York

				Sample Designation:	B-5	B-6	B-6
				Sample Date:	10/10/2021	10/09/2021	10/09/2021
				Sample Depth (ft bls):	23 - 25	0.5 - 2.5	9 - 11
				Normal Sample or Field Duplicate:	FD	N	N
Parameters	NYSDEC Part 375 Unresticted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units			
Pentachlorophenol	0.8	6.7	0.8	MG/KG	0.31 U	0.29 UJ	0.32 U
Phenanthrene	100	500	1000	MG/KG	0.39 U	0.02 J-	0.39 U
Phenol	0.33	500	0.33	MG/KG	0.39 U	0.36 U	0.39 U
Pyrene	100	500	1000	MG/KG	0.39 U	0.025 J-	0.39 U

Table 4. Summary of Semivolatile Organic Compounds in Soil, 458 East 99th Street, Brooklyn, New York

				Sample Designation:	**B-6**
				Sample Date:	**10/09/2021**
				Sample Depth (ft bls):	**23 - 25**
				Normal Sample or Field Duplicate:	**N**
Parameters	NYSDEC Part 375 Unresticted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	
1,2,4,5-Tetrachlorobenzene	--	--	--	MG/KG	0.4 U
1,4-Dioxane (P-Dioxane)	0.1	130	0.1	MG/KG	0.04 U
2,3,4,6-Tetrachlorophenol	--	--	--	MG/KG	0.4 U
2,4,5-Trichlorophenol	--	--	--	MG/KG	0.4 U
2,4,6-Trichlorophenol	--	--	--	MG/KG	0.16 U
2,4-Dichlorophenol	--	--	--	MG/KG	0.16 U
2,4-Dimethylphenol	--	--	--	MG/KG	0.4 U
2,4-Dinitrophenol	--	--	--	MG/KG	0.33 U
2,4-Dinitrotoluene	--	--	--	MG/KG	0.082 U
2,6-Dinitrotoluene	--	--	--	MG/KG	0.082 U
2-Chloronaphthalene	--	--	--	MG/KG	0.4 U
2-Chlorophenol	--	--	--	MG/KG	0.4 U
2-Methylnaphthalene	--	--	--	MG/KG	0.4 U
2-Methylphenol (O-Cresol)	0.33	500	0.33	MG/KG	0.4 U
2-Nitroaniline	--	--	--	MG/KG	0.4 U
2-Nitrophenol	--	--	--	MG/KG	0.4 U
3,3'-Dichlorobenzidine	--	--	--	MG/KG	0.16 U
3-Nitroaniline	--	--	--	MG/KG	0.4 U
4,6-Dinitro-2-Methylphenol	--	--	--	MG/KG	0.33 U
4-Bromophenyl Phenyl Ether	--	--	--	MG/KG	0.4 U
4-Chloro-3-Methylphenol	--	--	--	MG/KG	0.4 U
4-Chloroaniline	--	--	--	MG/KG	0.4 U
4-Chlorophenyl Phenyl Ether	--	--	--	MG/KG	0.4 U
4-Methylphenol (P-Cresol)	0.33	500	0.33	MG/KG	0.4 U
4-Nitroaniline	--	--	--	MG/KG	0.4 U
4-Nitrophenol	--	--	--	MG/KG	0.82 U
Acenaphthene	20	500	98	MG/KG	0.4 U
Acenaphthylene	100	500	107	MG/KG	0.4 U
Acetophenone	--	--	--	MG/KG	0.4 U
Anthracene	100	500	1000	MG/KG	0.4 U
Atrazine	--	--	--	MG/KG	0.16 U
Benzaldehyde	--	--	--	MG/KG	0.4 UJ

Table 4. Summary of Semivolatile Organic Compounds in Soil, 458 East 99th Street, Brooklyn, New York

				Sample Designation:	**B-6**
				Sample Date:	**10/09/2021**
				Sample Depth (ft bls):	**23 - 25**
				Normal Sample or Field Duplicate:	**N**
Parameters	NYSDEC Part 375 Unresticted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	
Benzo(A)Anthracene	1	5.6	1	MG/KG	0.04 U
Benzo(A)Pyrene	1	1	22	MG/KG	0.04 U
Benzo(B)Fluoranthene	1	5.6	1.7	MG/KG	0.04 U
Benzo(G,H,I)Perylene	100	500	1000	MG/KG	0.4 U
Benzo(K)Fluoranthene	0.8	56	1.7	MG/KG	0.04 U
Benzyl Butyl Phthalate	--	--	--	MG/KG	0.4 U
Biphenyl (Diphenyl)	--	--	--	MG/KG	0.4 U
Bis(2-Chloroethoxy) Methane	--	--	--	MG/KG	0.4 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	MG/KG	0.04 U
Bis(2-Chloroisopropyl) Ether	--	--	--	MG/KG	0.4 U
Bis(2-Ethylhexyl) Phthalate	--	--	--	MG/KG	0.4 U
Caprolactam	--	--	--	MG/KG	0.4 U
Carbazole	--	--	--	MG/KG	0.4 U
Chrysene	1	56	1	MG/KG	0.4 U
Dibenz(A,H)Anthracene	0.33	0.56	1000	MG/KG	0.04 U
Dibenzofuran	7	350	210	MG/KG	0.4 U
Diethyl Phthalate	--	--	--	MG/KG	0.4 U
Dimethyl Phthalate	--	--	--	MG/KG	0.4 U
Di-N-Butyl Phthalate	--	--	--	MG/KG	0.4 U
Di-N-Octylphthalate	--	--	--	MG/KG	0.4 U
Fluoranthene	100	500	1000	MG/KG	0.4 U
Fluorene	30	500	386	MG/KG	0.4 U
Hexachlorobenzene	0.33	6	3.2	MG/KG	0.04 U
Hexachlorobutadiene	--	--	--	MG/KG	0.082 U
Hexachlorocyclopentadiene	--	--	--	MG/KG	0.4 U
Hexachloroethane	--	--	--	MG/KG	0.04 U
Indeno(1,2,3-C,D)Pyrene	0.5	5.6	8.2	MG/KG	0.04 U
Isophorone	--	--	--	MG/KG	0.16 U
Naphthalene	12	500	12	MG/KG	0.4 U
Nitrobenzene	--	--	--	MG/KG	0.04 U
N-Nitrosodi-N-Propylamine	--	--	--	MG/KG	0.04 U
N-Nitrosodiphenylamine	--	--	--	MG/KG	0.4 U

Table 4. Summary of Semivolatile Organic Compounds in Soil, 458 East 99th Street, Brooklyn, New York

				Sample Designation:	B-6
				Sample Date:	10/09/2021
				Sample Depth (ft bls):	23 - 25
				Normal Sample or Field Duplicate:	N
Parameters	NYSDEC Part 375 Unresticted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	
Pentachlorophenol	0.8	6.7	0.8	MG/KG	0.33 U
Phenanthrene	100	500	1000	MG/KG	0.4 U
Phenol	0.33	500	0.33	MG/KG	0.4 U
Pyrene	100	500	1000	MG/KG	0.4 U

Table 5. Summary of Metals in Soil, 458 East 99th Street, Brooklyn, New York

				Sample Designation:	**B-4**	**B-4**	**B-4**	**B-5**	**B-5**	**B-5**
				Sample Date:	**10/09/2021**	**10/09/2021**	**10/09/2021**	**10/10/2021**	**10/10/2021**	**10/10/2021**
				Sample Depth (ft bls):	**0.5 - 2.5**	**10 - 12**	**23 - 25**	**0.5 - 2.5**	**10 - 12**	**23 - 25**
				Normal Sample or Field Duplicate:	**N**	**N**	**N**	**N**	**N**	**N**
Parameters	NYSDEC Part 375 Unresticted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units						
Aluminum	--	--	--	MG/KG	8810	8570	3610	7640	4980	3000
Antimony	--	--	--	MG/KG	0.47 J	1.1 U	1.2 U	1.1 U	1.1 U	1.2 U
Arsenic	**13**	16	16	MG/KG	5.9	**15.1**	0.37 J	2.9	0.96 J	0.65 J
Barium	350	400	820	MG/KG	86.1	66.3	14.3	64.5	19	9.4
Beryllium	7.2	590	47	MG/KG	0.53	0.52	0.24 J	0.45	0.095 J	0.15 J
Cadmium	2.5	9.3	7.5	MG/KG	0.27 J	0.22 J	1.2 U	1.1 U	1.1 U	1.2 U
Calcium	--	--	--	MG/KG	5890	2280	493	1240	599	323 J
Chromium, Total	30	1500	--	MG/KG	20.9	13.9	8.3	16.1	11.1	9
Cobalt	--	--	--	MG/KG	6.7	5.1	2.9	6.9	2.6	2.5
Copper	50	270	1720	MG/KG	26.7	35.8	10.2	24.4	8.5	7.3
Iron	--	--	--	MG/KG	23700	17400	6120	16400	5920	6570
Lead	**63**	1000	450	MG/KG	**88.8**	10.3	2.3	59.7	4	2
Magnesium	--	--	--	MG/KG	2290	1660	1770	2020	1670	1810
Manganese	1600	10000	2000	MG/KG	317	954	69.9	506	62.9	64.9
Mercury	0.18	2.8	0.73	MG/KG	0.028	0.02 U	0.019 U	0.081	0.021 U	0.018 U
Nickel	30	310	130	MG/KG	14.2	13	13.1	13.3	11.9	13.7
Potassium	--	--	--	MG/KG	980	884	399	851	371	403
Selenium	3.9	1500	4	MG/KG	0.38 J	0.75 J	1.5 U	0.28 J	1.4 U	1.5 U
Silver	2	1500	8.3	MG/KG	1.4	1.1 U	1.2 U	1.1 U	1.1 U	1.2 U
Sodium	--	--	--	MG/KG	216	133	71.3 J	149	82.7 J	65 J
Thallium	--	--	--	MG/KG	0.11 J	0.23 J	0.47 U	0.099 J	0.46 U	0.47 U
Vanadium	--	--	--	MG/KG	26.1	19.4	9.1	25.8	9.3	8.7 J
Zinc	109	10000	2480	MG/KG	87.3	27.7	16.4	51.6	16.2	11.3

Table 5. Summary of Metals in Soil, 458 East 99th Street, Brooklyn, New York

				Sample Designation:	B-5	B-6	B-6	B-6
				Sample Date:	10/10/2021	10/09/2021	10/09/2021	10/09/2021
				Sample Depth (ft bls):	23 - 25	0.5 - 2.5	9 - 11	23 - 25
				Normal Sample or Field Duplicate:	FD	N	N	N
Parameters	NYSDEC Part 375 Unresticted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units				
Aluminum	--	--	--	MG/KG	2970	7620	6620	3260
Antimony	--	--	--	MG/KG	1.1 U	0.2 J	1.1 U	1.2 U
Arsenic	**13**	16	16	MG/KG	1.4	**13.5 J**	1.6	1 J
Barium	350	400	820	MG/KG	10.5	63.6	13.5	13.1
Beryllium	7.2	590	47	MG/KG	0.25 J	0.7	0.33 J	0.34 J
Cadmium	2.5	9.3	7.5	MG/KG	1.1 U	0.18 J	1.1 U	1.2 U
Calcium	--	--	--	MG/KG	696 J	3380	441	530
Chromium, Total	30	1500	--	MG/KG	10.2	24	14.4	10
Cobalt	--	--	--	MG/KG	2.8	7.1	4.9	3.6
Copper	50	270	1720	MG/KG	8.1	27.6	9.8	9.4
Iron	--	--	--	MG/KG	9810	29900 J	15900	8710
Lead	**63**	1000	450	MG/KG	2.6	28.2	3.6	2.5
Magnesium	--	--	--	MG/KG	1730	1730 J	1470	1510
Manganese	1600	10000	2000	MG/KG	77.3	484 J	157	83.8
Mercury	0.18	2.8	0.73	MG/KG	0.02 U	0.029	0.02 U	0.02 U
Nickel	30	310	130	MG/KG	15.3	16.3	14.1	13.2
Potassium	--	--	--	MG/KG	350	819	278	396
Selenium	3.9	1500	4	MG/KG	1.4 U	0.46 J	1.4 U	1.5 U
Silver	2	1500	8.3	MG/KG	1.1 U	1.1 U	1.1 U	1.2 U
Sodium	--	--	--	MG/KG	62.2 J	176	72.3 J	58.6 J
Thallium	--	--	--	MG/KG	0.45 U	0.35 J	0.049 J	0.47 U
Vanadium	--	--	--	MG/KG	13.4 J	27.1 J	18.5	17.2
Zinc	109	10000	2480	MG/KG	14.3	56.5	14.2	14.9

Table 6. Summary of Polychlorinated Biphenyls in Soil, 458 East 99th Street, Brooklyn, New York

				Sample Designation:	**B-4**	**B-4**	**B-4**	**B-5**
				Sample Date:	**10/09/2021**	**10/09/2021**	**10/09/2021**	**10/10/2021**
				Sample Depth (ft bls):	**0.5 - 2.5**	**10 - 12**	**23 - 25**	**0.5 - 2.5**
				Normal Sample or Field Duplicate:	**N**	**N**	**N**	**N**
Parameters	NYSDEC Part 375 Unresticted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units				
PCB-1016 (Aroclor 1016)	--	--	--	MG/KG	0.073 U	0.082 U	0.083 U	0.072 U
PCB-1221 (Aroclor 1221)	--	--	--	MG/KG	0.073 U	0.082 U	0.083 U	0.072 U
PCB-1232 (Aroclor 1232)	--	--	--	MG/KG	0.073 U	0.082 U	0.083 U	0.072 U
PCB-1242 (Aroclor 1242)	--	--	--	MG/KG	0.073 U	0.082 U	0.083 U	0.072 U
PCB-1248 (Aroclor 1248)	--	--	--	MG/KG	0.073 U	0.082 U	0.083 U	0.072 U
PCB-1254 (Aroclor 1254)	--	--	--	MG/KG	0.073 U	0.082 U	0.083 U	0.072 U
PCB-1260 (Aroclor 1260)	--	--	--	MG/KG	0.073 U	0.082 U	0.083 U	0.072 U
PCB-1262 (Aroclor 1262)	--	--	--	MG/KG	0.073 U	0.082 U	0.083 U	0.072 U
PCB-1268 (Aroclor 1268)	--	--	--	MG/KG	0.073 U	0.082 U	0.083 U	0.072 U
Polychlorinated Biphenyl (PCBs)	0.1	1	3.2	MG/KG	0.073 U	0.082 U	0.083 U	0.072 U

Table 6. Summary of Polychlorinated Biphenyls in Soil, 458 East 99th Street, Brooklyn, New York

				Sample Designation:	B-5	B-5	B-5	B-6
				Sample Date:	10/10/2021	10/10/2021	10/10/2021	10/09/2021
				Sample Depth (ft bls):	10 - 12	23 - 25	23 - 25	0.5 - 2.5
				Normal Sample or Field Duplicate:	N	N	FD	N
Parameters	NYSDEC Part 375 Unresticted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units				
PCB-1016 (Aroclor 1016)	--	--	--	MG/KG	0.082 U	0.081 U	0.079 U	0.073 U
PCB-1221 (Aroclor 1221)	--	--	--	MG/KG	0.082 U	0.081 U	0.079 U	0.073 U
PCB-1232 (Aroclor 1232)	--	--	--	MG/KG	0.082 U	0.081 U	0.079 U	0.073 U
PCB-1242 (Aroclor 1242)	--	--	--	MG/KG	0.082 U	0.081 U	0.079 U	0.073 U
PCB-1248 (Aroclor 1248)	--	--	--	MG/KG	0.082 U	0.081 U	0.079 U	0.073 U
PCB-1254 (Aroclor 1254)	--	--	--	MG/KG	0.082 U	0.081 U	0.079 U	0.073 U
PCB-1260 (Aroclor 1260)	--	--	--	MG/KG	0.082 U	0.081 U	0.079 U	0.073 UT
PCB-1262 (Aroclor 1262)	--	--	--	MG/KG	0.082 U	0.081 U	0.079 U	0.073 U
PCB-1268 (Aroclor 1268)	--	--	--	MG/KG	0.082 U	0.081 U	0.079 U	0.073 U
Polychlorinated Biphenyl (PCBs)	0.1	1	3.2	MG/KG	0.082 U	0.081 U	0.079 U	0.073 U

Table 6. Summary of Polychlorinated Biphenyls in Soil, 458 East 99th Street, Brooklyn, New York

				Sample Designation:	**B-6**	**B-6**
				Sample Date:	**10/09/2021**	**10/09/2021**
				Sample Depth (ft bls):	**9 - 11**	**23 - 25**
				Normal Sample or Field Duplicate:	**N**	**N**
Parameters	NYSDEC Part 375 Unresticted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units		
PCB-1016 (Aroclor 1016)	--	--	--	MG/KG	0.08 U	0.082 U
PCB-1221 (Aroclor 1221)	--	--	--	MG/KG	0.08 U	0.082 U
PCB-1232 (Aroclor 1232)	--	--	--	MG/KG	0.08 U	0.082 U
PCB-1242 (Aroclor 1242)	--	--	--	MG/KG	0.08 U	0.082 U
PCB-1248 (Aroclor 1248)	--	--	--	MG/KG	0.08 U	0.082 U
PCB-1254 (Aroclor 1254)	--	--	--	MG/KG	0.08 U	0.082 U
PCB-1260 (Aroclor 1260)	--	--	--	MG/KG	0.08 U	0.082 U
PCB-1262 (Aroclor 1262)	--	--	--	MG/KG	0.08 U	0.082 U
PCB-1268 (Aroclor 1268)	--	--	--	MG/KG	0.08 U	0.082 U
Polychlorinated Biphenyl (PCBs)	0.1	1	3.2	MG/KG	0.08 U	0.082 U

Table 7. Summary of Pesticides in Soil, 458 East 99th Street, Brooklyn, New York

				Sample Designation:	B-4	B-4	B-4
				Sample Date:	10/09/2021	10/09/2021	10/09/2021
				Sample Depth (ft bls):	0.5 - 2.5	10 - 12	23 - 25
				Normal Sample or Field Duplicate:	N	N	N
Parameters	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units			
Aldrin	0.005	0.68	0.19	MG/KG	0.0073 U	0.0082 U	0.0083 U
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.02	3.4	0.02	MG/KG	0.0022 U	0.0024 U	0.0025 U
Alpha Endosulfan	2.4	200	102	MG/KG	0.0073 U	0.0082 U	0.0083 U
Beta Bhc (Beta Hexachlorocyclohexane)	0.036	3	0.09	MG/KG	0.0022 U	0.0024 U	0.0025 U
Beta Endosulfan	2.4	200	102	MG/KG	0.0073 U	0.0082 U	0.0083 U
Chlordane (Technical)	--	--	--	MG/KG	0.073 U	0.082 U	0.083 U
Delta BHC (Delta Hexachlorocyclohexane)	0.04	500	0.25	MG/KG	0.0022 U	0.0024 U	0.0025 U
Dieldrin	0.005	1.4	0.1	MG/KG	0.0022 U	0.0024 U	0.0025 U
Endosulfan Sulfate	2.4	200	1000	MG/KG	0.0073 U	0.0082 U	0.0083 U
Endrin	0.014	89	0.06	MG/KG	0.0073 U	0.0082 U	0.0083 U
Endrin Aldehyde	--	--	--	MG/KG	0.0073 U	0.0082 U	0.0083 U
Endrin Ketone	--	--	--	MG/KG	0.0073 U	0.0082 U	0.0083 U
Gamma Bhc (Lindane)	0.1	9.2	0.1	MG/KG	0.0022 U	0.0024 U	0.0025 U
Heptachlor	0.042	15	0.38	MG/KG	0.0073 U	0.0082 U	0.0083 U
Heptachlor Epoxide	--	--	--	MG/KG	0.0073 U	0.0082 U	0.0083 U
Methoxychlor	--	--	--	MG/KG	0.0073 U	0.0082 U	0.0083 U
4,4'-DDD	0.0033	92	14	MG/KG	0.0073 U	0.0082 U	0.0083 U
4,4'-DDE	**0.0033**	62	17	MG/KG	**0.0057 J**	0.0082 U	0.0083 U
4,4'-DDT	**0.0033**	47	136	MG/KG	0.0073 U	0.0082 U	0.0083 U
Toxaphene	--	--	--	MG/KG	0.073 U	0.082 U	0.083 U

Table 7. Summary of Pesticides in Soil, 458 East 99th Street, Brooklyn, New York

				Sample Designation:	B-5	B-5	B-5
				Sample Date:	10/10/2021	10/10/2021	10/10/2021
				Sample Depth (ft bls):	0.5 - 2.5	10 - 12	23 - 25
				Normal Sample or Field Duplicate:	N	N	N
Parameters	NYSDEC Part 375 Unresticted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units			
Aldrin	0.005	0.68	0.19	MG/KG	0.0072 U	0.0082 U	0.0081 U
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.02	3.4	0.02	MG/KG	0.0021 U	0.0025 U	0.0024 U
Alpha Endosulfan	2.4	200	102	MG/KG	0.0072 U	0.0082 U	0.0081 U
Beta Bhc (Beta Hexachlorocyclohexane)	0.036	3	0.09	MG/KG	0.0021 U	0.0025 U	0.0024 U
Beta Endosulfan	2.4	200	102	MG/KG	0.0072 U	0.0082 U	0.0081 U
Chlordane (Technical)	--	--	--	MG/KG	0.072 U	0.082 U	0.081 U
Delta BHC (Delta Hexachlorocyclohexane)	0.04	500	0.25	MG/KG	0.0021 U	0.0025 U	0.0024 U
Dieldrin	0.005	1.4	0.1	MG/KG	0.0021 U	0.0025 U	0.0024 U
Endosulfan Sulfate	2.4	200	1000	MG/KG	0.0072 U	0.0082 U	0.0081 U
Endrin	0.014	89	0.06	MG/KG	0.0072 U	0.0082 U	0.0081 U
Endrin Aldehyde	--	--	--	MG/KG	0.0072 U	0.0082 U	0.0081 U
Endrin Ketone	--	--	--	MG/KG	0.0072 U	0.0082 U	0.0081 U
Gamma Bhc (Lindane)	0.1	9.2	0.1	MG/KG	0.0021 U	0.0025 U	0.0024 U
Heptachlor	0.042	15	0.38	MG/KG	0.0072 U	0.0082 U	0.0081 U
Heptachlor Epoxide	--	--	--	MG/KG	0.0072 U	0.0082 U	0.0081 U
Methoxychlor	--	--	--	MG/KG	0.0072 U	0.0082 U	0.0081 U
4,4'-DDD	0.0033	92	14	MG/KG	0.0072 U	0.0082 U	0.0081 U
4,4'-DDE	**0.0033**	62	17	MG/KG	0.0072 U	0.0082 U	0.0081 U
4,4'-DDT	**0.0033**	47	136	MG/KG	0.0072 U	0.0082 U	0.0081 U
Toxaphene	--	--	--	MG/KG	0.072 U	0.082 U	0.081 U

Table 7. Summary of Pesticides in Soil, 458 East 99th Street, Brooklyn, New York

				Sample Designation:	B-5	B-6	B-6
				Sample Date:	10/10/2021	10/09/2021	10/09/2021
				Sample Depth (ft bls):	23 - 25	0.5 - 2.5	9 - 11
				Normal Sample or Field Duplicate:	FD	N	N
Parameters	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units			
Aldrin	0.005	0.68	0.19	MG/KG	0.0079 U	0.073 U	0.008 U
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.02	3.4	0.02	MG/KG	0.0024 U	0.022 U	0.0024 U
Alpha Endosulfan	2.4	200	102	MG/KG	0.0079 U	0.073 UT	0.008 U
Beta Bhc (Beta Hexachlorocyclohexane)	0.036	3	0.09	MG/KG	0.0024 U	0.022 U	0.0024 U
Beta Endosulfan	2.4	200	102	MG/KG	0.0079 U	0.073 UT	0.008 U
Chlordane (Technical)	--	--	--	MG/KG	0.079 U	0.73 U	0.08 U
Delta BHC (Delta Hexachlorocyclohexane)	0.04	500	0.25	MG/KG	0.0024 U	0.022 U	0.0024 U
Dieldrin	0.005	1.4	0.1	MG/KG	0.0024 U	0.022 U	0.0024 U
Endosulfan Sulfate	2.4	200	1000	MG/KG	0.0079 U	0.073 UT	0.008 U
Endrin	0.014	89	0.06	MG/KG	0.0079 U	0.073 U	0.008 U
Endrin Aldehyde	--	--	--	MG/KG	0.0079 U	0.073 UT	0.008 U
Endrin Ketone	--	--	--	MG/KG	0.0079 U	0.073 U	0.008 U
Gamma Bhc (Lindane)	0.1	9.2	0.1	MG/KG	0.0024 U	0.022 U	0.0024 U
Heptachlor	0.042	15	0.38	MG/KG	0.0079 U	0.073 U	0.008 U
Heptachlor Epoxide	--	--	--	MG/KG	0.0079 U	0.073 UT	0.008 U
Methoxychlor	--	--	--	MG/KG	0.0079 U	0.073 UT	0.008 U
4,4'-DDD	0.0033	92	14	MG/KG	0.0079 U	0.073 U	0.008 U
4,4'-DDE	**0.0033**	62	17	MG/KG	0.0028 J	**1.9 T**	**0.0095**
4,4'-DDT	**0.0033**	47	136	MG/KG	**0.0048 J**	**1.4**	**0.03**
Toxaphene	--	--	--	MG/KG	0.079 U	0.73 U	0.08 U

Table 7. Summary of Pesticides in Soil, 458 East 99th Street, Brooklyn, New York

				Sample Designation:	**B-6**
				Sample Date:	**10/09/2021**
				Sample Depth (ft bls):	**23 - 25**
				Normal Sample or Field Duplicate:	**N**
Parameters	NYSDEC Part 375 Unresticted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	
Aldrin	0.005	0.68	0.19	MG/KG	0.0082 U
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.02	3.4	0.02	MG/KG	0.0025 U
Alpha Endosulfan	2.4	200	102	MG/KG	0.0082 U
Beta Bhc (Beta Hexachlorocyclohexane)	0.036	3	0.09	MG/KG	0.0025 UT
Beta Endosulfan	2.4	200	102	MG/KG	0.0082 U
Chlordane (Technical)	--	--	--	MG/KG	0.082 U
Delta BHC (Delta Hexachlorocyclohexane)	0.04	500	0.25	MG/KG	0.0025 UT
Dieldrin	0.005	1.4	0.1	MG/KG	0.0025 U
Endosulfan Sulfate	2.4	200	1000	MG/KG	0.0082 U
Endrin	0.014	89	0.06	MG/KG	0.0082 U
Endrin Aldehyde	--	--	--	MG/KG	0.0082 U
Endrin Ketone	--	--	--	MG/KG	0.0082 U
Gamma Bhc (Lindane)	0.1	9.2	0.1	MG/KG	0.0025 UT
Heptachlor	0.042	15	0.38	MG/KG	0.0082 UT
Heptachlor Epoxide	--	--	--	MG/KG	0.0082 U
Methoxychlor	--	--	--	MG/KG	0.0082 U
4,4'-DDD	0.0033	92	14	MG/KG	0.0082 U
4,4'-DDE	**0.0033**	62	17	MG/KG	0.0082 U
4,4'-DDT	**0.0033**	47	136	MG/KG	0.0082 U
Toxaphene	--	--	--	MG/KG	0.082 U

Table 8. Summary of Per- and Polyfluoroalkyl Substances in Soil, 458 East 99th Street, Brooklyn, New York

				Sample Designation:	B-4	B-4	B-4
				Sample Date:	10/09/2021	10/09/2021	10/09/2021
				Sample Depth (ft bls):	0.5 - 2.5	10 - 12	23 - 25
				Normal Sample or Field Duplicate:	N	N	N
Parameters	NYSDEC Part 375 Unrestricted Use GV	NYSDEC Part 375 Commercial GV	NYSDEC Part 375 Protection of Groundwater GV	Units			
2-(N-methyl perfluorooctanesulfonamido) acetic acid	--	--	--	UG/KG	0.21 U	0.24 U	0.25 U
N-ethyl perfluorooctanesulfonamidoacetic acid	--	--	--	UG/KG	0.21 U	0.24 U	0.25 U
Perfluorobutanesulfonic acid (PFBS)	--	--	--	UG/KG	0.41 U	0.48 U	0.5 U
Perfluorobutanoic Acid	--	--	--	UG/KG	0.82 U	0.96 U	0.99 U
Perfluorodecane Sulfonic Acid	--	--	--	UG/KG	0.21 U	0.24 U	0.25 U
Perfluorodecanoic acid (PFDA)	--	--	--	UG/KG	0.21 U	0.24 U	0.25 U
Perfluorododecanoic acid (PFDoA)	--	--	--	UG/KG	0.21 U	0.24 U	0.25 U
Perfluoroheptane Sulfonate (PFHPS)	--	--	--	UG/KG	0.21 U	0.24 U	0.25 U
Perfluoroheptanoic acid (PFHpA)	--	--	--	UG/KG	0.21 U	0.24 U	0.25 U
Perfluorohexanesulfonic acid (PFHxS)	--	--	--	UG/KG	0.21 U	0.24 U	0.25 U
Perfluorohexanoic acid (PFHxA)	--	--	--	UG/KG	0.21 U	0.24 U	0.25 U
Perfluorononanoic acid (PFNA)	--	--	--	UG/KG	0.21 U	0.24 U	0.25 U
Perfluorooctane Sulfonamide (FOSA)	--	--	--	UG/KG	0.21 U	0.24 U	0.25 U
Perfluorooctanesulfonic acid (PFOS)	0.88	440	3.7	UG/KG	0.21 U	0.24 U	0.25 U
Perfluorooctanoic acid (PFOA)	0.66	500	1.1	UG/KG	0.21 U	0.24 U	0.25 U
Perfluoropentanoic Acid (PFPeA)	--	--	--	UG/KG	0.21 U	0.24 U	0.25 U
Perfluorotetradecanoic acid (PFTA)	--	--	--	UG/KG	0.21 U	0.24 U	0.25 U
Perfluorotridecanoic Acid (PFTriA)	--	--	--	UG/KG	0.21 U	0.24 U	0.25 U
Perfluoroundecanoic Acid (PFUnA)	--	--	--	UG/KG	0.21 U	0.24 U	0.25 U
Sodium 1H,1H,2H,2H-Perfluorodecane Sulfonate (8:2)	--	--	--	UG/KG	0.62 U	0.72 U	0.74 U
Sodium 1H,1H,2H,2H-Perfluorooctane Sulfonate (6:2)	--	--	--	UG/KG	0.62 U	0.72 U	0.74 U

Table 8. Summary of Per- and Polyfluoroalkyl Substances in Soil, 458 East 99th Street, Brooklyn, New York

				Sample Designation:	B-5	B-5	B-5
				Sample Date:	10/10/2021	10/10/2021	10/10/2021
				Sample Depth (ft bls):	0.5 - 2.5	10 - 12	23 - 25
				Normal Sample or Field Duplicate:	N	N	N
Parameters	NYSDEC Part 375 Unrestricted Use GV	NYSDEC Part 375 Commercial GV	NYSDEC Part 375 Protection of Groundwater GV	Units			
2-(N-methyl perfluorooctanesulfonamido) acetic acid	--	--	--	UG/KG	0.21 U	0.25 U	0.25 U
N-ethyl perfluorooctanesulfonamidoacetic acid	--	--	--	UG/KG	0.21 U	0.25 U	0.25 U
Perfluorobutanesulfonic acid (PFBS)	--	--	--	UG/KG	0.42 U	0.49 U	0.5 U
Perfluorobutanoic Acid	--	--	--	UG/KG	0.84 U	0.98 U	1.01 U
Perfluorodecane Sulfonic Acid	--	--	--	UG/KG	0.21 U	0.25 U	0.25 U
Perfluorodecanoic acid (PFDA)	--	--	--	UG/KG	0.21 U	0.25 U	0.25 U
Perfluorododecanoic acid (PFDoA)	--	--	--	UG/KG	0.21 U	0.25 U	0.25 U
Perfluoroheptane Sulfonate (PFHPS)	--	--	--	UG/KG	0.21 U	0.25 U	0.25 U
Perfluoroheptanoic acid (PFHpA)	--	--	--	UG/KG	0.21 U	0.25 U	0.25 U
Perfluorohexanesulfonic acid (PFHxS)	--	--	--	UG/KG	0.21 U	0.25 U	0.25 U
Perfluorohexanoic acid (PFHxA)	--	--	--	UG/KG	0.21 U	0.25 U	0.25 U
Perfluorononanoic acid (PFNA)	--	--	--	UG/KG	0.21 U	0.25 U	0.25 U
Perfluorooctane Sulfonamide (FOSA)	--	--	--	UG/KG	0.21 U	0.25 U	0.25 U
Perfluorooctanesulfonic acid (PFOS)	0.88	440	3.7	UG/KG	0.21 U	0.25 U	0.25 U
Perfluorooctanoic acid (PFOA)	0.66	500	1.1	UG/KG	0.21 U	0.25 U	0.25 U
Perfluoropentanoic Acid (PFPeA)	--	--	--	UG/KG	0.21 U	0.25 U	0.25 U
Perfluorotetradecanoic acid (PFTA)	--	--	--	UG/KG	0.21 U	0.25 U	0.25 U
Perfluorotridecanoic Acid (PFTriA)	--	--	--	UG/KG	0.21 U	0.25 U	0.25 U
Perfluoroundecanoic Acid (PFUnA)	--	--	--	UG/KG	0.21 U	0.25 U	0.25 U
Sodium 1H,1H,2H,2H-Perfluorodecane Sulfonate (8:2)	--	--	--	UG/KG	0.63 U	0.74 U	0.76 U
Sodium 1H,1H,2H,2H-Perfluorooctane Sulfonate (6:2)	--	--	--	UG/KG	0.63 U	0.74 U	0.76 U

Table 8. Summary of Per- and Polyfluoroalkyl Substances in Soil, 458 East 99th Street, Brooklyn, New York

				Sample Designation:	B-5	B-6	B-6
				Sample Date:	10/10/2021	10/09/2021	10/09/2021
				Sample Depth (ft bls):	23 - 25	0.5 - 2.5	9 - 11
				Normal Sample or Field Duplicate:	FD	N	N
Parameters	NYSDEC Part 375 Unrestricted Use GV	NYSDEC Part 375 Commercial GV	NYSDEC Part 375 Protection of Groundwater GV	Units			
2-(N-methyl perfluorooctanesulfonamido) acetic acid	--	--	--	UG/KG	0.25 U	0.2 U	0.25 U
N-ethyl perfluorooctanesulfonamidoacetic acid	--	--	--	UG/KG	0.25 U	0.2 U	0.25 U
Perfluorobutanesulfonic acid (PFBS)	--	--	--	UG/KG	0.49 U	0.41 U	0.49 U
Perfluorobutanoic Acid	--	--	--	UG/KG	0.98 U	0.81 U	0.99 U
Perfluorodecane Sulfonic Acid	--	--	--	UG/KG	0.25 U	0.2 U	0.25 U
Perfluorodecanoic acid (PFDA)	--	--	--	UG/KG	0.25 U	0.2 U	0.25 U
Perfluorododecanoic acid (PFDoA)	--	--	--	UG/KG	0.25 U	0.2 U	0.25 U
Perfluoroheptane Sulfonate (PFHPS)	--	--	--	UG/KG	0.25 U	0.2 U	0.25 U
Perfluoroheptanoic acid (PFHpA)	--	--	--	UG/KG	0.25 U	0.2 U	0.25 U
Perfluorohexanesulfonic acid (PFHxS)	--	--	--	UG/KG	0.25 U	0.2 U	0.25 U
Perfluorohexanoic acid (PFHxA)	--	--	--	UG/KG	0.25 U	0.2 U	0.25 U
Perfluorononanoic acid (PFNA)	--	--	--	UG/KG	0.25 U	0.2 U	0.25 U
Perfluorooctane Sulfonamide (FOSA)	--	--	--	UG/KG	0.25 U	0.2 U	0.25 U
Perfluorooctanesulfonic acid (PFOS)	0.88	440	3.7	UG/KG	0.25 U	0.2 U	0.25 U
Perfluorooctanoic acid (PFOA)	0.66	500	1.1	UG/KG	0.25 U	0.2 U	0.25 U
Perfluoropentanoic Acid (PFPeA)	--	--	--	UG/KG	0.25 U	0.2 U	0.25 U
Perfluorotetradecanoic acid (PFTA)	--	--	--	UG/KG	0.25 U	0.2 U	0.25 U
Perfluorotridecanoic Acid (PFTriA)	--	--	--	UG/KG	0.25 U	0.2 U	0.25 U
Perfluoroundecanoic Acid (PFUnA)	--	--	--	UG/KG	0.25 U	0.2 U	0.25 U
Sodium 1H,1H,2H,2H-Perfluorodecane Sulfonate (8:2)	--	--	--	UG/KG	0.74 U	0.61 U	0.74 U
Sodium 1H,1H,2H,2H-Perfluorooctane Sulfonate (6:2)	--	--	--	UG/KG	0.74 U	0.61 U	0.74 U

Table 8. Summary of Per- and Polyfluoroalkyl Substances in Soil, 458 East 99th Street, Brooklyn, New York

				Sample Designation:	B-6
				Sample Date:	10/09/2021
				Sample Depth (ft bls):	23 - 25
				Normal Sample or Field Duplicate:	N
Parameters	NYSDEC Part 375 Unrestricted Use GV	NYSDEC Part 375 Commercial GV	NYSDEC Part 375 Protection of Groundwater GV	Units	
2-(N-methyl perfluorooctanesulfonamido) acetic acid	--	--	--	UG/KG	0.25 U
N-ethyl perfluorooctanesulfonamidoacetic acid	--	--	--	UG/KG	0.25 U
Perfluorobutanesulfonic acid (PFBS)	--	--	--	UG/KG	0.5 U
Perfluorobutanoic Acid	--	--	--	UG/KG	1.01 U
Perfluorodecane Sulfonic Acid	--	--	--	UG/KG	0.25 U
Perfluorodecanoic acid (PFDA)	--	--	--	UG/KG	0.25 U
Perfluorododecanoic acid (PFDoA)	--	--	--	UG/KG	0.25 U
Perfluoroheptane Sulfonate (PFHPS)	--	--	--	UG/KG	0.25 U
Perfluoroheptanoic acid (PFHpA)	--	--	--	UG/KG	0.25 U
Perfluorohexanesulfonic acid (PFHxS)	--	--	--	UG/KG	0.25 U
Perfluorohexanoic acid (PFHxA)	--	--	--	UG/KG	0.25 U
Perfluorononanoic acid (PFNA)	--	--	--	UG/KG	0.25 U
Perfluorooctane Sulfonamide (FOSA)	--	--	--	UG/KG	0.25 U
Perfluorooctanesulfonic acid (PFOS)	0.88	440	3.7	UG/KG	0.25 U
Perfluorooctanoic acid (PFOA)	0.66	500	1.1	UG/KG	0.25 U
Perfluoropentanoic Acid (PFPeA)	--	--	--	UG/KG	0.25 U
Perfluorotetradecanoic acid (PFTA)	--	--	--	UG/KG	0.25 U
Perfluorotridecanoic Acid (PFTriA)	--	--	--	UG/KG	0.25 U
Perfluoroundecanoic Acid (PFUnA)	--	--	--	UG/KG	0.25 U
Sodium 1H,1H,2H,2H-Perfluorodecane Sulfonate (8:2)	--	--	--	UG/KG	0.76 U
Sodium 1H,1H,2H,2H-Perfluorooctane Sulfonate (6:2)	--	--	--	UG/KG	0.76 U

Table 9. Summary of Volatile Organic Compounds in Groundwater, 458 East 99th Street, Brooklyn, New York

Sample Designation:			GW-4S	GW-4D	GW-5S	GW-5D	GW-6S	GW-6D	GW-6D
Sample Date:			10/23/2021	10/23/2021	10/23/2021	10/23/2021	10/17/2021	10/17/2021	10/17/2021
Normal Sample or Field Duplicate:			N	N	N	N	N	N	FD
Parameters	NYSDEC Ambient Water Quality Standards and Guidance Values	Units							
1,1,1-Trichloroethane (TCA)	**5**	UG/L	1 U	**5.3**	1 U	1 U	**12**	**7.7**	**7.8**
1,1,2,2-Tetrachloroethane	5	UG/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	5	UG/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1,2-Trichloroethane	1	UG/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1-Dichloroethane	**5**	UG/L	1 U	2.6	1 U	2.1	**59**	**26**	**27**
1,1-Dichloroethene	**5**	UG/L	1 U	0.99 J	1 U	1 U	1.4	0.85 J	0.88 J
1,2,3-Trichlorobenzene	5	UG/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2,4-Trichlorobenzene	5	UG/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-Dibromo-3-Chloropropane	0.04	UG/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-Dibromoethane (Ethylene Dibromide)	0.0006	UG/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-Dichlorobenzene	3	UG/L	1 U	1 U	1 U	0.4 J	1 U	1 U	1 U
1,2-Dichloroethane	**0.6**	UG/L	1 U	1 U	1 U	1 U	1 UJ	1 UJ	1 UJ
1,2-Dichloropropane	1	UG/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,3-Dichlorobenzene	3	UG/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,4-Dichlorobenzene	3	UG/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U
2-Hexanone	50	UG/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Acetone	50	UG/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Benzene	1	UG/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Bromochloromethane	5	UG/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Bromodichloromethane	50	UG/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Bromoform	50	UG/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Bromomethane	5	UG/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Carbon Disulfide	60	UG/L	1 U	1 U	43	1 U	1 U	1 U	1 U
Carbon Tetrachloride	5	UG/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Chlorobenzene	5	UG/L	1 U	1 U	1 U	0.45 J	1 UJ	1 UJ	1 UJ
Chloroethane	**5**	UG/L	1 U	1 U	1 U	1 U	**43**	**19**	**19**
Chloroform	7	UG/L	1 U	1 U	1	1 U	0.48 J	0.4 J	0.53 J
Chloromethane	5	UG/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Cis-1,2-Dichloroethylene	**5**	UG/L	3.2	4	0.45 J	3.7	**32**	**16**	**17**
Cis-1,3-Dichloropropene	5	UG/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Cyclohexane	--	UG/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U

Table 9. Summary of Volatile Organic Compounds in Groundwater, 458 East 99th Street, Brooklyn, New York

		Sample Designation:	GW-4S	GW-4D	GW-5S	GW-5D	GW-6S	GW-6D	GW-6D
		Sample Date:	10/23/2021	10/23/2021	10/23/2021	10/23/2021	10/17/2021	10/17/2021	10/17/2021
		Normal Sample or Field Duplicate:	N	N	N	N	N	N	FD
Parameters	NYSDEC Ambient Water Quality Standards and Guidance Values	Units							
Dibromochloromethane	50	UG/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Dichlorodifluoromethane	5	UG/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Ethylbenzene	5	UG/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Isopropylbenzene (Cumene)	5	UG/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U
m,p-Xylene	5	UG/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Methyl Acetate	--	UG/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Methyl Ethyl Ketone (2-Butanone)	50	UG/L	5 UT	5 U	5 U	5 U	5 U	5 U	5 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	UG/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Methylcyclohexane	--	UG/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Methylene Chloride	5	UG/L	1 U	1 U	1 U	1 U	1.5 U	1 U	1 U
O-Xylene (1,2-Dimethylbenzene)	5	UG/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Styrene	5	UG/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Tert-Butyl Methyl Ether	10	UG/L	0.38 J	1 U	1 U	1 U	1 U	1 U	1 U
Tetrachloroethene (PCE)	**5**	UG/L	**11**	**10**	**8.5**	0.39 J	**6.8**	0.73 J	0.71 J
Toluene	5	UG/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Trans-1,2-Dichloroethene	5	UG/L	1 U	0.44 J	0.39 J	0.66 J	0.32 J	0.36 J	0.44 J
Trans-1,3-Dichloropropene	--	UG/L	1 U	1 U	1 U	1 U	1 UJ	1 UJ	1 UJ
Trichloroethene (TCE)	**5**	UG/L	3.5	**59**	0.71 J	2.1	**13**	**12**	**12**
Trichlorofluoromethane	5	UG/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Vinyl Chloride	**2**	UG/L	0.92 J	1 U	1 U	0.77 J	**23**	**7.6**	**7.7**

Table 9. Summary of Volatile Organic Compounds in Groundwater, 458 East 99th Street, Brooklyn, New York

		Sample Designation:	GW-7S	GW-7D	GW-8S	GW-8D
		Sample Date:	10/17/2021	10/17/2021	10/23/2021	10/23/2021
		Normal Sample or Field Duplicate:	N	N	N	N
Parameters	NYSDEC Ambient Water Quality Standards and Guidance Values	Units				
1,1,1-Trichloroethane (TCA)	**5**	UG/L	0.61 J	**62**	1 U	4
1,1,2,2-Tetrachloroethane	5	UG/L	1 U	1 U	1 U	1 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	5	UG/L	1 U	1 U	1 U	1 U
1,1,2-Trichloroethane	1	UG/L	1 U	1 U	1 U	1 U
1,1-Dichloroethane	**5**	UG/L	**6.1**	**370**	1 U	**5.2**
1,1-Dichloroethene	**5**	UG/L	1 U	**6.8**	1 U	0.6 J
1,2,3-Trichlorobenzene	5	UG/L	1 U	1 U	1 U	1 U
1,2,4-Trichlorobenzene	5	UG/L	1 U	1 U	1 U	1 U
1,2-Dibromo-3-Chloropropane	0.04	UG/L	1 U	1 U	1 U	1 U
1,2-Dibromoethane (Ethylene Dibromide)	0.0006	UG/L	1 U	1 U	1 U	1 U
1,2-Dichlorobenzene	3	UG/L	1 U	1 U	1 U	1 U
1,2-Dichloroethane	**0.6**	UG/L	1 UJ	**1.6**	1 U	1 U
1,2-Dichloropropane	1	UG/L	1 U	1 U	1 U	1 U
1,3-Dichlorobenzene	3	UG/L	1 U	1 U	1 U	1 U
1,4-Dichlorobenzene	3	UG/L	1 U	1 U	1 U	1 U
2-Hexanone	50	UG/L	5 U	5 U	5 U	5 U
Acetone	50	UG/L	5 U	5 U	5 U	5 U
Benzene	1	UG/L	1 U	1 U	1 U	1 U
Bromochloromethane	5	UG/L	1 U	1 U	1 U	1 U
Bromodichloromethane	50	UG/L	1 U	1 U	1 U	1 U
Bromoform	50	UG/L	1 U	1 U	1 U	1 U
Bromomethane	5	UG/L	1 U	1 U	1 U	1 U
Carbon Disulfide	60	UG/L	1 U	1 U	1 U	1 U
Carbon Tetrachloride	5	UG/L	1 U	1 U	1 U	1 U
Chlorobenzene	5	UG/L	1 UJ	1 U	1 U	1 U
Chloroethane	**5**	UG/L	1.8	**310 D**	1 U	1 U
Chloroform	7	UG/L	1 U	0.36 J	0.66 J	1 U
Chloromethane	5	UG/L	1 U	1 U	1 U	1 U
Cis-1,2-Dichloroethylene	**5**	UG/L	3.1	**340**	1.3	3.1
Cis-1,3-Dichloropropene	5	UG/L	1 U	1 U	1 U	1 U
Cyclohexane	--	UG/L	1 U	1 U	1 U	1 U

Table 9. Summary of Volatile Organic Compounds in Groundwater, 458 East 99th Street, Brooklyn, New York

		Sample Designation:	**GW-7S**	**GW-7D**	**GW-8S**	**GW-8D**
		Sample Date:	**10/17/2021**	**10/17/2021**	**10/23/2021**	**10/23/2021**
		Normal Sample or Field Duplicate:	**N**	**N**	**N**	**N**
Parameters	NYSDEC Ambient Water Quality Standards and Guidance Values	Units				
Dibromochloromethane	50	UG/L	1 U	1 U	1 U	1 U
Dichlorodifluoromethane	5	UG/L	1 U	1 U	1 U	1 U
Ethylbenzene	5	UG/L	1 U	1 U	1 U	1 U
Isopropylbenzene (Cumene)	5	UG/L	1 U	1 U	1 U	1 U
m,p-Xylene	5	UG/L	1 U	1 U	1 U	1 U
Methyl Acetate	--	UG/L	5 U	5 U	5 U	5 U
Methyl Ethyl Ketone (2-Butanone)	50	UG/L	5 U	5 U	5 U	5 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	UG/L	5 U	5 U	5 U	5 U
Methylcyclohexane	--	UG/L	1 U	1 U	1 U	1 U
Methylene Chloride	5	UG/L	1 U	4.2 U	1 U	1 U
O-Xylene (1,2-Dimethylbenzene)	5	UG/L	1 U	1.7	1 U	1 U
Styrene	5	UG/L	1 U	1 U	1 U	1 U
Tert-Butyl Methyl Ether	10	UG/L	1 U	1 U	0.74 J	1 U
Tetrachloroethene (PCE)	**5**	UG/L	0.92 J	1.6	**5.5**	2.9
Toluene	5	UG/L	1 U	1 U	1 U	1 U
Trans-1,2-Dichloroethene	5	UG/L	1 U	1.6	1 U	1 U
Trans-1,3-Dichloropropene	--	UG/L	1 UJ	1 U	1 U	1 U
Trichloroethene (TCE)	**5**	UG/L	2.2	**34**	1.4	**12**
Trichlorofluoromethane	5	UG/L	1 U	1 U	1 U	1 U
Vinyl Chloride	**2**	UG/L	0.94 J	**180 D**	0.89 J	1.4

Table 10. Summary of Semivolatile Organic Compounds in Groundwater, 458 East 99th Street, Brooklyn, New York

		Sample Designation:	GW-4S	GW-4D	GW-5S	GW-5D	GW-6S	GW-6D	GW-6D
		Sample Date:	10/23/2021	10/23/2021	10/23/2021	10/23/2021	10/17/2021	10/17/2021	10/17/2021
		Normal Sample or Field Duplicate:	N	N	N	N	N	N	FD
Parameters	NYSDEC Ambient Water Quality Standards and Guidance Values	Units							
1,2,4,5-Tetrachlorobenzene	5	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,4-Dioxane (P-Dioxane)	0.35	UG/L	0.2 UJ	0.2 U	0.2 U	0.33	0.2 U	0.2 U	0.2 U
2,3,4,6-Tetrachlorophenol	--	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2,4,5-Trichlorophenol	--	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2,4,6-Trichlorophenol	--	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2,4-Dichlorophenol	5	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2,4-Dimethylphenol	50	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2,4-Dinitrophenol	10	UG/L	20 U	20 U	20 U	20 U	20 U	20 U	20 U
2,4-Dinitrotoluene	5	UG/L	2 U	2 U	2 U	2 U	2 U	2 U	2 U
2,6-Dinitrotoluene	5	UG/L	2 U	2 U	2 U	2 U	2 U	2 U	2 U
2-Chloronaphthalene	10	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2-Chlorophenol	--	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2-Methylnaphthalene	--	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2-Methylphenol (O-Cresol)	--	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2-Nitroaniline	5	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2-Nitrophenol	--	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
3,3'-Dichlorobenzidine	5	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
3-Nitroaniline	5	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
4,6-Dinitro-2-Methylphenol	--	UG/L	20 U	20 U	20 U	20 U	20 U	20 U	20 U
4-Bromophenyl Phenyl Ether	--	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-Chloro-3-Methylphenol	--	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-Chloroaniline	5	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-Chlorophenyl Phenyl Ether	--	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-Methylphenol (P-Cresol)	--	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-Nitroaniline	5	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-Nitrophenol	--	UG/L	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Acenaphthene	20	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Acenaphthylene	20	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Acetophenone	--	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Anthracene	50	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Atrazine	7.5	UG/L	2 UT	2 UT	2 UT	2 UT	2 U	2 U	2 U

Table 10. Summary of Semivolatile Organic Compounds in Groundwater, 458 East 99th Street, Brooklyn, New York

		Sample Designation:	GW-4S	GW-4D	GW-5S	GW-5D	GW-6S	GW-6D	GW-6D
		Sample Date:	10/23/2021	10/23/2021	10/23/2021	10/23/2021	10/17/2021	10/17/2021	10/17/2021
		Normal Sample or Field Duplicate:	N	N	N	N	N	N	FD
Parameters	NYSDEC Ambient Water Quality Standards and Guidance Values	Units							
Benzaldehyde	--	UG/L	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ
Benzo(A)Anthracene	0.002	UG/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Benzo(A)Pyrene	0	UG/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Benzo(B)Fluoranthene	0.002	UG/L	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Benzo(G,H,I)Perylene	--	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Benzo(K)Fluoranthene	0.002	UG/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Benzyl Butyl Phthalate	50	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Biphenyl (Diphenyl)	5	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Bis(2-Chloroethoxy) Methane	5	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	1	UG/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Bis(2-Chloroisopropyl) Ether	5	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Bis(2-Ethylhexyl) Phthalate	5	UG/L	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Caprolactam	--	UG/L	10 UT	10 U	10 U	10 U	10 U	10 U	10 U
Carbazole	--	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Chrysene	0.002	UG/L	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Dibenz(A,H)Anthracene	--	UG/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Dibenzofuran	--	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Diethyl Phthalate	50	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Dimethyl Phthalate	50	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Di-N-Butyl Phthalate	50	UG/L	10 UT	10 U	10 U	10 U	10 U	10 U	10 U
Di-N-Octylphthalate	--	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Fluoranthene	50	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Fluorene	50	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Hexachlorobenzene	0.04	UG/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Hexachlorobutadiene	0.5	UG/L	1 UT	1 U	1 U	1 U	1 U	1 U	1 U
Hexachlorocyclopentadiene	5	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Hexachloroethane	5	UG/L	2 UT	2 U	2 U	2 U	2 U	2 U	2 U
Indeno(1,2,3-C,D)Pyrene	0.002	UG/L	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Isophorone	50	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Naphthalene	10	UG/L	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Nitrobenzene	0.4	UG/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U

Table 10. Summary of Semivolatile Organic Compounds in Groundwater, 458 East 99th Street, Brooklyn, New York

		Sample Designation:	GW-4S	GW-4D	GW-5S	GW-5D	GW-6S	GW-6D	GW-6D
		Sample Date:	10/23/2021	10/23/2021	10/23/2021	10/23/2021	10/17/2021	10/17/2021	10/17/2021
		Normal Sample or Field Duplicate:	N	N	N	N	N	N	FD
Parameters	NYSDEC Ambient Water Quality Standards and Guidance Values	Units							
N-Nitrosodi-N-Propylamine	--	UG/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U
N-Nitrosodiphenylamine	50	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Pentachlorophenol	1	UG/L	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Phenanthrene	50	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Phenol	1	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Pyrene	50	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U

Table 10. Summary of Semivolatile Organic Compounds in Groundwater, 458 East 99th Street, Brooklyn, New York

		Sample Designation:	GW-7S	GW-7D	GW-8S	GW-8D
		Sample Date:	10/17/2021	10/17/2021	10/23/2021	10/23/2021
		Normal Sample or Field Duplicate:	N	N	N	N
Parameters	NYSDEC Ambient Water Quality Standards and Guidance Values	Units				
1,2,4,5-Tetrachlorobenzene	5	UG/L	10 U	10 U	10 U	10 U
1,4-Dioxane (P-Dioxane)	0.35	UG/L	0.2 U	0.2 U	0.2 U	0.2 U
2,3,4,6-Tetrachlorophenol	--	UG/L	10 U	10 U	10 U	10 U
2,4,5-Trichlorophenol	--	UG/L	10 U	10 U	10 U	10 U
2,4,6-Trichlorophenol	--	UG/L	10 U	10 U	10 U	10 U
2,4-Dichlorophenol	5	UG/L	10 U	10 U	10 U	10 U
2,4-Dimethylphenol	50	UG/L	10 U	10 U	10 U	10 U
2,4-Dinitrophenol	10	UG/L	20 U	20 U	20 U	20 U
2,4-Dinitrotoluene	5	UG/L	2 U	2 U	2 U	2 U
2,6-Dinitrotoluene	5	UG/L	2 U	2 U	2 U	2 U
2-Chloronaphthalene	10	UG/L	10 U	10 U	10 U	10 U
2-Chlorophenol	--	UG/L	10 U	10 U	10 U	10 U
2-Methylnaphthalene	--	UG/L	10 U	10 U	10 U	10 U
2-Methylphenol (O-Cresol)	--	UG/L	10 U	10 U	10 U	10 U
2-Nitroaniline	5	UG/L	10 U	10 U	10 U	10 U
2-Nitrophenol	--	UG/L	10 U	10 U	10 U	10 U
3,3'-Dichlorobenzidine	5	UG/L	10 U	10 U	10 U	10 U
3-Nitroaniline	5	UG/L	10 U	10 U	10 U	10 U
4,6-Dinitro-2-Methylphenol	--	UG/L	20 U	20 U	20 U	20 U
4-Bromophenyl Phenyl Ether	--	UG/L	10 U	10 U	10 U	10 U
4-Chloro-3-Methylphenol	--	UG/L	10 U	10 U	10 U	10 U
4-Chloroaniline	5	UG/L	10 U	10 U	10 U	10 U
4-Chlorophenyl Phenyl Ether	--	UG/L	10 U	10 U	10 U	10 U
4-Methylphenol (P-Cresol)	--	UG/L	10 U	10 U	10 U	10 U
4-Nitroaniline	5	UG/L	10 U	10 U	10 U	10 U
4-Nitrophenol	--	UG/L	20 U	20 U	20 U	20 U
Acenaphthene	20	UG/L	10 U	10 U	10 U	10 U
Acenaphthylene	20	UG/L	10 U	10 U	10 U	10 U
Acetophenone	--	UG/L	10 U	10 U	10 U	10 U
Anthracene	50	UG/L	10 U	10 U	10 U	10 U
Atrazine	7.5	UG/L	2 U	2 U	2 UT	2 UT

Table 10. Summary of Semivolatile Organic Compounds in Groundwater, 458 East 99th Street, Brooklyn, New York

		Sample Designation:	GW-7S	GW-7D	GW-8S	GW-8D
		Sample Date:	10/17/2021	10/17/2021	10/23/2021	10/23/2021
		Normal Sample or Field Duplicate:	N	N	N	N
Parameters	NYSDEC Ambient Water Quality Standards and Guidance Values	Units				
Benzaldehyde	--	UG/L	10 UJ	10 UJ	10 UJ	10 UJ
Benzo(A)Anthracene	0.002	UG/L	1 U	1 U	1 U	1 U
Benzo(A)Pyrene	0	UG/L	1 U	1 U	1 U	1 U
Benzo(B)Fluoranthene	0.002	UG/L	2 U	2 U	2 U	2 U
Benzo(G,H,I)Perylene	--	UG/L	10 U	10 U	10 U	10 U
Benzo(K)Fluoranthene	0.002	UG/L	1 U	1 U	1 U	1 U
Benzyl Butyl Phthalate	50	UG/L	10 U	10 U	10 U	10 U
Biphenyl (Diphenyl)	5	UG/L	10 U	10 U	10 U	10 U
Bis(2-Chloroethoxy) Methane	5	UG/L	10 U	10 U	10 U	10 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	1	UG/L	1 U	1 U	1 U	1 U
Bis(2-Chloroisopropyl) Ether	5	UG/L	10 U	10 U	10 U	10 U
Bis(2-Ethylhexyl) Phthalate	5	UG/L	2 U	2 U	2 U	2 U
Caprolactam	--	UG/L	10 U	10 U	10 U	10 U
Carbazole	--	UG/L	10 U	10 U	10 U	10 U
Chrysene	0.002	UG/L	2 U	2 U	2 U	2 U
Dibenz(A,H)Anthracene	--	UG/L	1 U	1 U	1 U	1 U
Dibenzofuran	--	UG/L	10 U	10 U	10 U	10 U
Diethyl Phthalate	50	UG/L	10 U	10 U	10 U	10 U
Dimethyl Phthalate	50	UG/L	10 U	10 U	10 U	10 U
Di-N-Butyl Phthalate	50	UG/L	10 U	10 U	10 U	10 U
Di-N-Octylphthalate	--	UG/L	10 U	10 U	10 U	10 U
Fluoranthene	50	UG/L	10 U	10 U	10 U	10 U
Fluorene	50	UG/L	10 U	10 U	10 U	10 U
Hexachlorobenzene	0.04	UG/L	1 U	1 U	1 U	1 U
Hexachlorobutadiene	0.5	UG/L	1 U	1 U	1 U	1 U
Hexachlorocyclopentadiene	5	UG/L	10 U	10 U	10 U	10 U
Hexachloroethane	5	UG/L	2 U	2 U	2 U	2 U
Indeno(1,2,3-C,D)Pyrene	0.002	UG/L	2 U	2 U	2 U	2 U
Isophorone	50	UG/L	10 U	10 U	10 U	10 U
Naphthalene	10	UG/L	2 U	2 U	2 U	2 U
Nitrobenzene	0.4	UG/L	1 U	1 U	1 U	1 U

Table 10. Summary of Semivolatile Organic Compounds in Groundwater, 458 East 99th Street, Brooklyn, New York

		Sample Designation:	**GW-7S**	**GW-7D**	**GW-8S**	**GW-8D**
		Sample Date:	**10/17/2021**	**10/17/2021**	**10/23/2021**	**10/23/2021**
		Normal Sample or Field Duplicate:	**N**	**N**	**N**	**N**
Parameters	NYSDEC Ambient Water Quality Standards and Guidance Values	Units				
N-Nitrosodi-N-Propylamine	--	UG/L	1 U	1 U	1 U	1 U
N-Nitrosodiphenylamine	50	UG/L	10 U	10 U	10 U	10 U
Pentachlorophenol	1	UG/L	20 U	20 U	20 U	20 U
Phenanthrene	50	UG/L	10 U	10 U	10 U	10 U
Phenol	1	UG/L	10 U	10 U	10 U	10 U
Pyrene	50	UG/L	10 U	10 U	10 U	10 U

Table 11. Summary of Metals in Groundwater, 458 East 99th Street, Brooklyn, New York

		Sample Designation:	GW-4S	GW-4S	GW-4D	GW-4D	GW-5S	GW-5S	GW-5D	GW-5D	GW-6S
		Sample Date:	10/23/2021	10/23/2021	10/23/2021	10/23/2021	10/23/2021	10/23/2021	10/23/2021	10/23/2021	10/17/2021
		Normal Sample or Field Duplicate:	N	N	N	N	N	N	N	N	N
		Total or Dissolved:	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total
Parameters	NYSDEC Ambient Water Quality Standards and Guidance Values	Units									
Aluminum	--	UG/L	227	40 UJ	418	40 UJ	1240	40 UJ	677	40 UJ	602
Antimony	3	UG/L	2 U	2 UJ	2 U	2 UJ	2 U	2 UJ	2 U	2 UJ	2 U
Arsenic	25	UG/L	2.3	2 UJ	1.4 J	2 UJ	1.8 J	2 UJ	1.2 J	2 UJ	2 U
Barium	1000	UG/L	470	340 J-	106	95.1 J-	66.3	46.1 J-	74.2	53.7 J-	33.8
Beryllium	3	UG/L	0.8 U	0.8 UJ	0.8 U	0.8 UJ	0.8 U	0.8 UJ	0.8 U	0.8 UJ	0.8 U
Cadmium	5	UG/L	2 U	2 UJ	2 U	2 UJ	2 U	2 UJ	2 U	2 UJ	2 U
Calcium	--	UG/L	300000	310000 J-	59900	61900 J-	91700	89900 J-	60000	57500 J-	44000
Chromium, Total	50	UG/L	4 U	4 UJ	4 U	4 UJ	2.7 J	4 UJ	3.1 J	4 UJ	4 U
Cobalt	--	UG/L	1.3 J	1.1 J-	5.5	5.4 J-	2.8 J	1.6 J-	2.3 J	1.8 J-	2.6 J
Copper	200	UG/L	4 U	4 UJ	4 U	4 UJ	7.2	4 UJ	4 U	4 UJ	4 U
Iron	**300**	UG/L	**19900**	120 UJ	**20300**	**3500 J-**	**3880**	120 UJ	**20400**	**2220 J-**	**749**
Lead	**25**	UG/L	1.4	1.2 UJ	1.5	1.2 UJ	17.4	1.2 UJ	1.9	1.2 UJ	1.2 U
Magnesium	35000	UG/L	28500	27600 J-	9370	9510 J-	5550	5960 J-	12200	11500 J-	8600
Manganese	**300**	UG/L	**2950**	**2810 J-**	**1230**	**1260 J-**	**697**	**748 J-**	**1670**	**1550 J-**	**2400**
Mercury	0.7	UG/L	0.2 U	0.2 UJ	0.2 U	0.2 UJ	0.2 U	0.2 UJ	0.2 U	0.2 UJ	0.2 U
Nickel	100	UG/L	1.6 J	4 UJ	1.5 J	4 UJ	1.9 J	4 UJ	4 U	4 UJ	3.1 J
Potassium	--	UG/L	38700	37600 J-	9760	9930 J-	6410	7030 J-	7330	6820 J-	5050
Selenium	10	UG/L	0.61 J	0.79 J-	0.61 J	2.5 UJ	2.5 U	2.5 UJ	2.5 U	2.5 UJ	1.1 J
Silver	50	UG/L	2 U	2 UJ	2 U	2 UJ	2 U	2 UJ	2 U	2 UJ	2 U
Sodium	**20000**	UG/L	**324000**	**321000 J-**	**81600**	**84100 J-**	**20800 J**	**24500 J**	**66700**	**61500 J-**	**55800**
Thallium	0.5	UG/L	0.8 U	0.8 UJ	0.8 U	0.8 UJ	0.8 U	0.8 UJ	0.8 U	0.8 UJ	0.8 U
Vanadium	--	UG/L	1.5 J	4 UJ	0.83 J	4 UJ	7.3	4 UJ	0.79 J	4 UJ	0.69 J
Zinc	2000	UG/L	29.8	13.8 J-	22.2	11.6 J-	14.7 J	16 UJ	7.1 J	16 UJ	15.7 J

Table 11. Summary of Metals in Groundwater, 458 East 99th Street, Brooklyn, New York

		Sample Designation:	**GW-6S**	**GW-6D**	**GW-6D**	**GW-6D**	**GW-6D**	**GW-7S**	**GW-7S**	**GW-7D**	**GW-7D**
		Sample Date:	**10/17/2021**	**10/17/2021**	**10/17/2021**	**10/17/2021**	**10/17/2021**	**10/17/2021**	**10/17/2021**	**10/17/2021**	**10/17/2021**
		Normal Sample or Field Duplicate:	**N**	**N**	**N**	**FD**	**FD**	**N**	**N**	**N**	**N**
		Total or Dissolved:	**Dissolved**	**Total**	**Dissolved**	**Total**	**Dissolved**	**Total**	**Dissolved**	**Total**	**Dissolved**
Parameters	NYSDEC Ambient Water Quality Standards and Guidance Values	Units									
Aluminum	--	UG/L	40 UJ	1040	40 UJ	963	40 UJ	70.2	40 UJ	219	40 UJ
Antimony	3	UG/L	2 UJ	2 U	2 UJ	2 U	2 UJ	2 U	2 UJ	2 U	2 UJ
Arsenic	25	UG/L	2 UJ	2 U	0.9 J-	2 U	2 UJ	2 U	2 UJ	2 U	2 UJ
Barium	1000	UG/L	34.2 J-	40.4	33.2 J-	38.9	31.1 J-	68.2	71.1 J-	31.1	31.9 J-
Beryllium	3	UG/L	0.8 UJ	0.8 U	0.8 UJ	0.8 U	0.8 UJ	0.8 U	0.8 UJ	0.8 U	0.8 UJ
Cadmium	5	UG/L	2 UJ	2 U	2 UJ	2 U	2 UJ	2 U	2 UJ	2 U	2 UJ
Calcium	--	UG/L	46900 J-	22900	22100 J-	23000	19400 J-	79900	82900 J-	19000	20900 J-
Chromium, Total	50	UG/L	4 UJ	4.7	4 UJ	4.6	4 UJ	4 U	4 UJ	4 U	4 UJ
Cobalt	--	UG/L	2.7 J-	2.2 J	1.4 J-	2.1 J	0.9 J-	0.75 J	0.82 J-	1.3 J	1.1 J-
Copper	200	UG/L	4 UJ	3.3 J	4 UJ	3.2 J	4 UJ	4 U	4 UJ	4 U	4 UJ
Iron	**300**	UG/L	72.3 J-	**2020**	120 UJ	**1840**	120 UJ	197	118 J-	**2120**	99.7 J-
Lead	**25**	UG/L	1.2 UJ	1.2 U	1.2 UJ	1.2 U	1.2 UJ	1.2 U	1.2 UJ	1.2 U	1.2 UJ
Magnesium	35000	UG/L	8540 J-	5240	4180 J-	5130	3450 J-	13500	13500 J-	3870	4190 J-
Manganese	**300**	UG/L	**2630 J-**	**559**	**608 J-**	**569**	**485 J-**	**2980**	**3000 J-**	**519**	**500 J-**
Mercury	0.7	UG/L	0.2 UJ	0.2 U	0.2 UJ	0.2 U	0.2 UJ	0.2 U	0.2 UJ	0.2 U	0.2 UJ
Nickel	100	UG/L	2.7 J-	3.6 J	1.4 J-	3.8 J	1.1 J-	1.7 J	1.7 J-	2.8 J	2.5 J-
Potassium	--	UG/L	5120 J-	5360	4880 J-	5250	4600 J-	5670	5890 J-	4770	4690 J-
Selenium	10	UG/L	1 J-	2.5 U	2.5 UJ	2.5 U	2.5 UJ	4.3	4.6 J-	2.5 U	0.75 J-
Silver	50	UG/L	2 UJ	2 U	2 UJ	2 U	2 UJ	2 U	2 UJ	2 U	2 UJ
Sodium	**20000**	UG/L	**57500 J-**	**28000**	**24900 J-**	**28000**	**22000 J-**	**92100**	**87000 J-**	**31400**	**29400 J-**
Thallium	0.5	UG/L	0.8 UJ	0.8 U	0.8 UJ	0.8 U	0.8 UJ	0.8 U	0.8 UJ	0.8 U	0.8 UJ
Vanadium	--	UG/L	4 UJ	3.4 J	4 UJ	3.4 J	4 UJ	4 U	4 UJ	4 U	4 UJ
Zinc	2000	UG/L	22.1 J	6.9 J	15.3 J-	8.4 J	16 UJ	16 U	10.4 J-	14.4 J	16 UJ

Table 11. Summary of Metals in Groundwater, 458 East 99th Street, Brooklyn, New York

Sample Designation:			GW-8S	GW-8S	GW-8D	GW-8D
Sample Date:			10/23/2021	10/23/2021	10/23/2021	10/23/2021
Normal Sample or Field Duplicate:			N	N	N	N
Total or Dissolved:			Total	Dissolved	Total	Dissolved
Parameters	NYSDEC Ambient Water Quality Standards and Guidance Values	Units				
Aluminum	--	UG/L	1940	40 UJ	260	40 UJ
Antimony	3	UG/L	0.92 J	2 UJ	2 U	2 UJ
Arsenic	25	UG/L	5.1	2 UJ	1.4 J	2 UJ
Barium	1000	UG/L	501	323 J-	126	111 J-
Beryllium	3	UG/L	0.15 J	0.8 UJ	0.8 U	0.8 UJ
Cadmium	5	UG/L	2 U	2 UJ	2 U	2 UJ
Calcium	--	UG/L	134000	148000 J-	65600	63000 J-
Chromium, Total	50	UG/L	6.5	4 UJ	4 U	4 UJ
Cobalt	--	UG/L	2.3 J	1.4 J-	1 J	1.2 J-
Copper	200	UG/L	56.1	4 UJ	4 U	4 UJ
Iron	**300**	UG/L	**31300**	120 UJ	**9580**	**1600 J-**
Lead	**25**	UG/L	**148**	1.2 UJ	1.2 U	1.2 UJ
Magnesium	35000	UG/L	11100	12400 J-	7490	7690 J-
Manganese	**300**	UG/L	**1610**	**1770 J-**	**1260**	**1250 J-**
Mercury	0.7	UG/L	0.24	0.2 UJ	0.2 U	0.2 UJ
Nickel	100	UG/L	5	4 UJ	4 U	4 UJ
Potassium	--	UG/L	25100	28700 J-	10400	10200 J-
Selenium	10	UG/L	2.5 U	2.5 UJ	2.5 U	2.5 UJ
Silver	50	UG/L	2 U	2 UJ	2 U	2 UJ
Sodium	**20000**	UG/L	**151000**	**171000 J-**	**102000**	**99500 J-**
Thallium	0.5	UG/L	0.8 U	0.8 UJ	0.8 U	0.8 UJ
Vanadium	--	UG/L	6	4 UJ	4 U	4 UJ
Zinc	2000	UG/L	110	13.9 J-	16 U	16 UJ

Table 12. Summary of Per- and Polyfluoroalkyl Substances in Groundwater, 458 East 99th Street, Brooklyn, New York

		Sample Designation:	GW-4S	GW-4D	GW-5S	GW-5D	GW-6S	GW-6D
		Sample Date:	10/23/2021	10/23/2021	10/23/2021	10/23/2021	10/17/2021	10/17/2021
		Normal Sample or Field Duplicate:	N	N	N	N	N	N
Parameters	NYSDEC Ambient Water Quality Guidance Values	Units						
2-(N-methyl perfluorooctanesulfonamido) acetic acid	--	UG/L	0.0018 U	0.00173 U	0.00178 U	0.00176 U	0.00184 U	0.0019 U
N-ethyl perfluorooctanesulfonamidoacetic acid	--	UG/L	0.00269 U	0.001 J	0.00267 U	0.00264 U	0.00275 U	0.00285 U
Perfluorobutanesulfonic acid (PFBS)	--	UG/L	0.0017 J	0.00676	0.00356	0.00206	0.00184 U	0.0019 U
Perfluorobutanoic Acid	--	UG/L	0.0073 J+	0.00531 J+	0.0112 J+	0.0083 J+	0.00459 U	0.00475 U
Perfluorodecane Sulfonic Acid	--	UG/L	0.0018 U	0.00173 U	0.00178 U	0.00176 U	0.00184 U	0.0019 U
Perfluorodecanoic acid (PFDA)	--	UG/L	0.0018 U	0.00093 J	0.00046 J	0.00176 U	0.00059 J	0.00069 J
Perfluorododecanoic acid (PFDoA)	--	UG/L	0.0018 U	0.00173 U	0.00178 U	0.00176 U	0.00184 U	0.0019 U
Perfluoroheptane Sulfonate (PFHPS)	--	UG/L	0.0018 U	0.00173 U	0.0006 J	0.00176 U	0.00184 U	0.0019 U
Perfluoroheptanoic acid (PFHpA)	--	UG/L	0.00411	0.00621	0.0109	0.00553	0.00384	0.00159 J
Perfluorohexanesulfonic acid (PFHxS)	--	UG/L	0.00098 J	0.00181	0.00357	0.00145 J	0.00111 J	0.00092 J
Perfluorohexanoic acid (PFHxA)	--	UG/L	0.00848	0.00622	0.0126	0.0118	0.00406 J+	0.0019 U
Perfluorononanoic acid (PFNA)	--	UG/L	0.0018 U	0.00212	0.00417	0.00116 J	0.00194	0.00064 J
Perfluorooctane Sulfonamide (FOSA)	--	UG/L	0.0018 U	0.00173 U	0.00178 U	0.00176 U	0.00184 U	0.00067 J
Perfluorooctanesulfonic acid (PFOS)	**0.0027**	UG/L	0.0018 U	**0.00878**	**0.013**	**0.00615**	**0.00431**	0.0027
Perfluorooctanoic acid (PFOA)	**0.0067**	UG/L	**0.014**	**0.0443**	**0.113**	**0.0471**	**0.0205**	**0.00695**
Perfluoropentanoic Acid (PFPeA)	--	UG/L	0.0138	0.00666	0.0117	0.0126	0.00245	0.0019 U
Perfluorotetradecanoic acid (PFTA)	--	UG/L	0.0018 U	0.00173 U	0.00178 U	0.00176 U	0.00184 U	0.0019 U
Perfluorotridecanoic Acid (PFTriA)	--	UG/L	0.0018 U	0.00173 U	0.00178 U	0.00176 U	0.00184 U	0.0019 U
Perfluoroundecanoic Acid (PFUnA)	--	UG/L	0.0018 U	0.00173 U	0.00178 U	0.00176 U	0.00184 U	0.0019 U
Sodium 1H,1H,2H,2H-Perfluorodecane Sulfonate (8:2)	--	UG/L	0.00269 U	0.00259 U	0.00267 U	0.00264 U	0.00275 U	0.00285 U
Sodium 1H,1H,2H,2H-Perfluorooctane Sulfonate (6:2)	--	UG/L	0.00449 U	0.0033 J	0.00693	0.0044 U	0.00459 U	0.00475 U

Table 12. Summary of Per- and Polyfluoroalkyl Substances in Groundwater, 458 East 99th Street, Brooklyn, New York

Sample Designation:			**GW-6D**	**GW-7S**	**GW-7D**	**GW-8S**	**GW-8D**
Sample Date:			**10/17/2021**	**10/17/2021**	**10/17/2021**	**10/23/2021**	**10/23/2021**
Normal Sample or Field Duplicate:			**FD**	**N**	**N**	**N**	**N**
Parameters	NYSDEC Ambient Water Quality Guidance Values	Units					
2-(N-methyl perfluorooctanesulfonamido) acetic acid	--	UG/L	0.00181 U	0.00174 U	0.0019 U	0.00176 U	0.00173 U
N-ethyl perfluorooctanesulfonamidoacetic acid	--	UG/L	0.00271 U	0.00261 U	0.00285 U	0.00264 U	0.00066 J
Perfluorobutanesulfonic acid (PFBS)	--	UG/L	0.00181 U	0.00174 U	0.0019 U	0.0014 J	0.00305
Perfluorobutanoic Acid	--	UG/L	0.00452 U	0.00435 U	0.00475 U	0.00756 J+	0.00633 J+
Perfluorodecane Sulfonic Acid	--	UG/L	0.00181 U	0.00174 U	0.0019 U	0.00176 U	0.00173 U
Perfluorodecanoic acid (PFDA)	--	UG/L	0.00069 J	0.00174 U	0.00054 J	0.00176 U	0.00083 J
Perfluorododecanoic acid (PFDoA)	--	UG/L	0.00181 U	0.00174 U	0.0019 U	0.00176 U	0.00173 U
Perfluoroheptane Sulfonate (PFHPS)	--	UG/L	0.00181 U	0.00174 U	0.0019 U	0.00176 U	0.00173 U
Perfluoroheptanoic acid (PFHpA)	--	UG/L	0.00182	0.00377	0.00161 J	0.0039	0.00612
Perfluorohexanesulfonic acid (PFHxS)	--	UG/L	0.00105 J	0.00058 J	0.00076 J	0.00114 J	0.00178
Perfluorohexanoic acid (PFHxA)	--	UG/L	0.00193 J+	0.00279 J+	0.00199 J+	0.00842	0.00907
Perfluorononanoic acid (PFNA)	--	UG/L	0.00081 EMPC	0.00122 EMPC	0.00069 EMPC	0.00094 J	0.0016 J
Perfluorooctane Sulfonamide (FOSA)	--	UG/L	0.00062 J	0.00174 U	0.0019 U	0.00176 U	0.00173 U
Perfluorooctanesulfonic acid (PFOS)	**0.0027**	UG/L	0.00255	**0.00419**	0.00239	0.00261	**0.00898 EMPC**
Perfluorooctanoic acid (PFOA)	**0.0067**	UG/L	0.00644	**0.0174**	0.00641	**0.0262**	**0.0478**
Perfluoropentanoic Acid (PFPeA)	--	UG/L	0.00181 U	0.00198 J+	0.0019 U	0.0108	0.0106
Perfluorotetradecanoic acid (PFTA)	--	UG/L	0.00181 U	0.00174 U	0.0019 U	0.00176 U	0.00173 U
Perfluorotridecanoic Acid (PFTriA)	--	UG/L	0.00181 U	0.00174 U	0.0019 U	0.00176 U	0.00173 U
Perfluoroundecanoic Acid (PFUnA)	--	UG/L	0.00181 U	0.00174 U	0.0019 U	0.00176 U	0.00173 U
Sodium 1H,1H,2H,2H-Perfluorodecane Sulfonate (8:2)	--	UG/L	0.00271 U	0.00261 U	0.00285 U	0.00264 U	0.0026 U
Sodium 1H,1H,2H,2H-Perfluorooctane Sulfonate (6:2)	--	UG/L	0.00452 U	0.00435 U	0.00475 U	0.00468	0.00433 U

Table 13. Summary of Volatile Organic Compounds in Indoor Air, Outdoor Air and Soil Vapor, 458 East 99th Street, Brooklyn, New York

	Sample Designation:	SSSV-1	IA-1	SSSV-2	IA-2	SSSV-3	SSSV-3	IA-3	SSSV-4
	Sample Date:	10/17/2021	10/17/2021	10/17/2021	10/17/2021	10/17/2021	10/17/2021	10/17/2021	10/17/2021
	Normal Sample or Field Duplicate:	N	N	N	N	N	FD	N	N
Parameters	Units								
1,1,1-Trichloroethane (TCA)	UG/M3	**55**	1.1 U	**61**	1.1 U	7.6 U	**2 J**	1.1 U	8.7 UJ
1,1,2,2-Tetrachloroethane	UG/M3	5.5 U	1.4 U	1.4 U	1.4 U	9.6 U	11 U	1.4 U	11 UJ
1,1,2-Trichloro-1,2,2-Trifluoroethane	UG/M3	6.1 U	**0.5 J**	1.5 U	**0.57 J**	11 U	12 U	**0.48 J**	12 UJ
1,1,2-Trichloroethane	UG/M3	4.4 U	1.1 U	1.1 U	1.1 U	7.6 U	8.7 U	1.1 U	8.7 UJ
1,1-Dichloroethane	UG/M3	3.2 U	0.81 U	0.81 U	0.81 U	5.7 U	6.5 U	0.81 U	6.5 UJ
1,1-Dichloroethene	UG/M3	0.8 U	0.2 U	0.2 U	0.2 U	1.4 U	1.6 U	0.2 U	1.6 UJ
1,2,4-Trichlorobenzene	UG/M3	15 U	3.7 U	3.7 U	3.7 U	26 U	30 U	3.7 U	30 UJ
1,2,4-Trimethylbenzene	UG/M3	3.9 U	**1.1**	**1**	**2.3**	6.9 U	7.9 U	**1.2**	7.9 UJ
1,2-Dibromoethane (Ethylene Dibromide)	UG/M3	6.1 U	1.5 U	1.5 U	1.5 U	11 U	12 U	1.5 U	12 UJ
1,2-Dichlorobenzene	UG/M3	4.8 U	1.2 U	1.2 U	1.2 U	8.4 U	9.6 U	1.2 U	9.6 UJ
1,2-Dichloroethane	UG/M3	3.2 U	0.81 U	0.81 U	0.81 U	5.7 U	6.5 U	0.81 U	6.5 UJ
1,2-Dichloropropane	UG/M3	3.7 U	0.92 U	0.92 U	0.92 U	6.5 U	7.4 U	0.92 U	7.4 UJ
1,2-Dichlorotetrafluoroethane	UG/M3	5.6 U	1.4 U	1.4 U	1.4 U	9.8 U	11 U	1.4 U	11 UJ
1,3,5-Trimethylbenzene (Mesitylene)	UG/M3	3.9 U	**0.33 J**	**0.35 J**	**0.78 J**	6.9 U	7.9 U	**0.36 J**	7.9 UJ
1,3-Butadiene	UG/M3	1.8 U	0.44 U	0.44 U	0.44 U	3.1 U	3.5 U	0.44 U	3.5 UJ
1,3-Dichlorobenzene	UG/M3	4.8 U	1.2 U	1.2 U	1.2 U	8.4 U	9.6 U	1.2 U	9.6 UJ
1,4-Dichlorobenzene	UG/M3	4.8 U	1.2 U	1.2 U	1.2 U	8.4 U	9.6 U	1.2 U	9.6 UJ
1,4-Dioxane (P-Dioxane)	UG/M3	72 U	18 U	18 U	18 U	130 U	140 U	18 U	140 UJ
2,2,4-Trimethylpentane	UG/M3	3.7 U	**0.45 J**	**1.2**	**0.42 J**	6.5 U	7.5 U	**0.47 J**	7.5 UJ
2-Chlorotoluene	UG/M3	4.1 U	1 U	1 U	1 U	7.2 U	8.3 U	1 U	8.3 UJ
2-Hexanone	UG/M3	8.2 U	2 U	2 U	2 U	14 U	16 U	2 U	16 UJ
4-Ethyltoluene	UG/M3	3.9 U	**0.28 J**	**0.28 J**	**0.68 J**	6.9 U	7.9 U	**0.29 J**	7.9 UJ
Acetone	UG/M3	**26 J**	**35**	**45**	**36**	83 U	95 U	**25**	95 UJ
Allyl Chloride (3-Chloropropene)	UG/M3	6.3 U	1.6 U	1.6 U	1.6 U	11 U	13 U	1.6 U	13 UJ
Benzene	UG/M3	2.6 U	**0.54 J**	**0.44 J**	**0.6 J**	4.5 U	5.1 U	**0.57 J**	5.1 UJ
Benzyl Chloride	UG/M3	4.1 U	1 U	1 U	1 U	7.2 U	8.3 U	1 U	8.3 UJ
Bromodichloromethane	UG/M3	5.4 U	1.3 U	1.3 U	1.3 U	9.4 U	11 U	1.3 U	11 UJ
Bromoform	UG/M3	8.3 U	2.1 U	2.1 U	2.1 U	14 U	17 U	2.1 U	17 UJ
Bromomethane	UG/M3	3.1 U	0.78 U	0.78 U	0.78 U	5.4 U	6.2 U	0.78 U	6.2 UJ
Butane	UG/M3	4.8 U	**1.8**	**0.79 J**	**2**	8.3 U	9.5 U	**2**	9.5 UJ
Carbon Disulfide	UG/M3	**5.5 J**	**0.67 J**	**2.2**	1.6 U	**8.6 J**	12 U	1.6 U	12 UJ
Carbon Tetrachloride	UG/M3	**0.83 J**	**0.37**	**13**	**0.43**	**29**	**30**	**0.44**	1.8 UJ
Chlorobenzene	UG/M3	3.7 U	0.92 U	0.92 U	0.92 U	6.4 U	7.4 U	0.92 U	7.4 UJ
Chlorodifluoromethane	UG/M3	**9.1**	**1.2 J**	**7.7**	**1.3 J**	**12**	**12 J**	**1.4 J**	**3.5 J**
Chloroethane	UG/M3	5.3 U	1.3 U	1.3 U	1.3 U	9.2 U	11 U	1.3 U	11 UJ
Chloroform	UG/M3	3.9 U	0.98 U	**16**	0.98 U	**6 J**	**6.7 J**	0.98 U	**41 J**

Table 13. Summary of Volatile Organic Compounds in Indoor Air, Outdoor Air and Soil Vapor, 458 East 99th Street, Brooklyn, New York

Sample Designation:		SSSV-1	IA-1	SSSV-2	IA-2	SSSV-3	SSSV-3	IA-3	SSSV-4
Sample Date:		10/17/2021	10/17/2021	10/17/2021	10/17/2021	10/17/2021	10/17/2021	10/17/2021	10/17/2021
Normal Sample or Field Duplicate:		N	N	N	N	N	FD	N	N
Parameters	Units								
Chloromethane	UG/M3	4.1 U	**1.2**	**0.99 J**	**1.2**	7.2 U	8.3 U	**1.2**	8.3 UJ
Cis-1,2-Dichloroethene	UG/M3	0.8 U	0.2 U	0.2 U	0.2 U	1.4 U	1.6 U	0.2 U	**3.7 J**
Cis-1,3-Dichloropropene	UG/M3	3.6 U	0.91 U	0.91 U	0.91 U	6.4 U	7.3 U	0.91 U	7.3 UJ
Cyclohexane	UG/M3	**2.6 J**	**0.85**	**0.47 J**	**0.64 J**	4.8 U	5.5 U	**0.89**	**2.9 J**
Cymene	UG/M3	4.4 U	1.1 U	**0.24 J**	1.1 U	7.7 U	8.8 U	**0.21 J**	8.8 UJ
Dibromochloromethane	UG/M3	6.8 U	1.7 U	1.7 U	1.7 U	12 U	14 U	1.7 U	14 UJ
Dichlorodifluoromethane	UG/M3	**3.6 J**	**2.2 J**	**2.3 J**	**2.5**	17 U	20 U	**2.4 J**	20 UJ
Ethylbenzene	UG/M3	3.5 U	**1.3**	**1.6**	**2.4**	6.1 U	6.9 U	**1.2**	6.9 UJ
Hexachlorobutadiene	UG/M3	8.5 U	2.1 U	2.1 U	**1 J**	15 U	17 U	**0.52 J**	17 UJ
Isopropanol	UG/M3	**22 J**	**15**	**4.7 J**	**24**	86 U	98 U	**15**	**56 J**
Isopropylbenzene (Cumene)	UG/M3	3.9 U	0.98 U	0.98 U	**0.2 J**	6.9 U	7.9 U	0.98 U	7.9 UJ
m,p-Xylene	UG/M3	**4.7 J**	**5.7**	**6.7**	**11**	15 U	17 U	**5.4**	17 UJ
Methyl Ethyl Ketone (2-Butanone)	UG/M3	5.9 U	**3.2**	**2.3**	**3.2**	10 U	12 U	**2.3**	12 UJ
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	UG/M3	8.2 U	2 U	2 U	2 U	14 U	16 U	2 U	16 UJ
Methyl Methacrylate	UG/M3	8.2 U	2 U	**1.8 J**	2 U	14 U	16 U	2 U	16 UJ
Methylene Chloride	UG/M3	**12**	**3.9**	**0.61 J**	**7.3**	12 U	14 U	**8.8**	**16 J**
Naphthalene	UG/M3	10 U	2.6 U	2.6 U	2.6 U	18 U	21 U	2.6 U	21 UJ
N-Butylbenzene	UG/M3	4.4 U	1.1 U	1.1 U	1.1 U	7.7 U	8.8 U	1.1 U	8.8 UJ
N-Heptane	UG/M3	3.3 U	**0.59 J**	**1.2**	**0.61 J**	5.7 U	6.6 U	**0.45 J**	6.6 UJ
N-Hexane	UG/M3	**6.9 J**	**2.2**	**1.1 J**	**4.1**	12 U	14 U	**5.1**	**10 J**
N-Propylbenzene	UG/M3	3.9 U	0.98 U	0.98 U	**0.41 J**	6.9 U	7.9 U	0.98 U	7.9 UJ
O-Xylene (1,2-Dimethylbenzene)	UG/M3	3.5 U	**1.5**	**1.3**	**2.8**	6.1 U	6.9 U	**1.4**	6.9 UJ
Sec-Butylbenzene	UG/M3	4.4 U	1.1 U	1.1 U	1.1 U	7.7 U	8.8 U	1.1 U	8.8 UJ
Styrene	UG/M3	3.4 U	0.85 U	**0.34 J**	**0.24 J**	6 U	6.8 U	0.85 U	6.8 UJ
T-Butylbenzene	UG/M3	4.4 U	1.1 U	1.1 U	1.1 U	7.7 U	8.8 U	1.1 U	8.8 UJ
Tert-Butyl Alcohol	UG/M3	61 U	15 U	15 U	15 U	110 U	120 U	15 U	120 UJ
Tert-Butyl Methyl Ether	UG/M3	2.9 U	0.72 U	0.72 U	0.72 U	5 U	5.8 U	0.72 U	5.8 UJ
Tetrachloroethene (PCE)	UG/M3	**3800 D**	**3.9**	**300 D**	**2.1**	**6000 D**	**7300 D**	**2.1**	**16000 J**
Tetrahydrofuran	UG/M3	59 U	15 U	15 U	15 U	100 U	120 U	15 U	120 UJ
Toluene	UG/M3	**31**	**26**	**46**	**46**	**12**	**12**	**22**	**15 J**
Trans-1,2-Dichloroethene	UG/M3	3.2 U	0.79 U	0.79 U	0.79 U	5.6 U	6.3 U	0.79 U	6.3 UJ
Trans-1,3-Dichloropropene	UG/M3	3.6 U	0.91 U	0.91 U	0.91 U	6.4 U	7.3 U	0.91 U	7.3 UJ
Trichloroethene (TCE)	UG/M3	**25**	0.2 U	**100**	0.2 U	**92**	**100**	0.2 U	**440 J**
Trichlorofluoromethane	UG/M3	**1.7 J**	**1.3**	**1.4**	**1.3**	7.9 U	9 U	**1.3**	9 UJ
Vinyl Bromide	UG/M3	3.5 U	0.87 U	0.87 U	0.87 U	6.1 U	7 U	0.87 U	7 UJ
Vinyl Chloride	UG/M3	0.8 U	0.2 U	0.2 U	0.2 U	1.4 U	1.6 U	0.2 U	1.6 UJ

Table 13. Summary of Volatile Organic Compounds in Indoor Air, Outdoor Air and Soil Vapor, 458 East 99th Street, Brooklyn, New York

Sample Designation:		IA-4	SSSV-5	IA-5	OA-1
Sample Date:		10/17/2021	10/17/2021	10/17/2021	10/17/2021
Normal Sample or Field Duplicate:		N	N	N	N
Parameters	Units				
1,1,1-Trichloroethane (TCA)	UG/M3	1.1 U	**43**	1.1 U	1.1 U
1,1,2,2-Tetrachloroethane	UG/M3	1.4 U	1.4 U	1.4 U	1.4 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	UG/M3	**0.51 J**	**0.48 J**	**0.47 J**	**0.44 J**
1,1,2-Trichloroethane	UG/M3	1.1 U	1.1 U	1.1 U	1.1 U
1,1-Dichloroethane	UG/M3	0.81 U	0.81 U	0.81 U	0.81 U
1,1-Dichloroethene	UG/M3	0.2 U	0.2 U	0.2 U	0.2 U
1,2,4-Trichlorobenzene	UG/M3	3.7 U	3.7 U	3.7 U	3.7 U
1,2,4-Trimethylbenzene	UG/M3	**0.82 J**	**0.64 J**	**1.1**	**0.35 J**
1,2-Dibromoethane (Ethylene Dibromide)	UG/M3	1.5 U	1.5 U	1.5 U	1.5 U
1,2-Dichlorobenzene	UG/M3	1.2 U	1.2 U	1.2 U	1.2 U
1,2-Dichloroethane	UG/M3	0.81 U	0.81 U	0.81 U	0.81 U
1,2-Dichloropropane	UG/M3	0.92 U	0.92 U	0.92 U	0.92 U
1,2-Dichlorotetrafluoroethane	UG/M3	1.4 U	1.4 U	1.4 U	1.4 U
1,3,5-Trimethylbenzene (Mesitylene)	UG/M3	**0.3 J**	**0.22 J**	**0.39 J**	0.98 U
1,3-Butadiene	UG/M3	0.44 U	0.44 U	0.44 U	0.44 U
1,3-Dichlorobenzene	UG/M3	1.2 U	1.2 U	1.2 U	1.2 U
1,4-Dichlorobenzene	UG/M3	1.2 U	1.2 U	1.2 U	1.2 U
1,4-Dioxane (P-Dioxane)	UG/M3	18 U	18 U	18 U	18 U
2,2,4-Trimethylpentane	UG/M3	**0.47 J**	**0.4 J**	**0.39 J**	**0.46 J**
2-Chlorotoluene	UG/M3	1 U	1 U	1 U	1 U
2-Hexanone	UG/M3	2 U	2 U	2 U	2 U
4-Ethyltoluene	UG/M3	0.98 U	0.98 U	**0.34 J**	0.98 U
Acetone	UG/M3	**18**	**25**	**31**	**7.2 J**
Allyl Chloride (3-Chloropropene)	UG/M3	1.6 U	1.6 U	1.6 U	1.6 U
Benzene	UG/M3	**0.48 J**	**0.44 J**	**0.52 J**	**0.46 J**
Benzyl Chloride	UG/M3	1 U	1 U	1 U	1 U
Bromodichloromethane	UG/M3	1.3 U	1.3 U	1.3 U	1.3 U
Bromoform	UG/M3	2.1 U	2.1 U	2.1 U	2.1 U
Bromomethane	UG/M3	0.78 U	0.78 U	0.78 U	0.78 U
Butane	UG/M3	**1.7**	**1.1 J**	**1.7**	**1.9**
Carbon Disulfide	UG/M3	**1.7**	**0.4 J**	1.6 U	1.6 U
Carbon Tetrachloride	UG/M3	**0.37**	**4.6**	**0.43**	**0.39**
Chlorobenzene	UG/M3	0.92 U	0.92 U	0.92 U	0.92 U
Chlorodifluoromethane	UG/M3	**1.2 J**	**5.8**	**1.2 J**	**1.1 J**
Chloroethane	UG/M3	1.3 U	1.3 U	1.3 U	1.3 U
Chloroform	UG/M3	0.98 U	**0.7 J**	0.98 U	0.98 U

Table 13. Summary of Volatile Organic Compounds in Indoor Air, Outdoor Air and Soil Vapor, 458 East 99th Street, Brooklyn, New York

Sample Designation:		IA-4	SSSV-5	IA-5	OA-1
Sample Date:		10/17/2021	10/17/2021	10/17/2021	10/17/2021
Normal Sample or Field Duplicate:		N	N	N	N
Parameters	Units				
Chloromethane	UG/M3	**1.2**	**0.39 J**	**1.1**	**1.6**
Cis-1,2-Dichloroethene	UG/M3	0.2 U	0.2 U	0.2 U	0.2 U
Cis-1,3-Dichloropropene	UG/M3	0.91 U	0.91 U	0.91 U	0.91 U
Cyclohexane	UG/M3	**0.2 J**	**0.16 J**	**0.61 J**	**0.16 J**
Cymene	UG/M3	1.1 U	1.1 U	1.1 U	1.1 U
Dibromochloromethane	UG/M3	1.7 U	1.7 U	1.7 U	1.7 U
Dichlorodifluoromethane	UG/M3	**2.2 J**	**3.1**	**2.2 J**	**2.3 J**
Ethylbenzene	UG/M3	**0.51 J**	**0.9**	**1.5**	0.87 U
Hexachlorobutadiene	UG/M3	2.1 U	2.1 U	2.1 U	2.1 U
Isopropanol	UG/M3	**8 J**	**6.4 J**	**19**	12 U
Isopropylbenzene (Cumene)	UG/M3	0.98 U	0.98 U	0.98 U	0.98 U
m,p-Xylene	UG/M3	**2.1 J**	**3.7**	**6.7**	**1.3 J**
Methyl Ethyl Ketone (2-Butanone)	UG/M3	**0.85 J**	**2**	**2.1**	**1 J**
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	UG/M3	2 U	2 U	2 U	2 U
Methyl Methacrylate	UG/M3	2 U	2 U	2 U	2 U
Methylene Chloride	UG/M3	**2**	**0.85 J**	**3.4**	**1.6 J**
Naphthalene	UG/M3	2.6 U	2.6 U	2.6 U	2.6 U
N-Butylbenzene	UG/M3	1.1 U	1.1 U	1.1 U	1.1 U
N-Heptane	UG/M3	0.82 U	**0.41 J**	**0.58 J**	0.82 U
N-Hexane	UG/M3	**1 J**	**1.1 J**	**1.9**	**1 J**
N-Propylbenzene	UG/M3	0.98 U	0.98 U	**0.23 J**	0.98 U
O-Xylene (1,2-Dimethylbenzene)	UG/M3	**0.61 J**	**0.96**	**1.7**	0.87 U
Sec-Butylbenzene	UG/M3	1.1 U	1.1 U	1.1 U	1.1 U
Styrene	UG/M3	0.85 U	**0.25 J**	0.85 U	0.85 U
T-Butylbenzene	UG/M3	1.1 U	1.1 U	1.1 U	1.1 U
Tert-Butyl Alcohol	UG/M3	15 U	15 U	15 U	15 U
Tert-Butyl Methyl Ether	UG/M3	0.72 U	0.72 U	0.72 U	0.72 U
Tetrachloroethene (PCE)	UG/M3	**3.5**	**770 D**	**2.3**	**0.22 J**
Tetrahydrofuran	UG/M3	15 U	15 U	15 U	15 U
Toluene	UG/M3	**7.1**	**12**	**36**	**3.7**
Trans-1,2-Dichloroethene	UG/M3	0.79 U	0.79 U	0.79 U	0.79 U
Trans-1,3-Dichloropropene	UG/M3	0.91 U	0.91 U	0.91 U	0.91 U
Trichloroethene (TCE)	UG/M3	0.2 U	**240 D**	0.2 U	0.2 U
Trichlorofluoromethane	UG/M3	**1.2**	**1.4**	**1.2**	**1.2**
Vinyl Bromide	UG/M3	0.87 U	0.87 U	0.87 U	0.87 U
Vinyl Chloride	UG/M3	0.2 U	0.2 U	0.2 U	0.2 U

Table 14. Track 1/Track 4 Soil Cleanup Objectives

Parameter	Track 1 Soil Cleanup Objectives*	Track 4 Soil Cleanup Objectives**
Volatile Organic Compounds (Concentrations in mg/kg)		
1,1,1-Trichloroethane	0.68	500
1,1-Dichloroethane	0.27	240
1,1-Dichloroethene	0.33	500
1,2,4-Trimethylbenzene	3.6	190
1,3,5-Trimethylbenzene	8.4	190
1,2-Dichlorobenzene	1.1	500
1,2-Dichloroethane	0.02	30
1,3-Dichlorobenzene	2.4	280
1,4-Dichlorobenzene	1.8	130
2-Butanone (MEK)	0.12	500
Acetone	0.05	500
Benzene	0.06	44
n-Butylbenzene	12	500
Carbon tetrachloride	0.76	22
Chlorobenzene	1.1	500
Chloroform	0.37	350
cis-1,2-Dichloroethene	0.25	500
Ethylbenzene	1	390
Methylene chloride	0.05	500
MTBE	0.93	500
n-Propylbenzene	3.9	500
sec-Butylbenzene	11	500
tert-Butylbenzene	5.9	500
Tetrachloroethene	1.3	150
Toluene	0.7	500
trans-1,2-Dichloroethene	0.19	500
Trichloroethene	0.47	200
Vinyl chloride	0.02	13
Xylenes (total)	0.26	500
Semivolatile Organic Compounds (Concentrations in mg/kg)		
1,4-Dioxane	0.1	130
2-Methylphenol	0.33	500
3&4-Methylphenol	0.33	500
Acenaphthene	20	500
Acenaphthylene	100	500
Anthracene	100	500
Benzo[a]anthracene	1	5.6
Benzo[a]pyrene	1	1
Benzo[b]fluoranthene	1	5.6
Benzo[g,h,i]perylene	100	500
Benzo[k]fluoranthene	0.8	56
Chrysene	1	56
Dibenzo[a,h]anthracene	0.33	0.56
Dibenzofuran	7	350
Fluoranthene	100	500
Fluorene	30	500
Hexachlorobenzene	0.33	6
Indeno[1,2,3-cd]pyrene	0.5	5.6
Naphthalene	12	500
Pentachlorophenol	0.8	6.7

Table 14. Track 1/Track 4 Soil Cleanup Objectives

Parameter	Track 1 Soil Cleanup Objectives*	Track 4 Soil Cleanup Objectives**
Phenanthrene	100	500
Phenol	0.33	500
Pyrene	100	500
Metals (Concentrations in mg/kg)		
Arsenic	13	16
Barium	350	400
Beryllium	7.2	590
Cadmium	2.5	9.3
Chromium, Hexavalent	1	400
Chromium	30	1500
Copper	50	270
Cyanide, Total	27	27
Lead	63	1000
Manganese	1600	10000
Mercury	0.18	2.8
Nickel	30	310
Selenium	3.9	1500
Silver	2	1500
Zinc	109	10000
Pesticides (Concentrations in mg/kg)		
2,4,5-TP	3.8	500
4,4'-DDD	0.0033	92
4,4'-DDE	0.0033	62
4,4'-DDT	0.0033	47
Aldrin	0.005	0.068
alpha-BHC	0.02	3.4
alpha-Chlordane	0.094	24
beta-BHC	0.036	3
delta-BHC	0.04	500
Dieldrin	0.005	1.4
Endosulfan I	2.4	200
Endosulfan II	2.4	200
Endosulfan sulfate	2.4	200
Endrin	0.014	89
gamma-BHC (Lindane)	0.1	9.2
Heptachlor	0.042	15
Total Polychlorinated Biphenyls (Concentrations in mg/kg)		
Total Polychlorinated Biphenyls	0.1	1

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* Soil cleanup objectives for the Track 1 remedy are the NYSDEC Part 375 Unrestricted Use SCOs.

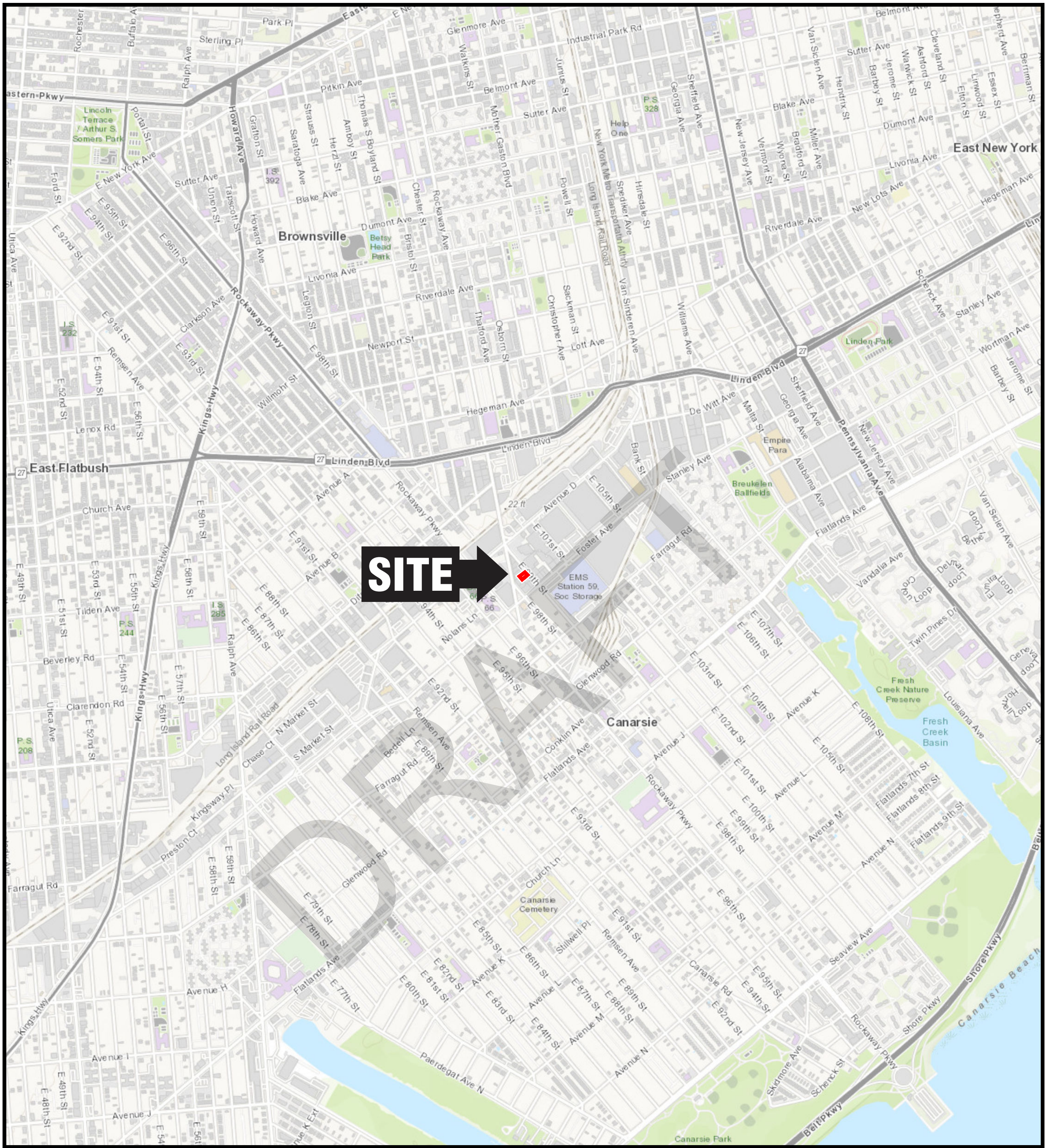
** Soil cleanup objectives for the Track 4 remedy are the NYSDEC Part 375 Commercial Use SCOs.

mg/kg - Milligrams per kilogram (parts per million [ppm])

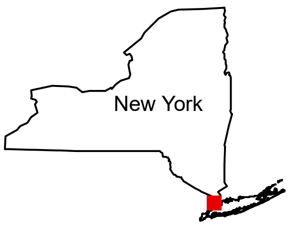
NYSDEC - New York State Department of Environmental Conservation

SCOs - Soil Cleanup Objectives

FIGURES



QUADRANGLE LOCATION



N

1,000 0 1,000'

Title:

SITE LOCATION MAP

458 EAST 99TH STREET
BROOKLYN, NY

Prepared for:

458 EAST OWNERS, LLC

ROUX

Compiled by: L.C.	Date: 01/30/25	FIGURE
Prepared by: M.S.R.	Scale: AS SHOWN	1
Project Mgr: L.C.	Project: 4078.0001Y000	
File: 4078.0001Y124.01.mxd		

N

LEGEND

☐ BCP SITE BOUNDARY AND ENVIRONMENTAL EASEMENT BOUNDARY

NOTES

1. AERIAL SOURCE: NYS OFFICE OF INFORMATION TECHNOLOGY SERVICES GIS PROGRAM OFFICE (GPO)

30 0 30'

Title:

SITE LAYOUT MAP AND INSTITUTIONAL CONTROL BOUNDARIES

458 EAST 99TH STREET
BROOKLYN, NY

Prepared for:

458 EAST OWNERS, LLC

ROUX

		FIGURE
Compiled by: C.C.	Date: 01/30/25	2
Prepared by: M.S.R.	Scale: AS SHOWN	
Project Mgr: D.K.	Project: 4078.0001Y000	
File: 4078.0001Y101.02.mxd		

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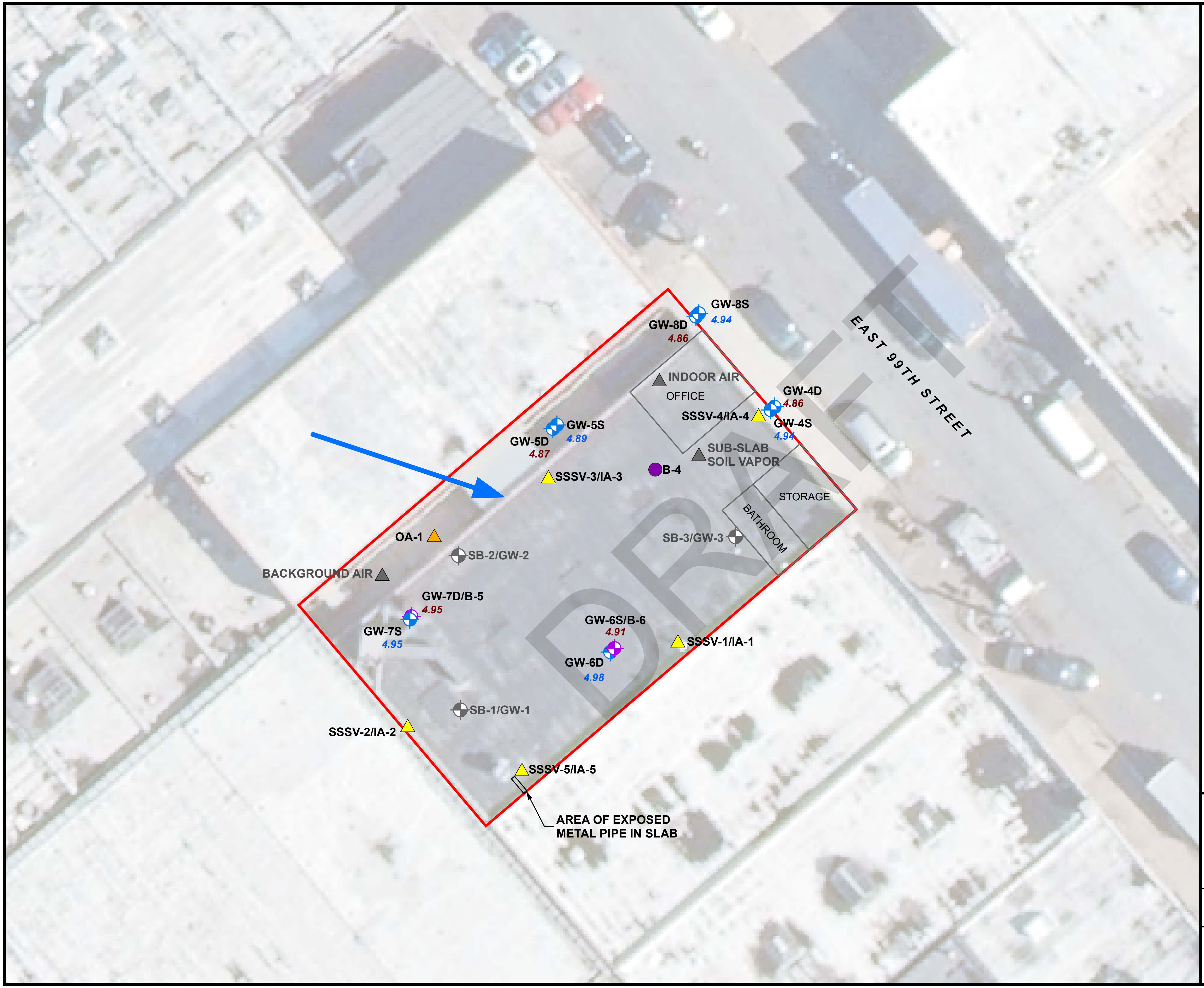

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LEGEND

●	LOCATION OF SOIL BORING
⊕	LOCATION OF GROUNDWATER MONITORING WELL
⊕	LOCATION OF SOIL BORING AND PERMANENT GROUNDWATER MONITORING WELL
△	LOCATION OF OUTDOOR AIR SAMPLE
△	LOCATION OF SUB-SLAB/INDOOR AIR SAMPLE
⊕	APPROXIMATE LOCATION OF PREVIOUS SOIL BORING AND GROUNDWATER MONITORING WELL
▲	APPROXIMATE LOCATION OF PREVIOUS SUB-SLAB/INDOOR/OUTDOOR AIR SAMPLE
▭	BCP SITE BOUNDARY
➡	INFERRED GROUNDWATER FLOW DIRECTION
4.94\\ *4.94*	GROUNDWATER ELEVATION IN FEET RELATIVE TO NAVD88

NOTES

1. GROUNDWATER ELEVATIONS BASED ON GAUGING DATA COLLECTED ON NOVEMBER 18, 2021.
2. OBSERVED GROUNDWATER ELEVATIONS AT SHALLOW WELLS ARE LISTED IN BLUE AND DEEP WELLS ARE LISTED IN RED
3. NAVD88 - NORTH AMERICAN VERTICAL DATUM OF 1988

20 0 20'

Title:

GROUNDWATER FLOW MAP

458 EAST 99TH STREET
BROOKLYN, NY

Prepared for:

458 EAST OWNERS, LLC

ROUX

Compiled by: L.C.	Date: 01/30/25	FIGURE
Prepared by: M.S.R.	Scale: AS SHOWN	3
Project Mgr: L.C.	Project: 4078.0001Y000	
File: 4078.0001Y124.03.mxd		

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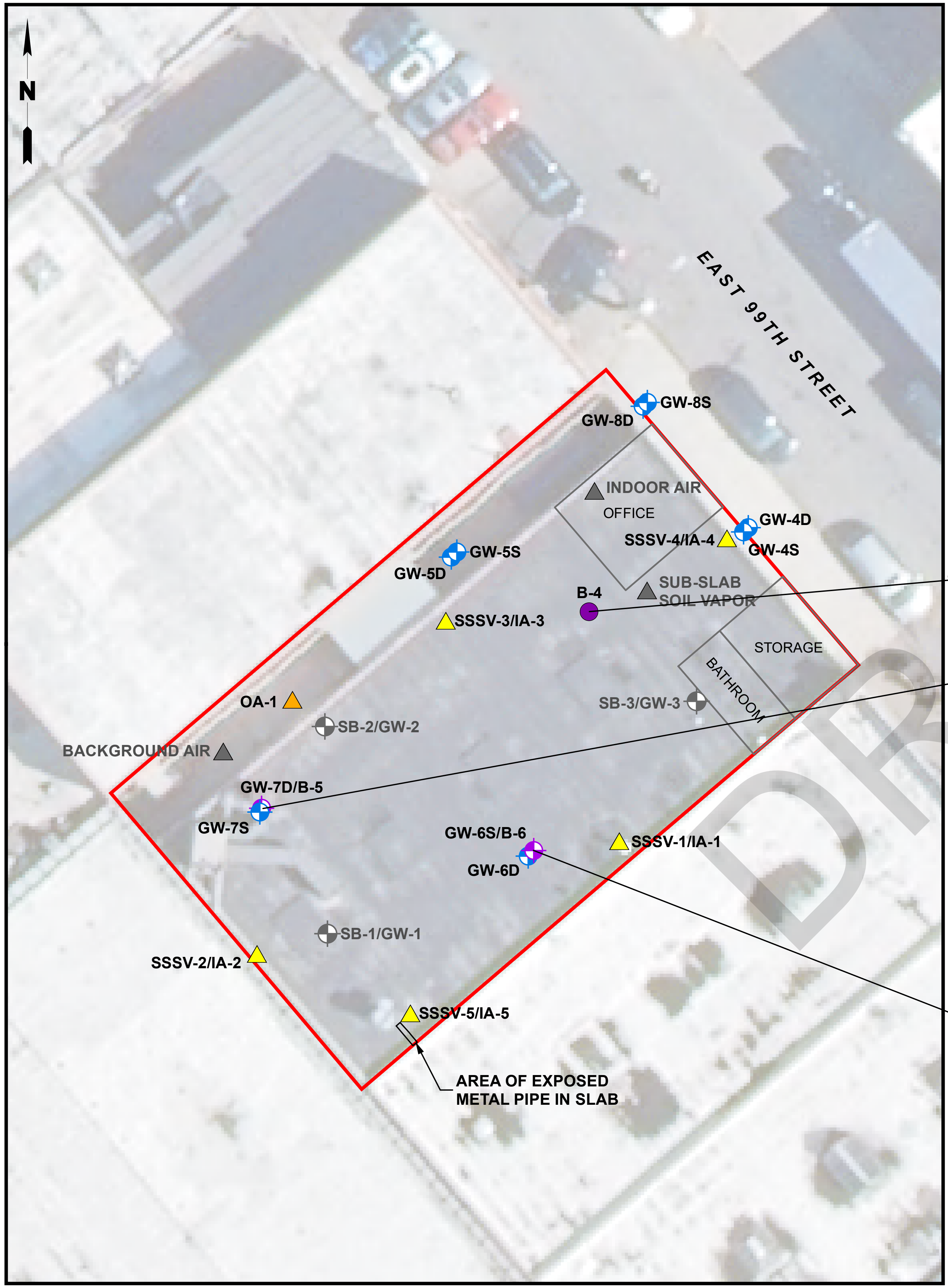

B-4	10/09/2021	10/09/2021	10/09/2021
Depth (ft bls)	0.5 - 2.5	10 - 12	23 - 25
VOCs			
Tetrachloroethene (PCE)	18	ND	ND
Metals			
Arsenic	NE	**15.1**	NE
Lead	**88.8**	NE	NE
Pesticides			
4,4'-DDE	**0.0057 J**	ND	ND

B-5	10/10/2021	10/10/2021	10/10/2021	10/10/2021
Depth (ft bls)	0.5 - 2.5	10 - 12	23 - 25	23 - 25 DUP
Pesticides				
4,4'-DDT	ND	ND	ND	**0.0048 J**

B-6	10/09/202	10/09/202	10/09/202
Depth (ft bls)	0.5 - 2.5	9 - 11	23 - 25
Metals			
Arsenic	**13.5**	NE	NE
Pesticides			
4,4'-DDE	**1.9 T**	**0.0095**	ND
4,4'-DDT	**1.4**	**0.03**	ND

LEGEND

●	LOCATION OF SOIL BORING
⌖	LOCATION OF PERMANENT GROUNDWATER MONITORING WELL
⌖	LOCATION OF SOIL BORING AND PERMANENT GROUNDWATER MONITORING WELL
▲	LOCATION OF OUTDOOR AIR SAMPLE
▲	LOCATION OF SUB-SLAB/INDOOR AIR SAMPLE
⌖	APPROXIMATE LOCATION OF PREVIOUS SOIL BORING AND GROUNDWATER MONITORING WELL
▲	APPROXIMATE LOCATION OF PREVIOUS SUB-SLAB/INDOOR/OUTDOOR AIR SAMPLE
▭	BCP SITE BOUNDARY

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO
VOCs			
Tetrachloroethene (PCE)	**1.3**	150	1.3
Metals			
Arsenic	**13**	16	16
Lead	**63**	1000	450
Pesticides			
4,4'-DDD	**0.0033**	92	14
4,4'-DDE	**0.0033**	62	17
4,4'-DDT	**0.0033**	47	136

NOTES

1. ALL CONCENTRATIONS ARE SHOWN IN MILLIGRAMS PER KILOGRAM

DUP - DUPLICATE SAMPLE
FT BLS - FEET BELOW LAND SURFACE
J - ESTIMATED VALUE
ND - NO DETECTION
NE - NO EXCEEDANCE
NYSDEC - NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
P - THE RPD BETWEEN THE RESULTS FOR THE TWO COLUMNS EXCEEDS THE METHOD-SPECIFIED CRITERIA
RPD - RELATIVE PERCENT DIFFERENCE
SCO - SOIL CLEANUP OBJECTIVE
T - INDICATES THAT A QUALITY CONTROL PARAMETER HAS EXCEEDED LABORATORY LIMITS
VOCS - VOLATILE ORGANIC COMPOUNDS

20 0 20'

Title:

SUMMARY OF RI EXCEEDANCES IN SOIL

458 EAST 99TH STREET
BROOKLYN, NY

Prepared for:

458 EAST OWNERS, LLC

ROUX

Compiled by: L.C.
Date: 01/30/25
Prepared by: M.S.R.
Scale: AS SHOWN
Project Mgr: L.C.
Project: 4078.0001Y000
File: 4078.0001Y124.04.mxd

FIGURE
4

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GW-8D	10/23/2021
VOCs	
1,1-Dichloroethane	**5.2**
Trichloroethene (TCE)	**12**
Metals, Total	
Iron	**9580**
Manganese	**1260**
Sodium	**102000**
Metals, Dissolved	
Iron	**1600 J-**
Manganese	**1250 J-**
Sodium	**99500 J-**
PFAS	
(PFOS)	**EMPC**
Perfluorooctanoic acid (PFOA)	**0.0478**

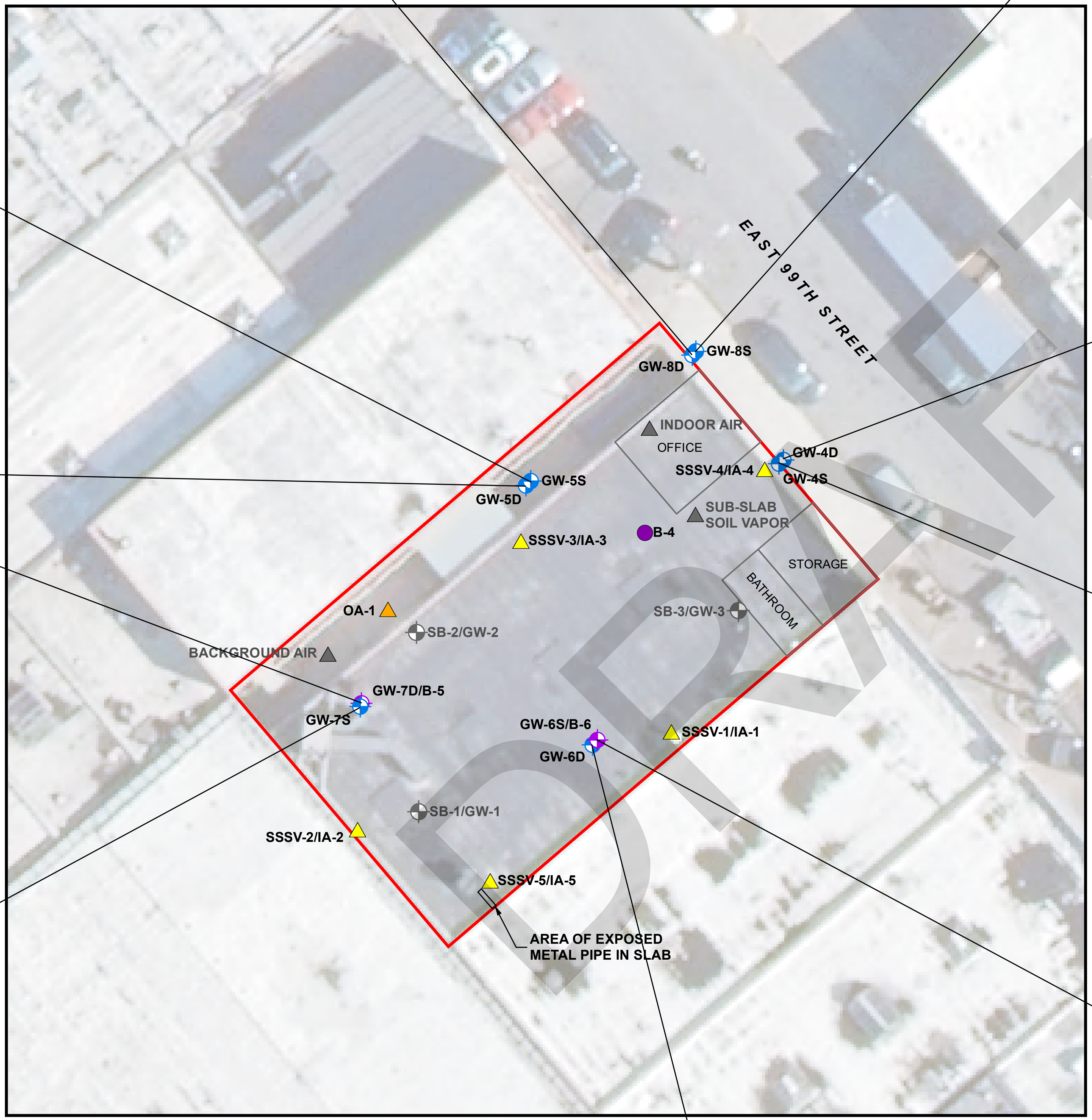
GW-8S	10/23/2021
VOCs	
Tetrachloroethene (PCE)	**5.5**
Metals, Total	
Iron	**31300**
Lead	**148**
Manganese	**1610**
Sodium	**151000**
Metals, Dissolved	
Manganese	**1770 J-**
Sodium	**171000 J-**
PFAS	
Perfluorooctanoic acid (PFOA)	**0.0262**

GW-5S	10/23/2021
VOCs	
Tetrachloroethene (PCE)	**8.5**
Metals, Total	
Iron	**3880**
Manganese	**697**
Sodium	**20800 J**
Metals, Dissolved	
Manganese	**748 J**
Sodium	**24500 J**
PFAS	
(PFOS)	**0.013**
Perfluorooctanoic acid (PFOA)	**0.113**

GW-5D	10/23/2021
Metals, Total	
Iron	**20400**
Manganese	**1670**
Sodium	**66700**
Metals, Dissolved	
Iron	**2220 J-**
Manganese	**1550 J-**
Sodium	**61500 J-**
PFAS	
(PFOS)	**0.00615**
Perfluorooctanoic acid (PFOA)	**0.0471**

GW-7D	10/17/2021
VOCs	
1,1,1-Trichloroethane (TCA)	**62**
1,1-Dichloroethane	**370**
1,1-Dichloroethene	**6.8**
1,2-Dichloroethane	**1.6**
Chloroethane	**310 D**
Cis-1,2-Dichloroethene	**340**
Trichloroethene (TCE)	**34**
Vinyl Chloride	**180 D**
Metals, Total	
Iron	**2120**
Manganese	**519**
Sodium	**31400**
Metals, Dissolved	
Manganese	**500 J-**
Sodium	**29400 J-**

GW-7S	10/17/2021
VOCs	
1,1-Dichloroethane	**6.1**
Metals, Total	
Manganese	**2980**
Sodium	**92100**
Metals, Dissolved	
Manganese	**3000**
Sodium	**87000**
PFAS	
(PFOS)	**0.00419 J-**
Perfluorooctanoic acid (PFOA)	**0.0174 J-**



GW-4D	10/23/2021
VOCs	
1,1,1-Trichloroethane (TCA)	**5.3**
Tetrachloroethene (PCE)	**10**
Trichloroethene (TCE)	**59**
Metals, Total	
Iron	**20300**
Manganese	**1230**
Sodium	**81600**
Metals, Dissolved	
Iron	**3500 J-**
Manganese	**1260 J-**
Sodium	**84100 J-**
PFAS	
(PFOS)	**0.00878**
Perfluorooctanoic acid (PFOA)	**0.0443**

GW-4S	10/23/2021
VOCs	
Tetrachloroethene (PCE)	**11**
Metals, Total	
Iron	**19900**
Manganese	**2950**
Sodium	**324000**
Metals, Dissolved	
Manganese	**2810 J-**
Sodium	**321000 J-**
PFAS	
Perfluorooctanoic acid (PFOA)	**0.014**

GW-6S	10/17/2021
VOCs	
1,1,1-Trichloroethane (TCA)	**12**
1,1-Dichloroethane	**59**
Chloroethane	**43**
Cis-1,2-Dichloroethene	**32**
Tetrachloroethene (PCE)	**6.8**
Trichloroethene (TCE)	**13**
Vinyl Chloride	**23**
Metals, Total	
Iron	**749**
Manganese	**2400**
Sodium	**55800**
Metals, Dissolved	
Manganese	**2630 J-**
Sodium	**57500 J-**
PFAS	
Perfluorooctanesulfonic acid (PFOS)	**0.00431**
Perfluorooctanoic acid (PFOA)	**0.0205**

GW-6D	10/17/2021	10/17/2021 DUP
VOCs		
1,1,1-Trichloroethane (TCA)	**7.7**	**7.8**
1,1-Dichloroethane	**26**	**27**
Chloroethane	**19**	**19**
Cis-1,2-Dichloroethyene	**16**	**17**
Trichloroethene (TCE)	**12**	**12**
Vinyl Chloride	**7.6**	**7.7**
Metals, Total		
Iron	**2020**	**1840**
Manganese	**559**	**569**
Sodium	**28000**	**28000**
Metals, Dissolved		
Manganese	**608 J-**	**485 J-**
Sodium	**24900 J-**	**22000 J-**
FAS		
Perfluorooctanoic acid (PFOA)	**0.00695**	NE

N

LEGEND

●	LOCATION OF SOIL BORING
⊕	LOCATION OF PERMANENT GROUNDWATER MONITORING WELL
⊕	LOCATION OF SOIL BORING AND PERMANENT GROUNDWATER MONITORING WELL
△	LOCATION OF OUTDOOR AIR SAMPLE
△	LOCATION OF SUB-SLAB/INDOOR AIR SAMPLE
⊕	APPROXIMATE LOCATION OF PREVIOUS SOIL BORING AND GROUNDWATER MONITORING WELL
▲	APPROXIMATE LOCATION OF PREVIOUS SUB-SLAB/INDOOR/OUTDOOR AIR SAMPLE
🟥	BCP SITE BOUNDARY

Parameter	NYSDEC AWQSGV
VOCs	
1,1,1-Trichloroethane (TCA)	**5**
1,1-Dichloroethane	**5**
1,1-Dichloroethene	**5**
1,2-Dichloroethane	**0.6**
Chloroethane	**5**
Cis-1,2-Dichloroethene	**5**
Tetrachloroethene (PCE)	**5**
Trichloroethene (TCE)	**5**
Vinyl Chloride	**2**
Metals, Total	
Iron	**300**
Lead	**25**
Manganese	**300**
Sodium	**20000**
Metals, Dissolved	
Iron	**300**
Manganese	**300**
Sodium	**20000**
PFAS	
Perfluorooctanesulfonic acid (PFOS)	**0.0027**
Perfluorooctanoic acid (PFOA)	**0.0067**

NOTES

1. ALL CONCENTRATIONS ARE SHOWN IN MICROGRAMS PER LITER

AWQSGVS - AMBIENT WATER-QUALITY STANDARDS AND GUIDANCE VALUES
D - DILUTION
DUP - DUPLICATE SAMPLE
NE - NO EXCEEDANCE
NYSDEC - NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
PFAS - PER- AND POLYFLUOROALKYL SUBSTANCES
VOCS - VOLATILE ORGANIC COMPOUNDS

20 0 20'

Title:

SUMMARY OF RI EXCEEDANCES IN GROUNDWATER

458 EAST 99TH STREET
BROOKLYN, NY

Prepared for:

458 EAST OWNERS, LLC

ROUX

Compiled by: L.C.	Date: 01/30/25	FIGURE
Prepared by: M.S.R.	Scale: AS SHOWN	5
Project Mgr: L.C.	Project: 4078.0001Y000	
File: 4078.0001Y124.05.mxd		

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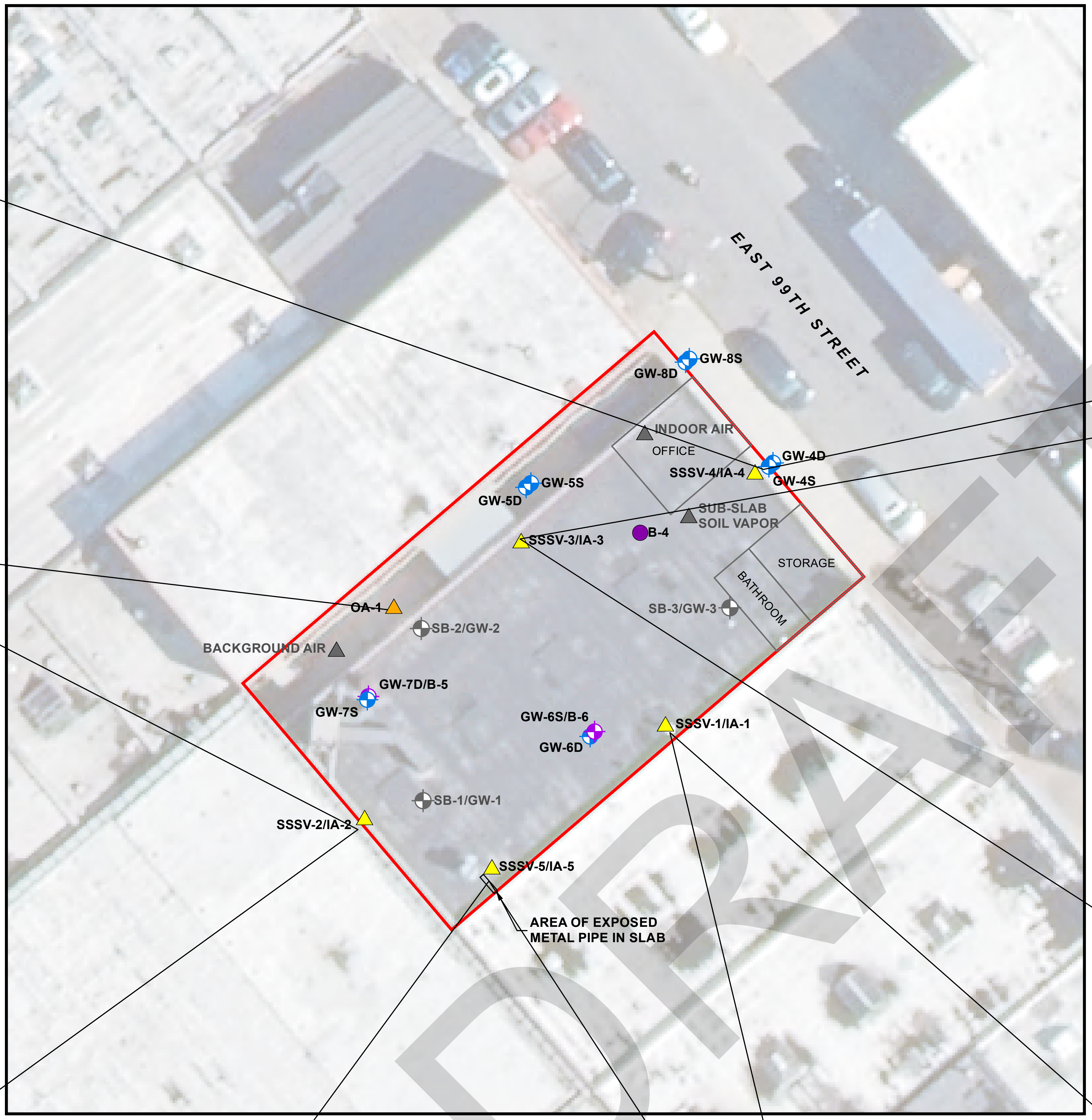

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SSSV-4	10/17/2021
VOCs	
Chlorodifluoromethane	**3.5 J**
Chloroform	**41 J**
Cis-1,2-Dichloroethylene	**3.7 J**
Cyclohexane	**2.9 J**
Isopropanol	**56 J**
Methylene Chloride	**16 J**
N-Hexane	**10 J**
Tetrachloroethene (PCE)	**16000 J**
Toluene	**15 J**
Trichloroethene (TCE)	**440J**

OA-1	10/17/2021
VOCs	
1,1,2-Trichloro-1,2,2-Trifluoroethane	**0.44 J**
1,2,4-Trimethylbenzene	**0.35 J**
2,2,4-Trimethylpentane	**0.46 J**
Acetone	**7.2 J**
Benzene	**0.46 J**
Butane	**1.9**
Carbon Tetrachloride	**0.39**
Chlorodifluoromethane	**1.1 J**
Chloromethane	**1.6**
Cyclohexane	**0.16 J**
Dichlorodifluoromethane	**2.3 J**
m,p-Xylene	**1.3 J**
Methyl Ethyl Ketone (2-Butanone)	**1 J**
Methylene Chloride	**1.6 J**
N-Hexane	**1 J**
Tetrachloroethene (PCE)	**0.22 J**
Toluene	**3.7**
Trichlorofluoromethane	**1.2**

IA-2	10/17/2021
VOCs	
1,1,2-Trichloro-1,2,2-Trifluoroethane	**0.57 J**
1,2,4-Trimethylbenzene	**2.3**
1,3,5-Trimethylbenzene (Mesitylene)	**0.78 J**
2,2,4-Trimethylpentane	**0.42 J**
4-Ethyltoluene	**0.68 J**
Acetone	**36**
Benzene	**0.6 J**
Butane	**2**
Carbon Tetrachloride	**0.43**
Chlorodifluoromethane	**1.3 J**
Chloromethane	**1.2**
Cyclohexane	**0.64 J**
Dichlorodifluoromethane	**2.5**
Ethylbenzene	**2.4**
Hexachlorobutadiene	**1 J**
Isopropanol	**24**
Isopropylbenzene (Cumene)	**0.2 J**
m,p-Xylene	**11**
Methyl Ethyl Ketone (2-Butanone)	**3.2**
Methylene Chloride	**7.3**
N-Heptane	**0.61 J**
N-Hexane	**4.1**
N-Propylbenzene	**0.41 J**
O-Xylene (1,2-Dimethylbenzene)	**2.8**
Styrene	**0.24 J**
Tetrachloroethene (PCE)	**2.1**
Toluene	**46**
Trichlorofluoromethane	**3.1**

IA-4	10/17/2021
VOCs	
1,1,2-Trichloro-1,2,2-Trifluoroethane	**0.51 J**
1,2,4-Trimethylbenzene	**0.82 J**
1,3,5-Trimethylbenzene (Mesitylene)	**0.3 J**
2,2,4-Trimethylpentane	**0.47 J**
Acetone	**18**
Benzene	**0.48 J**
Butane	**1.7**
Carbon Disulfide	**1.7**
Carbon Tetrachloride	**0.37**
Chlorodifluoromethane	**1.2 J**
Chloromethane	**1.2**
Cyclohexane	**0.2 J**
Dichlorodifluoromethane	**2.2 J**
Ethylbenzene	**0.51 J**
Isopropanol	**8 J**
m,p-Xylene	**2.1 J**
Methyl Ethyl Ketone (2-Butanone)	**0.85 J**
Methylene Chloride	**2**
N-Hexane	**1 J**
O-Xylene (1,2-Dimethylbenzene)	**0.61 J**
Tetrachloroethene (PCE)	**3.5**
Toluene	**7.1**
Trichlorofluoromethane	**1.2**

IA-3	10/17/2021
VOCs	
1,1,2-Trichloro-1,2,2-Trifluoroethane	**0.48 J**
1,2,4-Trimethylbenzene	**1.2**
1,3,5-Trimethylbenzene (Mesitylene)	**0.36 J**
2,2,4-Trimethylpentane	**0.47 J**
4-Ethyltoluene	**0.29 J**
Acetone	**25**
Benzene	**0.57 J**
Butane	**2**
Carbon Tetrachloride	**0.44**
Chlorodifluoromethane	**1.4 J**
Chloromethane	**1.2**
Cyclohexane	**0.89**
Cymene	**0.21 J**
Dichlorodifluoromethane	**2.4 J**
Ethylbenzene	**1.2**
Hexachlorobutadiene	**0.52 J**
Isopropanol	**15**
m,p-Xylene	**5.4**
Methyl Ethyl Ketone (2-Butanone)	**2.3**
Methylene Chloride	**8.8**
N-Heptane	**0.45 J**
N-Hexane	**5.1**
O-Xylene (1,2-Dimethylbenzene)	**1.4**
Tetrachloroethene (PCE)	**2.1**
Toluene	**22**
Trichlorofluoromethane	**1.3**

SSSV-3	10/17/2021	10/17/2021 DUP
VOCs		
1,1,1-Trichloroethane (TCA)	**NE**	**2 J**
Carbon Disulfide	**8.6 J**	**NE**
Carbon Tetrachloride	**29**	**30**
Chlorodifluoromethane	**12**	**12 J**
Chloroform	**6 J**	**6.7 J**
Tetrachloroethene (PCE)	**6000 D**	**7300 D**
Toluene	**12**	**12**
Trichloroethene (TCE)	**92**	**100**

SSSV-2	10/17/2021
VOCs	
1,1,1-Trichloroethane (TCA)	**61**
1,2,4-Trimethylbenzene	**1**
1,3,5-Trimethylbenzene (Mesitylene)	**0.35 J**
2,2,4-Trimethylpentane	**1.2**
4-Ethyltoluene	**0.28 J**
Acetone	**45**
Benzene	**0.44 J**
Butane	**0.79 J**
Carbon Disulfide	**2.2**
Carbon Tetrachloride	**13**
Chlorodifluoromethane	**7.7**
Chloroform	**16**
Chloromethane	**0.99 J**
Cyclohexane	**0.47 J**
Cymene	**0.24 J**
Dichlorodifluoromethane	**2.3 J**
Ethylbenzene	**1.6**
Isopropanol	**4.7 J**
m,p-Xylene	**6.7**
Methyl Ethyl Ketone (2-Butanone)	**2.3**
Methyl Methacrylate	**1.8 J**
Methylene Chloride	**0.61 J**
N-Heptane	**1.2**
N-Hexane	**1.1 J**
O-Xylene (1,2-Dimethylbenzene)	**1.3**
Styrene	**0.34 J**
Tetrachloroethene (PCE)	**300 D**
Toluene	**46**
Trichloroethene (TCE)	**100**
Trichlorofluoromethane	**1.4**

SSSV-5	10/17/2021
VOCs	
1,1,1-Trichloroethane (TCA)	**43**
1,1,2-Trichloro-1,2,2-Trifluoroethane	**0.48 J**
1,2,4-Trimethylbenzene	**0.64 J**
1,3,5-Trimethylbenzene (Mesitylene)	**0.22 J**
2,2,4-Trimethylpentane	**0.4 J**
Acetone	**25**
Benzene	**0.44 J**
Butane	**1.1 J**
Carbon Disulfide	**0.4 J**
Carbon Tetrachloride	**4.6**
Chlorodifluoromethane	**5.8**
Chloroform	**0.7 J**
Chloromethane	**0.39 J**
Cyclohexane	**0.16 J**
Dichlorodifluoromethane	**3.1**
Ethylbenzene	**0.9**
Isopropanol	**6.4 J**
m,p-Xylene	**3.7**
Methyl Ethyl Ketone (2-Butanone)	**2**
Methylene Chloride	**0.85 J**
N-Heptane	**0.41 J**
N-Hexane	**1.1 J**
O-Xylene (1,2-Dimethylbenzene)	**0.96**
Styrene	**0.25 J**
Tetrachloroethene (PCE)	**770 D**
Toluene	**12**
Trichloroethene (TCE)	**240 D**
Trichlorofluoromethane	**1.4**

IA-5	10/17/2021
VOCs	
1,1,2-Trichloro-1,2,2-Trifluoroethane	**0.47 J**
1,2,4-Trimethylbenzene	**1.1**
1,3,5-Trimethylbenzene (Mesitylene)	**0.39 J**
2,2,4-Trimethylpentane	**0.39 J**
4-Ethyltoluene	**0.34 J**
Acetone	**31**
Benzene	**0.52 J**
Butane	**1.7**
Carbon Tetrachloride	**0.43**
Chlorodifluoromethane	**1.2 J**
Chloromethane	**1.1**
Cyclohexane	**0.61 J**
Dichlorodifluoromethane	**2.2 J**
Ethylbenzene	**1.5**
Isopropanol	**19**
m,p-Xylene	**6.7**
Methyl Ethyl Ketone (2-Butanone)	**2.1**
Methylene Chloride	**3.4**
N-Heptane	**0.58 J**
N-Hexane	**1.9**
N-Propylbenzene	**0.23 J**
O-Xylene (1,2-Dimethylbenzene)	**1.7**
Tetrachloroethene (PCE)	**2.3**
Toluene	**36**
Trichlorofluoromethane	**1.2**

IA-1	10/17/2021
VOCs	
1,1,2-Trichloro-1,2,2-Trifluoroethane	**0.5 J**
1,2,4-Trimethylbenzene	**1.1**
1,3,5-Trimethylbenzene (Mesitylene)	**0.33 J**
2,2,4-Trimethylpentane	**0.45 J**
4-Ethyltoluene	**0.28 J**
Acetone	**35**
Benzene	**0.54 J**
Butane	**1.8**
Carbon Disulfide	**0.67 J**
Carbon Tetrachloride	**0.37**
Chlorodifluoromethane	**1.2 J**
Chloromethane	**1.2**
Cyclohexane	**0.85**
Dichlorodifluoromethane	**2.2 J**
Ethylbenzene	**1.3**
Isopropanol	**15**
m,p-Xylene	**5.7**
Methyl Ethyl Ketone (2-Butanone)	**3.2**
Methylene Chloride	**3.9**
N-Heptane	**0.59 J**
N-Hexane	**2.2**
O-Xylene (1,2-Dimethylbenzene)	**1.5**
Tetrachloroethene (PCE)	**3.9**
Toluene	**26**
Trichlorofluoromethane	**1.3**

SSSV-1	10/17/2021
VOCs	
1,1,1-Trichloroethane (TCA)	**55**
Acetone	**26 J**
Carbon Disulfide	**5.5 J**
Carbon Tetrachloride	**0.83 J**
Chlorodifluoromethane	**9.1**
Cyclohexane	**2.6 J**
Dichlorodifluoromethane	**3.6 J**
Isopropanol	**22 J**
m,p-Xylene	**4.7 J**
Methylene Chloride	**12**
N-Hexane	**6.9 J**
Tetrachloroethene (PCE)	**3800 D**
Toluene	**31**
Trichloroethene (TCE)	**25**
Trichlorofluoromethane	**1.7 J**

LEGEND

●	LOCATION OF SOIL BORING
⊕	LOCATION OF PERMANENT GROUNDWATER MONITORING WELL
⊕	LOCATION OF SOIL BORING AND PERMANENT GROUNDWATER MONITORING WELL
▲	LOCATION OF OUTDOOR AIR SAMPLE
△	LOCATION OF SUB-SLAB/INDOOR AIR SAMPLE
⊕	APPROXIMATE LOCATION OF PREVIOUS SOIL BORING AND GROUNDWATER MONITORING WELL
▲	APPROXIMATE LOCATION OF PREVIOUS SUB-SLAB/INDOOR/OUTDOOR AIR SAMPLE
▭	BCP SITE BOUNDARY

NOTES

1. ALL CONCENTRATIONS ARE SHOWN IN MICROGRAMS PER CUBIC METER

D - DILUTION
J - ESTIMATED VALUE
ND - NO EXCEEDANCE
VOCS - VOLATILE ORGANIC COMPOUNDS

20 0 20'

Title:

RI SOIL VAPOR INTRUSION ASSESSMENT DETECTIONS

458 EAST 99TH STREET
BROOKLYN, NY

Prepared for:

458 EAST OWNERS, LLC

ROUX

Compiled by: L.C.	Date: 01/30/25	FIGURE
Prepared by: M.S.R.	Scale: AS SHOWN	6
Project Mgr: L.C.	Project: 4078.0001Y000	
File: 4078.0001Y124.06.mxd		

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N

LEGEND

🟩 LIMITS OF SUB-SLAB DEPRESSURIZATION SYSTEM/SOIL VAPOR EXTRACTION SYSTEM

🟥 BCP SITE BOUNDARY

NOTES

1. AERIAL SOURCE: NYS OFFICE OF INFORMATION TECHNOLOGY SERVICES GIS PROGRAM OFFICE (GPO)

30 0 30'

Title:

ENGINEERING CONTROLS

458 EAST 99TH STREET
BROOKLYN, NY

Prepared for:

458 EAST OWNERS, LLC

ROUX

Compiled by: M.H.	Date: 01/30/25	FIGURE
Prepared by: M.S.R.	Scale: AS SHOWN	7
Project Mgr: D.K.	Project: 4078.0001Y000	
File: 4078.0001Y124.07.mxd		

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APPENDICES

A. Environmental Easement
B. List of Site Contacts
C. Soil Boring and Well Construction Logs
D. Health and Safety Plan and Community Air Monitoring Plan
E. SSDS/SVES As-Built and Component Manual
F. Quality Assurance Project Plan and Field Sampling Plan
G. Site Management Forms
H. Request to Import/Reuse Fill Material Form
I. Excavation Work Plan
J. Remedial System Optimization Table of Contents

APPENDIX A

Environmental Easement

NYC DEPARTMENT OF FINANCE
OFFICE OF THE CITY REGISTER

This page is part of the instrument. The City Register will rely on the information provided by you on this page for purposes of indexing this instrument.The information on this page will control for indexing purposes in the event of any conflict with the rest of the document.

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RECORDING AND ENDORSEMENT COVER PAGE

PAGE 1 OF 10

Document ID: **2024090600429001**
Document Date: 07-30-2024
Preparation Date: 10-01-2024
Document Type: EASEMENT
Document Page Count: 9

PRESENTER:
SIVE PAGET & RIESEL, P.C.
560 LEXINGTON AVENUE, 15TH FLOOR
NEW YORK, NY 10022
212-421-2150
NDUNCAN@SPRLAW.COM

RETURN TO:
SIVE PAGET & RIESEL, P.C.
560 LEXINGTON AVENUE, 15TH FLOOR
NEW YORK, NY 10022
212-421-2150
NDUNCAN@SPRLAW.COM

PROPERTY DATA

Borough	**Block**	**Lot**		**Unit**	**Address**
BROOKLYN	8131	56	Entire Lot		458 EAST 99TH STREET

Property Type: COMMERCIAL REAL ESTATE

CROSS REFERENCE DATA

CRFN_______ *or* DocumentID________ *or* ________ Year_____ Reel____ Page_____ *or* File Number__________

PARTIES

GRANTOR/SELLER:
458 EAST OWNERS, LLC
458 EAST 99TH STREET
BROOKLYN, NY 11236

GRANTEE/BUYER:
PEOPLE OF NEW YORK BY DEPT. ENVIRONMENTAL CONSERVA
625 BROADWAY
ALBANY, NY 12233

FEES AND TAXES

Mortgage :

Mortgage Amount:	$	0.00
Taxable Mortgage Amount:	$	0.00
Exemption:		
TAXES: County (Basic):	$	0.00
City (Additional):	$	0.00
Spec (Additional):	$	0.00
TASF:	$	0.00
MTA:	$	0.00
NYCTA:	$	0.00
Additional MRT:	$	0.00
TOTAL:	$	0.00
Recording Fee:	$	82.00
Affidavit Fee:	$	0.00

Filing Fee:	$	100.00
NYC Real Property Transfer Tax:	$	0.00
NYS Real Estate Transfer Tax:	$	0.00

RECORDED OR FILED IN THE OFFICE OF THE CITY REGISTER OF THE CITY OF NEW YORK

Recorded/Filed 10-02-2024 12:43
City Register File No.(CRFN):
2024000257471

Colette McClain-Jacques

City Register Official Signature

ENVIRONMENTAL EASEMENT GRANTED PURSUANT TO ARTICLE 71, TITLE 36 OF THE NEW YORK STATE ENVIRONMENTAL CONSERVATION LAW

THIS INDENTURE made as of this [illegible] day of July, 2024, between Owner, 458 East Owners, LLC, having an office at 458 East 99th Street, Brooklyn, County of Kings, State of New York (the "Grantor"), and The People of the State of New York (the "Grantee"), acting through their Commissioner of the Department of Environmental Conservation (the "Commissioner", or "NYSDEC" or "Department" as the context requires) with its headquarters located at 625 Broadway, Albany, New York 12233,

WHEREAS, the Legislature of the State of New York has declared that it is in the public interest to encourage the remediation of abandoned and likely contaminated properties ("sites") that threaten the health and vitality of the communities they burden while at the same time ensuring the protection of public health and the environment; and

WHEREAS, the Legislature of the State of New York has declared that it is in the public interest to establish within the Department a statutory environmental remediation program that includes the use of Environmental Easements as an enforceable means of ensuring the performance of operation, maintenance, and/or monitoring requirements and the restriction of future uses of the land, when an environmental remediation project leaves residual contamination at levels that have been determined to be safe for a specific use, but not all uses, or which includes engineered structures that must be maintained or protected against damage to perform properly and be effective, or which requires groundwater use or soil management restrictions; and

WHEREAS, the Legislature of the State of New York has declared that Environmental Easement shall mean an interest in real property, created under and subject to the provisions of Article 71, Title 36 of the New York State Environmental Conservation Law ("ECL") which contains a use restriction and/or a prohibition on the use of land in a manner inconsistent with engineering controls which are intended to ensure the long term effectiveness of a site remedial program or eliminate potential exposure pathways to hazardous waste or petroleum; and

WHEREAS, Grantor, is the owner of real property located at the address of 458 East 99th Street in the City of New York, County of Kings and State of New York, known and designated on the tax map of the New York City Department of Finance as tax map parcel number: Block 8131 Lot 56, being the same as that property conveyed to Grantor by deed dated September 12, 2016 and recorded in the City Register of the City of New York in City Register File No. 2016000326886. The property subject to this Environmental Easement (the "Controlled Property") comprises approximately 0.14 +/- acres, and is hereinafter more fully described in the Land Title Survey dated February 13, 2012, and last revised May 28, 2024, prepared by Oriana Nicoletti-Greco, which will be attached to the Site Management Plan. The Controlled Property description is set forth in and attached hereto as Schedule A; and

WHEREAS, the Department accepts this Environmental Easement in order to ensure the protection of public health and the environment and to achieve the requirements for remediation established for the Controlled Property until such time as this Environmental Easement is extinguished pursuant to ECL Article 71, Title 36; and

NOW THEREFORE, in consideration of the mutual covenants contained herein and the terms and conditions of Brownfield Cleanup Agreement Index Number: C224254-01-20, Grantor conveys to Grantee a permanent Environmental Easement pursuant to ECL Article 71, Title 36 in, on, over, under, and upon the Controlled Property as more fully described herein ("Environmental Easement").

1. Purposes. Grantor and Grantee acknowledge that the Purposes of this Environmental Easement are: to convey to Grantee real property rights and interests that will run with the land in perpetuity in order to provide an effective and enforceable means of encouraging the reuse and redevelopment of this Controlled Property at a level that has been determined to be safe for a specific use while ensuring the performance of operation, maintenance, and/or monitoring requirements; and to ensure the restriction of future uses of the land that are inconsistent with the above-stated purpose.

2. Institutional and Engineering Controls. The controls and requirements listed in the Department approved Site Management Plan ("SMP") including any and all Department approved amendments to the SMP are incorporated into and made part of this Environmental Easement. These controls and requirements apply to the use of the Controlled Property, run with the land, are binding on the Grantor and the Grantor's successors and assigns, and are enforceable in law or equity against any owner of the Controlled Property, any lessees and any person using the Controlled Property.

A. (1) The Controlled Property may be used for:

Commercial as described in 6 NYCRR Part 375-1.8(g)(2)(iii) and Industrial as described in 6 NYCRR Part 375-1.8(g)(2)(iv)

(2) All Engineering Controls must be operated and maintained as specified in the Site Management Plan (SMP);

(3) All Engineering Controls must be inspected at a frequency and in a manner defined in the SMP;

(4) The use of groundwater underlying the property is prohibited without necessary water quality treatment as determined by the NYSDOH or the New York City Department of Health and Mental Hygiene to render it safe for use as drinking water or for industrial purposes, and the user must first notify and obtain written approval to do so from the Department;

(5) Groundwater and other environmental or public health monitoring must be performed as defined in the SMP;

(6) Data and information pertinent to Site Management of the Controlled Property must be reported at the frequency and in a manner defined in the SMP;

(7) All future activities on the property that will disturb remaining contaminated material must be conducted in accordance with the SMP;

(8) Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in the SMP;

(9) Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical components of the remedy shall be performed as defined in the SMP;

(10) Access to the site must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice to the property owner to assure compliance with the restrictions identified by this Environmental Easement.

B. The Controlled Property shall not be used for Residential or Restricted Residential purposes as defined in 6NYCRR 375-1.8(g)(2)(i) and (ii), and the above-stated engineering controls may not be discontinued without an amendment or extinguishment of this Environmental Easement.

C. The SMP describes obligations that the Grantor assumes on behalf of Grantor, its successors and assigns. The Grantor's assumption of the obligations contained in the SMP which may include sampling, monitoring, and/or operating a treatment system, and providing certified reports to the NYSDEC, is and remains a fundamental element of the Department's determination that the Controlled Property is safe for a specific use, but not all uses. The SMP may be modified in accordance with the Department's statutory and regulatory authority. The Grantor and all successors and assigns, assume the burden of complying with the SMP and obtaining an up-to-date version of the SMP from:

Site Control Section
Division of Environmental Remediation
NYSDEC
625 Broadway
Albany, New York 12233
Phone: (518) 402-9553

D. Grantor must provide all persons who acquire any interest in the Controlled Property a true and complete copy of the SMP that the Department approves for the Controlled Property and all Department-approved amendments to that SMP.

E. Grantor covenants and agrees that until such time as the Environmental Easement is extinguished in accordance with the requirements of ECL Article 71, Title 36 of the ECL, the property deed and all subsequent instruments of conveyance relating to the Controlled Property shall state in at least fifteen-point bold-faced type:

This property is subject to an Environmental Easement held by the New York State Department of Environmental Conservation pursuant to Title 36 of Article 71 of the Environmental Conservation

Law.

F. Grantor covenants and agrees that this Environmental Easement shall be incorporated in full or by reference in any leases, licenses, or other instruments granting a right to use the Controlled Property.

G. Grantor covenants and agrees that it shall, at such time as NYSDEC may require, submit to NYSDEC a written statement by an expert the NYSDEC may find acceptable certifying under penalty of perjury, in such form and manner as the Department may require, that:

(1) the inspection of the site to confirm the effectiveness of the institutional and engineering controls required by the remedial program was performed under the direction of the individual set forth at 6 NYCRR Part 375-1.8(h)(3).

(2) the institutional controls and/or engineering controls employed at such site:

(i) are in-place;

(ii) are unchanged from the previous certification, or that any identified changes to the controls employed were approved by the NYSDEC and that all controls are in the Department-approved format; and

(iii) that nothing has occurred that would impair the ability of such control to protect the public health and environment;

(3) the owner will continue to allow access to such real property to evaluate the continued maintenance of such controls;

(4) nothing has occurred that would constitute a violation or failure to comply with any site management plan for such controls;

(5) the report and all attachments were prepared under the direction of, and reviewed by, the party making the certification;

(6) to the best of his/her knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the site remedial program, and generally accepted engineering practices; and

(7) the information presented is accurate and complete.

3. Right to Enter and Inspect. Grantee, its agents, employees, or other representatives of the State may enter and inspect the Controlled Property in a reasonable manner and at reasonable times to assure compliance with the above-stated restrictions.

4. Reserved Grantor's Rights. Grantor reserves for itself, its assigns, representatives, and successors in interest with respect to the Property, all rights as fee owner of the Property, including:

A. Use of the Controlled Property for all purposes not inconsistent with, or limited by the terms of this Environmental Easement;

B. The right to give, sell, assign, or otherwise transfer part or all of the underlying fee interest to the Controlled Property, subject and subordinate to this Environmental Easement;

5. Enforcement

A. This Environmental Easement is enforceable in law or equity in perpetuity by Grantor, Grantee, or any affected local government, as defined in ECL Section 71-3603, against the owner of the Property, any lessees, and any person using the land. Enforcement shall not be defeated because of any subsequent adverse possession, laches, estoppel, or waiver. It is not a defense in any action to enforce this Environmental Easement that: it is not appurtenant to an interest in real property; it is not of a character that has been recognized traditionally at common law; it imposes a negative burden; it imposes affirmative obligations upon the owner of any interest in the burdened property; the benefit does not touch or concern real property; there is no privity of estate or of contract; or it imposes an unreasonable restraint on alienation.

B. If any person violates this Environmental Easement, the Grantee may revoke the Certificate of Completion with respect to the Controlled Property.

C. Grantee shall notify Grantor of a breach or suspected breach of any of the terms of this Environmental Easement. Such notice shall set forth how Grantor can cure such breach or suspected breach and give Grantor a reasonable amount of time from the date of receipt of notice in which to cure. At the expiration of such period of time to cure, or any extensions granted by Grantee, the Grantee shall notify Grantor of any failure to adequately cure the breach or suspected breach, and Grantee may take any other appropriate action reasonably necessary to remedy any breach of this Environmental Easement, including the commencement of any proceedings in accordance with applicable law.

D. The failure of Grantee to enforce any of the terms contained herein shall not be deemed a waiver of any such term nor bar any enforcement rights.

6. Notice. Whenever notice to the Grantee (other than the annual certification) or approval from the Grantee is required, the Party providing such notice or seeking such approval shall identify the Controlled Property by referencing the following information:

County, NYSDEC Site Number, NYSDEC Brownfield Cleanup Agreement, State Assistance Contract or Order Number, and the County tax map number or the Liber and Page or computerized system identification number.

Parties shall address correspondence to:

Site Number: C224254
Office of General Counsel
NYSDEC
625 Broadway
Albany New York 12233-5500

With a copy to:

Site Control Section
Division of Environmental Remediation
NYSDEC
625 Broadway
Albany, NY 12233

All notices and correspondence shall be delivered by hand, by registered mail or by Certified mail and return receipt requested. The Parties may provide for other means of receiving and communicating notices and responses to requests for approval.

7. Recordation. Grantor shall record this instrument, within thirty (30) days of execution of this instrument by the Commissioner or her/his authorized representative in the office of the

recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

8. Amendment. Any amendment to this Environmental Easement may only be executed by the Commissioner of the New York State Department of Environmental Conservation or the Commissioner's Designee, and filed with the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

9. Extinguishment. This Environmental Easement may be extinguished only by a release by the Commissioner of the New York State Department of Environmental Conservation, or the Commissioner's Designee, and filed with the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

10. Joint Obligation. If there are two or more parties identified as Grantor herein, the obligations imposed by this instrument upon them shall be joint and several.

11. Consistency with the SMP. To the extent there is any conflict or inconsistency between the terms of this Environmental Easement and the SMP, regarding matters specifically addressed by the SMP, the terms of the SMP will control.

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IN WITNESS WHEREOF, Grantor has caused this instrument to be signed in its name.

458 East Owners, LLC:

By:

Print Name: Wolfgang Michelitsch

Title: Manager/Sole Member Date: 7.10.2024

Grantor's Acknowledgment

STATE OF NEW YORK)
) ss:
COUNTY OF Queens)

On the 10 day of July, in the year 2024 before me, the undersigned, personally appeared Wolfgang Michelitsch personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Notary Public - State of New York

MICHAEL TIGHE
NOTARY PUBLIC, STATE OF NEW YORK
Registration No. 01-TI6424056
Qualified in Nassau County
Commission Expires 10/25/25

THIS ENVIRONMENTAL EASEMENT IS HEREBY ACCEPTED BY THE PEOPLE OF THE STATE OF NEW YORK, Acting by and Through the Department of Environmental Conservation as Designee of the Commissioner,

By: JBrown

Janet E. Brown, Assistant Director
Division of Environmental Remediation

Grantee's Acknowledgment

STATE OF NEW YORK)
) ss:
COUNTY OF ALBANY)

On the 2nd day of August, in the year 2024 before me, the undersigned, personally appeared Andrew O. Guglielmi, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/ executed the same in his/her/ capacity as Designee of the Commissioner of the State of New York Department of Environmental Conservation, and that by his/her/ signature on the instrument, the individual, or the person upon behalf of which the individual acted, executed the instrument.

Jennifer Andaloro
Notary Public - State of New York

JENNIFER ANDALORO
Notary Public, State of New York
No. 02AN6098246
Qualified in Albany County
Commission Expires January 14, 2028

SCHEDULE “A” PROPERTY DESCRIPTION

ALL that certain plot, piece or parcel of land, situate, lying and being in the Borough of Brooklyn, County of Kings, City and State of New York, known and designated as and by Lot Numbers 34, 35 and 36 in Block 8131 as shown on a certain map entitled, “Map of property of Brooklyn and Philadelphia Realty Company” located in the Thirty-Second Ward of the Borough of Brooklyn, City of New York, surveyed May 15, 1906 by Alex D. Murphy, Civil Engineer and Surveyor and filed in the Office of the Register of Kings County on February 7, 1911, as Map Number 1555, which said lots according to said map are bounded and described as follows:

BEGINNING at a point on the westerly side of East 99th Street, distant 180 feet northerly from the corner formed by the intersection of the westerly side of East 99th Street with the northerly side of Foster Avenue;

RUNNING THENCE westerly through a party wall and parallel with the northerly side of Foster Avenue, 100 feet to a point;

RUNNING THENCE northerly parallel with the westerly side of East 99th Street, 60 feet to a point;

RUNNING THENCE easterly parallel with the northerly side of Foster Avenue 100 feet to the westerly side of East 99th Street; and

RUNNING THENCE southerly along the westerly side of East 99th Street 60 feet to the point or place of BEGINNING.

APPENDIX B

List of Site Contacts

APPENDIX B – LIST OF SITE CONTACTS

Name	**Phone/Email Address**
Wolfgang Michelitsch 458 East Owners, LLC	(917) 861-5369 eurowoodworking@aol.com
Michael Bogin. Sive, Paget, and Riesel, P.C.	(646) 378-7210 mbogin@sprlaw.com
Noelle Clarke, P.E. Roux Environmental Engineering and Geology, D.P.C.	(631) 232-2600 nclarke@rouxinc.com
Marlen Salazar Project Manager NYSDEC Division of Environmental Remediation, Superfund and Brownfield Cleanup Section	(718) 482-7129 marlen.salazar@dec.ny.gov
Cris-Sandra Maycock NYSDEC Project Supervisor NYSDEC Division of Environmental Remediation, Superfund and Brownfield Cleanup Section	(718) 482-4599 jane.oconnell@dec.ny.gov
Aaron Keegan Project Manager NYSDOH Bureau of Environmental Exposure Investigation	(518) 408-1943 aaron.keegan@health.ny.gov

APPENDIX C

Soil Boring and Well Construction Logs

B-4

Page 1 of 1

Client: 458 East 99th Street LLC	Site: 458 East 99th Street	Project Number: 4078.0001Y000
Address: 458 East 99th Street	City/State: Brooklyn, New York	Logged By: M. Mueller

Start to Finish Date: 10/9/2021 - 10/9/2021	Contractor: Eastern Environmental	Drill Type: Geoprobe	Sampler Type/Method: 2" Macro-Core
Borehole Depth: 25 feet	Backfill: Cuttings	Borehole Diameter: 3-inches	DTW:
Area: Brooklyn	Elevation: 14.22	Northing: -73.904918	Easting: 40.649746

Depth (ft)	USCS	Visual Description	Sample Interval	Recovery (ft)	PID	Notes
	MIXD	Dark brown, medium to coarse SAND, some Gravel, Brick (FILL); dry		5	0.0	Precleared to 5 feet bls. Soil sample B4_0.5-2.5 collected.
	MIXD	Dark brown, medium to fine SAND, some Gravel, Brick, RCA (FILL); dry			1.8	
5 10	SP	Brown, fine SAND, trace gravel; dry	G	3	0.0 0.1 0.0	Soil sample B4_10-12 collected.
	ML	Dark grey, fine SILT, trace peat; wet		5	0.0 0.0	
	SP-SM	Light grey, fine SAND, some Silt; wet				
15	SP	Grey, course to medium SAND, trace silt; wet		5		
	SP	Grey medium to fine SAND, trace silt; wet			0.0	
	SP	Brown, medium to fine SAND; wet			0.0	
20	SP	Grey, medium to fine SAND; wet		5		
		Brown, medium to fine SAND; wet			0.0 0.0	Soil sample B4_23-25 collected.

Bottom of borehole at 25 feet

ROUX

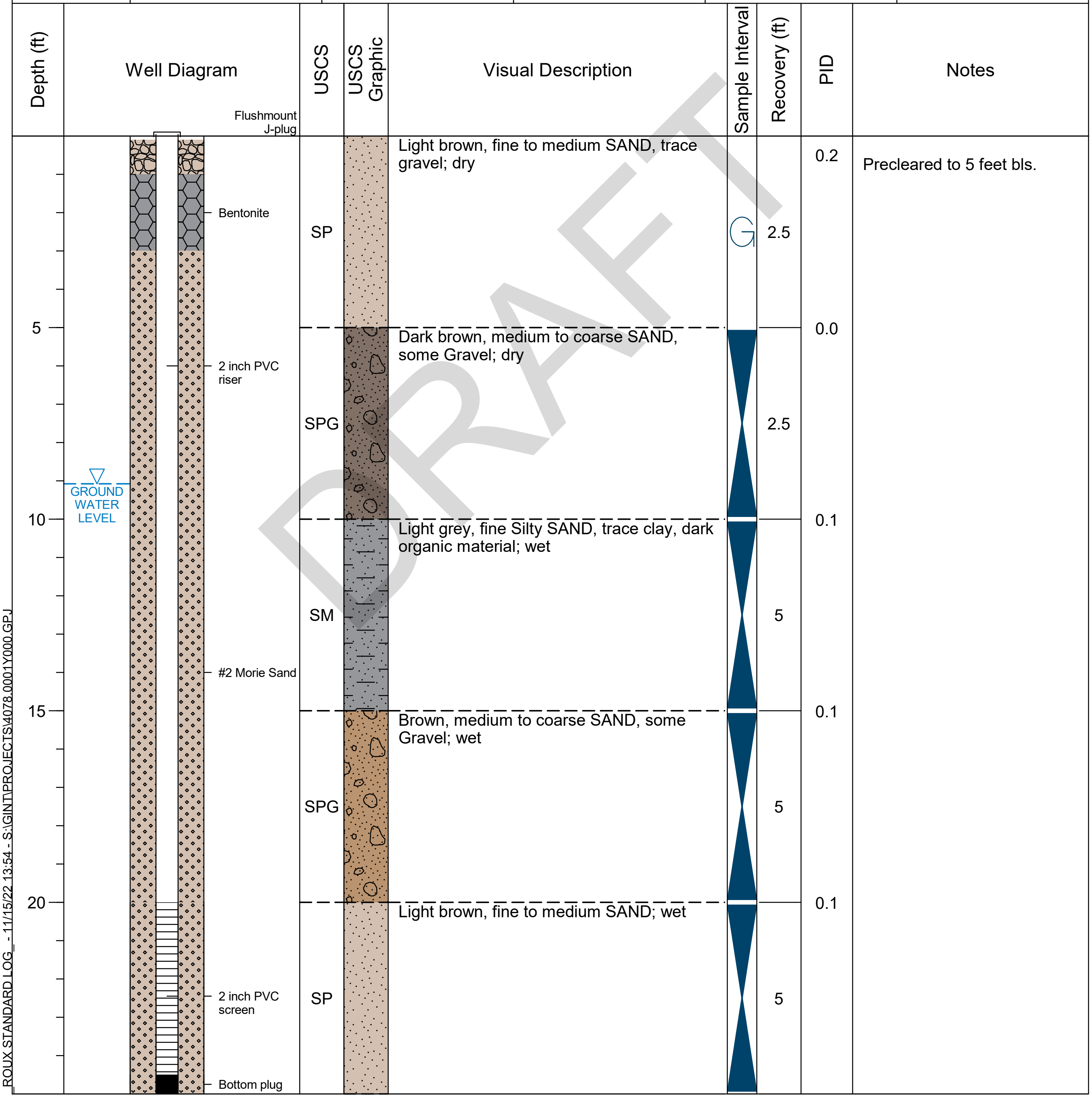
GW-4D

Page 1 of 1

Client: 458 East 99th Street LLC	Site: 458 East 99th Street	Project Number: 4078.0001Y000
Address: 458 East 99th Street	City/State: Brooklyn, New York	Logged By: N. Baragan

Start to Finish Date: 10/16/2021 - 10/16/2021	Contractor: Eastern Environmental	Drill Type: Geoprobe	Sampler Type/Method: 2" Macro-Core
Borehole Depth: 25 feet	Backfill: Cuttings	Borehole Diameter: 3-inches	DTW: 9.08 feet
Area: Brooklyn	Elevation: 14.29	Northing: -73.904828	Easting: 40.649782

Well Depth: 25 feet	Well Dia./Materials: 2-inch SCH 40 PVC	Screen Interval: 20-25 feet	Screen Slot Size: 20-Slot	Sand/Filter Pack Size: Morie #2	Annular Seal: Bentonite



Depth (ft)	USCS	Visual Description	Recovery (ft)	PID	Notes
0-5	SP	Light brown, fine to medium SAND, trace gravel; dry	2.5	0.2	Precleared to 5 feet bls.
5-10	SPG	Dark brown, medium to coarse SAND, some Gravel; dry	2.5	0.0	
10-15	SM	Light grey, fine Silty SAND, trace clay, dark organic material; wet	5	0.1	
15-20	SPG	Brown, medium to coarse SAND, some Gravel; wet	5	0.1	
20-25	SP	Light brown, fine to medium SAND; wet	5	0.1	

Bottom of borehole at 25 feet

ROUX

GW-4S

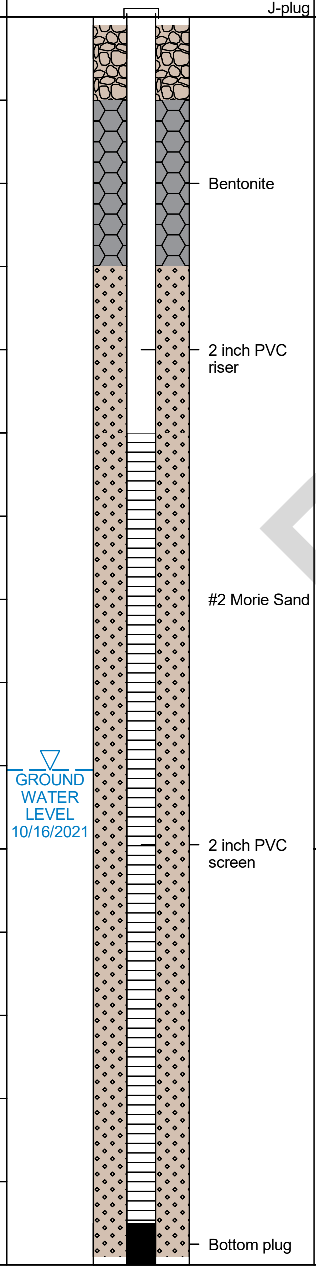
Page 1 of 1

Client: 458 East 99th Street LLC	Site: 458 East 99th Street	Project Number: 4078.0001Y000
Address: 458 East 99th Street	City/State: Brooklyn, New York	Logged By: N. Baragan

Start to Finish Date: 10/16/2021 - 10/16/2021	Contractor: Eastern Environmental	Drill Type: Geoprobe	Sampler Type/Method: 2" Macro-Core
Borehole Depth: 15 feet	Backfill: Cuttings	Borehole Diameter: 3-inches	DTW: 9.05 feet
Area: Brooklyn	Elevation: 14.31	Northing: -73.904831	Easting: 40.64978

Well Depth: 15 feet	Well Dia./Materials: 2-inch SCH 40 PVC	Screen Interval: 5-15 feet	Screen Slot Size: 20-Slot	Sand/Filter Pack Size: Morie #2	Annular Seal: Bentonite

Well Diagram



USCS Graphic

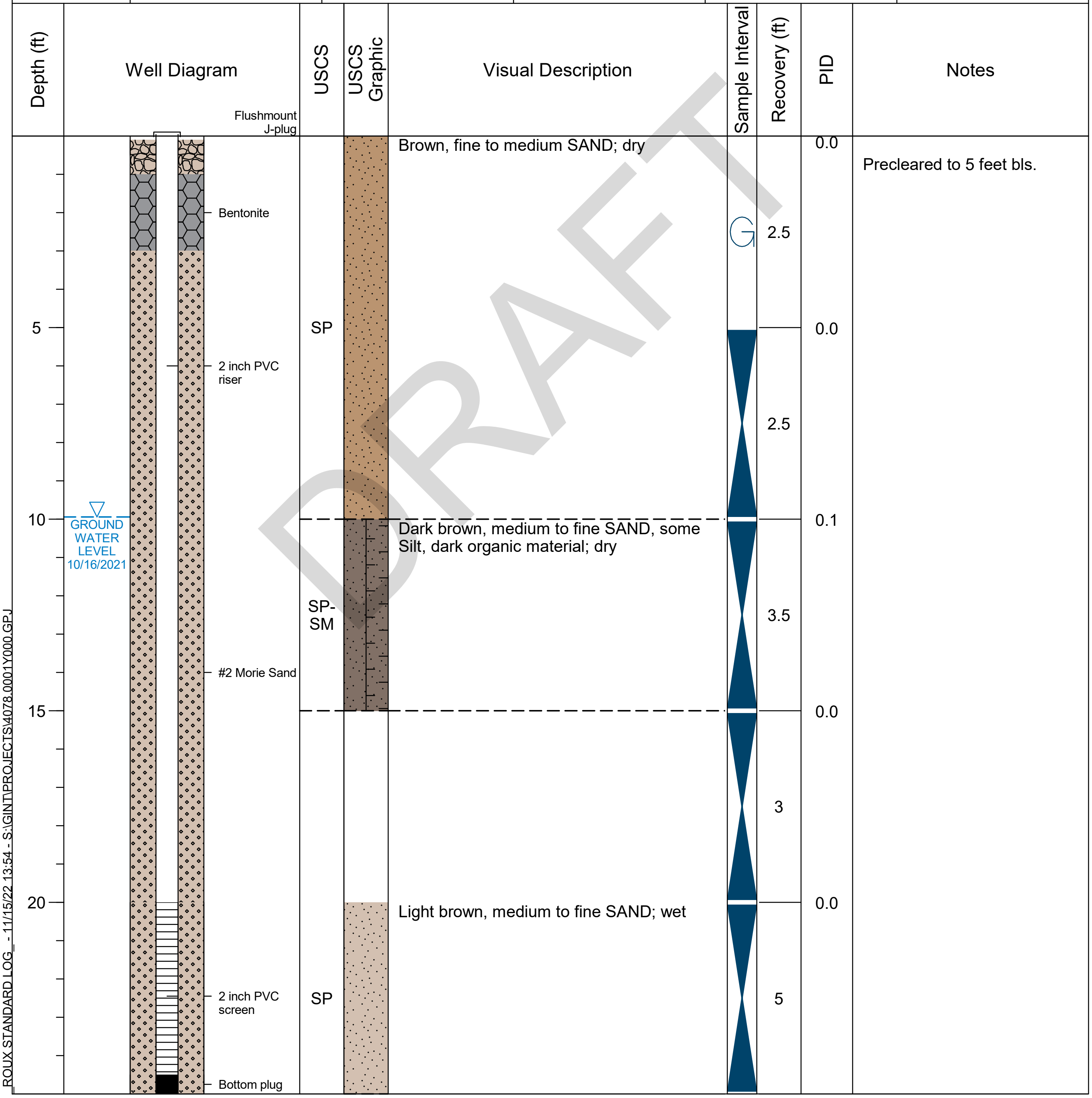
Depth (ft)	USCS	Visual Description	Sample Interval	Recovery (ft)	PID	Notes
		Light brown, medium to fine SAND, little Gravel				Precleared to 5 feet bls.
					0.0	
			G	5		
5	SPG				0.0	
				3		
10		Dark brown, medium to fine SAND and SILT, trace of clay, dark organic material; wet			0.1	
	SP-SM			4		

Bottom of borehole at 15 feet

Client: 458 East 99th Street LLC	Site: 458 East 99th Street	Project Number: 4078.0001Y000
Address: 458 East 99th Street	City/State: Brooklyn, New York	Logged By: M. Mueller

Start to Finish Date: 10/16/2021 - 10/16/2021	Contractor: Eastern Environmental	Drill Type: Geoprobe	Sampler Type/Method: 2" Macro-Core
Borehole Depth: 25 feet	Backfill: Cuttings	Borehole Diameter: 3-inches	DTW: 9.94 feet
Area: Brooklyn	Elevation: 15.16	Northing: -73.904995	Easting: 40.649769

Well Depth: 25 feet	Well Dia./Materials: 2-inch SCH 40 PVC	Screen Interval: 20-25 feet	Screen Slot Size: 20-Slot	Sand/Filter Pack Size: Morie #2	Annular Seal: Bentonite



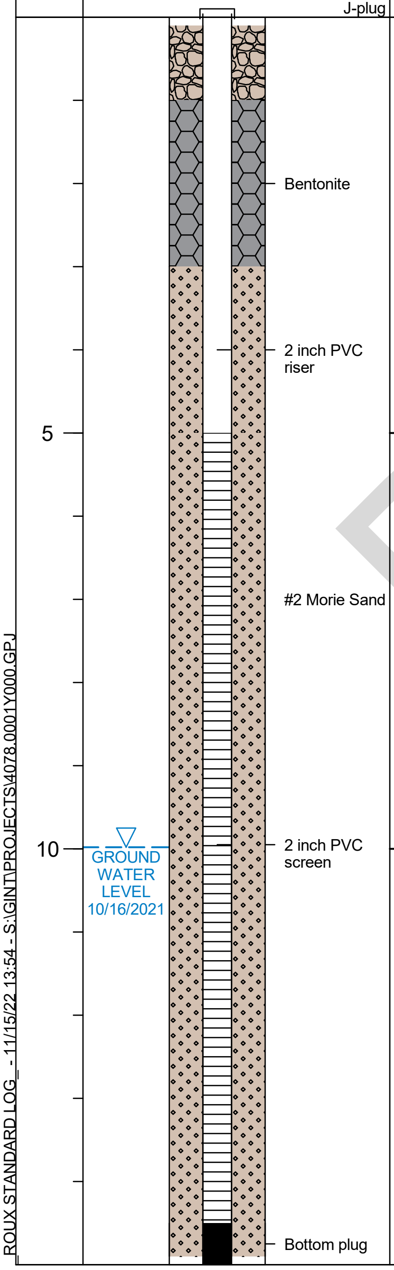
Depth (ft)	USCS	Visual Description	Recovery (ft)	PID	Notes
0	SP	Brown, fine to medium SAND; dry	2.5	0.0	Precleared to 5 feet bls.
5			2.5	0.0	
10	SP-SM	Dark brown, medium to fine SAND, some Silt, dark organic material; dry	3.5	0.1	
15			3	0.0	
20	SP	Light brown, medium to fine SAND; wet	5	0.0	

Bottom of borehole at 25 feet

Client: 458 East 99th Street LLC	Site: 458 East 99th Street	Project Number: 4078.0001Y000
Address: 458 East 99th Street	City/State: Brooklyn, New York	Logged By: N. Baragan

Start to Finish Date: 10/16/2021 - 10/16/2021	Contractor: Eastern Environmental	Drill Type: Geoprobe	Sampler Type/Method: 2" Macro-Core
Borehole Depth: 15 feet	Backfill: Cuttings	Borehole Diameter: 3-inches	DTW: 9.98 feet
Area: Brooklyn	Elevation: 15.15	Northing: -73.904992	Easting: 40.649771

Well Depth: 15 feet	Well Dia./Materials: 2-inch SCH 40 PVC	Screen Interval: 5-15 feet	Screen Slot Size: 20-Slot	Sand/Filter Pack Size: Morie #2	Annular Seal: Bentonite



Depth (ft)	USCS	Visual Description	Sample Interval	Recovery (ft)	PID	Notes
0-5	SW	Light brown, some white coarse to fine SAND, some Gravel; dry	G	2	0.0	Precleared to 5 feet bls.
5-10	SP	Light brown, medium to fine SAND, light gravel; dry		2.5	0.0	
10-15	SP-SM	Dark brown, medium to fine SAND, some Silt, dark organic material, little gravel; wet		5	0.0	

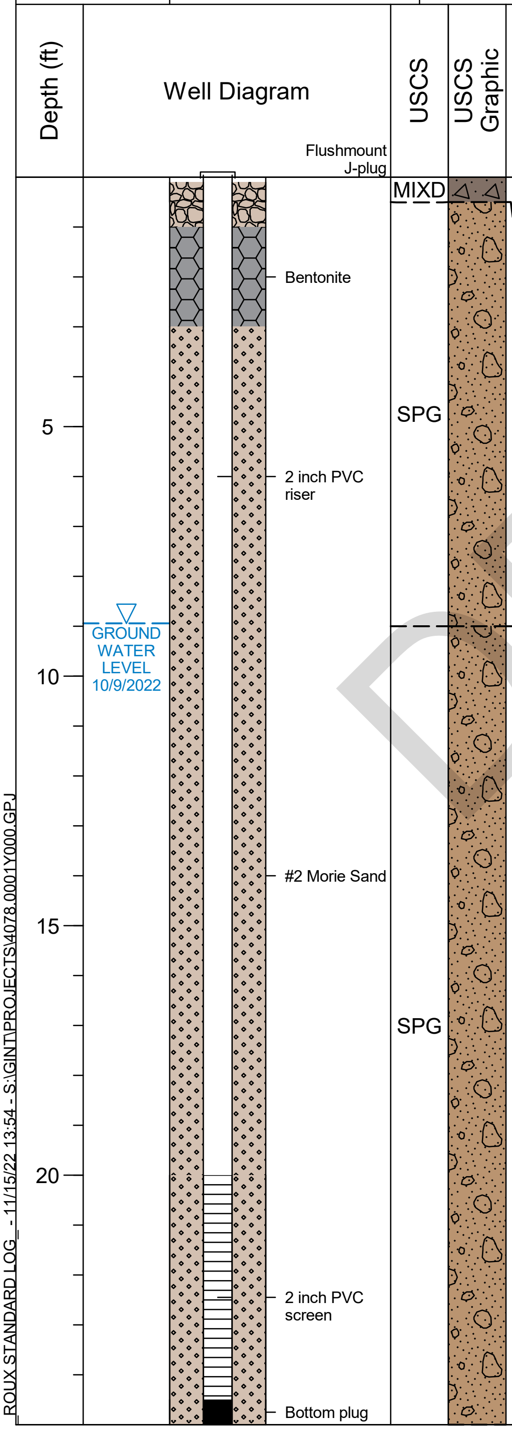
Bottom of borehole at 15 feet

GW-6D

Client: 458 East 99th Street LLC	Site: 458 East 99th Street	Project Number: 4078.0001Y000
Address: 458 East 99th Street	City/State: Brooklyn, New York	Logged By: M. Mueller

Start to Finish Date: 10/9/2021 - 10/9/2021	Contractor: Eastern Environmental	Drill Type: Geoprobe	Sampler Type/Method: 2" Macro-Core
Borehole Depth: 25 feet	Backfill: Cuttings	Borehole Diameter: 3-inches	DTW: 8.94 feet
Area: Brooklyn	Elevation: 14.19	Northing: -73.904952	Easting: 40.649641

Well Depth: 25 feet	Well Dia./Materials: 2-inch SCH 40 PVC	Screen Interval: 20-25 feet	Screen Slot Size: 20-Slot	Sand/Filter Pack Size: Morie #2	Annular Seal: Bentonite



Depth (ft)	USCS	Visual Description	Sample Interval	Recovery (ft)	PID	Notes
0	MIXD	Dark brown, medium to coarse SAND, some Gravel, brick, concrete (FILL); dry			0.0	Precleared to 5 feet bls. Soil sample B-6_0.5-2.5 collected.
0.5	SPG	Brown, medium to fine SAND, some Gravel, trace silt; dry	G	5		
5				2.5	0.0 0.0	
9	SPG	Brown, medium to fine SAND, some Gravel, trace silt; wet			0.0	Soil sample B-6_9.0-11.0 collected.
10				4	0.0	
15				5	0.0	
20				4	0.0	Soil sample B-6_23-25 collected.

Bottom of borehole at 25 feet

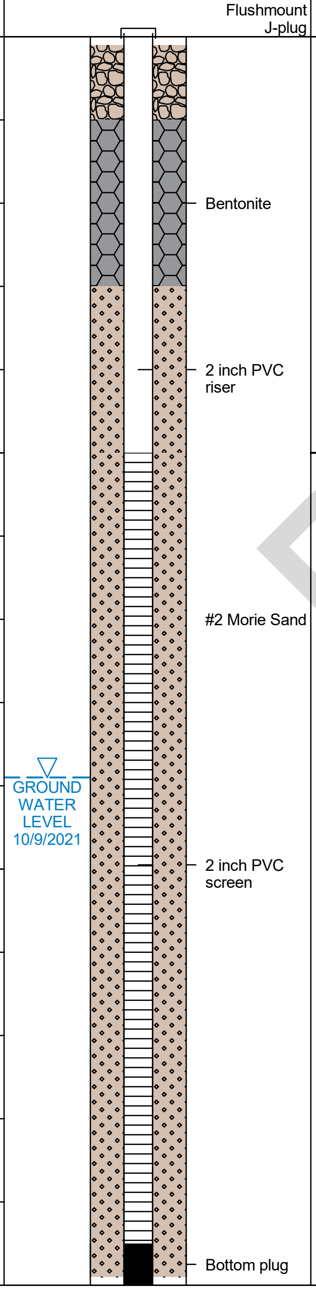
GW-6S

Page 1 of 1

Client: 458 East 99th Street LLC	Site: 458 East 99th Street	Project Number: 4078.0001Y000
Address: 458 East 99th Street	City/State: Brooklyn, New York	Logged By: M. Mueller

Start to Finish Date: 10/9/2021 - 10/9/2021	Contractor: Eastern Environmental	Drill Type: Geoprobe	Sampler Type/Method: 2" Macro-Core
Borehole Depth: 15 feet	Backfill: Cuttings	Borehole Diameter: 3-inches	DTW: 8.9 feet
Area: Brooklyn	Elevation: 14.18	Northing: -73.904949	Easting: 40.649643

Well Depth: 15 feet	Well Dia./Materials: 2-inch SCH 40 PVC	Screen Interval: 5-15 feet	Screen Slot Size: 20-Slot	Sand/Filter Pack Size: Morie #2	Annular Seal: Bentonite

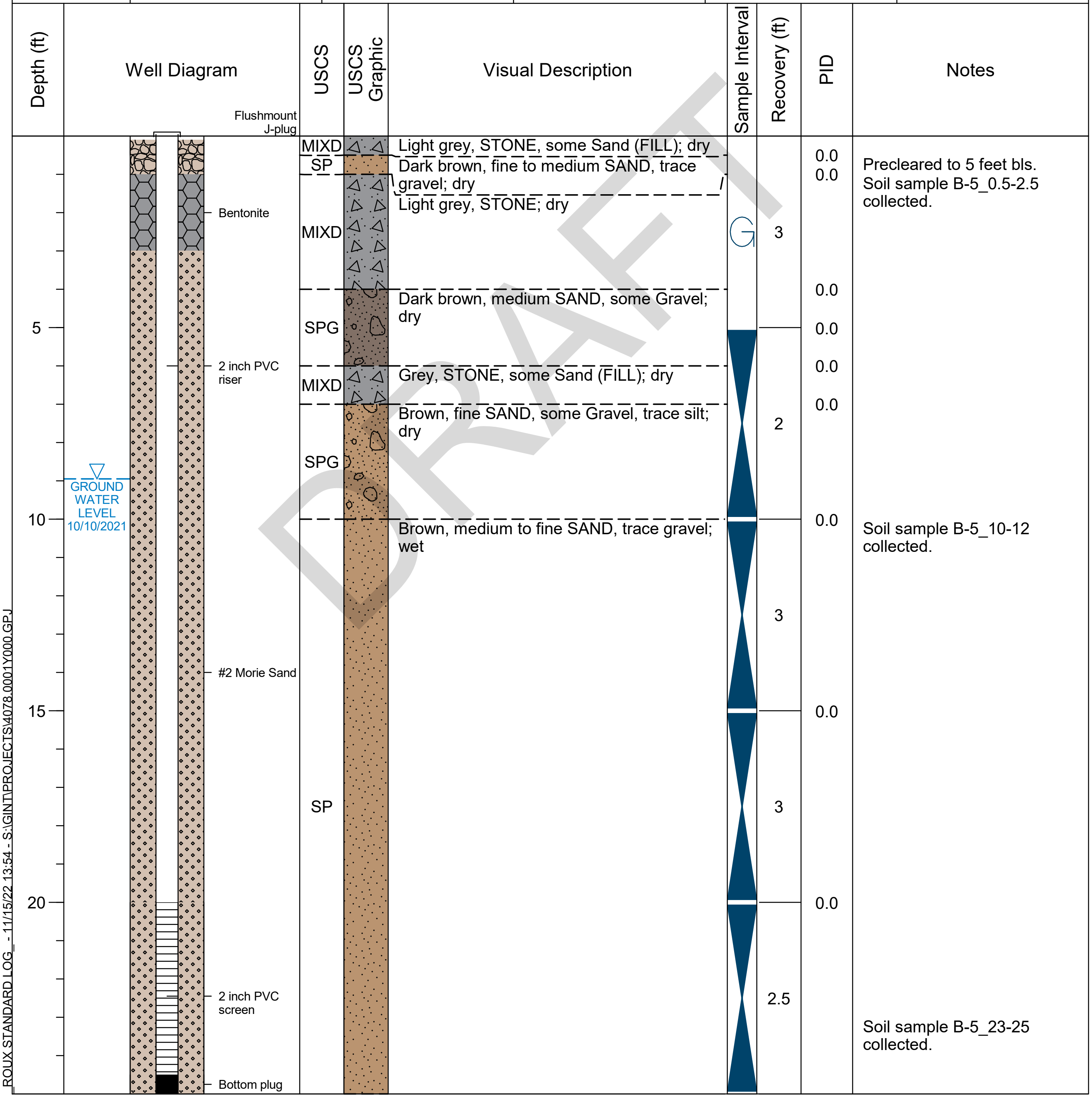


Depth (ft)	USCS	Visual Description	Sample Interval	Recovery (ft)	PID	Notes
0	SW	Brown, fine to coarse SAND, some Gravel, trace silt; dry	G	5	0.0	Precleared to 5 feet bls.
5	SW	Brown, fine to coarse SAND, some Gravel, trace silt; wet	▼	5	0.0	
10	SW		▼	5	0.0	

Bottom of borehole at 15 feet

Client: 458 East 99th Street LLC	Site: 458 East 99th Street	Project Number: 4078.0001Y000	
Address: 458 East 99th Street	City/State: Brooklyn, New York	Logged By: M. Mueller	
Start to Finish Date: 10/10/2021 - 10/10/2021	Contractor: Eastern Environmental	Drill Type: Geoprobe	Sampler Type/Method: 2" Macro-Core
Borehole Depth: 25 feet	Backfill: Cuttings	Borehole Diameter: 3-inches	DTW: 8.95 feet
Area: Brooklyn	Elevation: 14.15	Northing: -73.905102	Easting: 40.649662

Well Depth: 25 feet	Well Dia./Materials: 2-inch SCH 40 PVC	Screen Interval: 5-25 feet	Screen Slot Size: 20-Slot	Sand/Filter Pack Size: Morie #2	Annular Seal: Bentonite



USCS	Visual Description
MIXD	Light grey, STONE, some Sand (FILL); dry
SP	Dark brown, fine to medium SAND, trace gravel; dry
MIXD	Light grey, STONE; dry
SPG	Dark brown, medium SAND, some Gravel; dry
MIXD	Grey, STONE, some Sand (FILL); dry
SPG	Brown, fine SAND, some Gravel, trace silt; dry
SP	Brown, medium to fine SAND, trace gravel; wet

Recovery (ft): 3, 2, 3, 3, 2.5

PID: 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0

Notes:

Precleared to 5 feet bls. Soil sample B-5_0.5-2.5 collected.

Soil sample B-5_10-12 collected.

Soil sample B-5_23-25 collected.

Bottom of borehole at 25 feet

ROUX

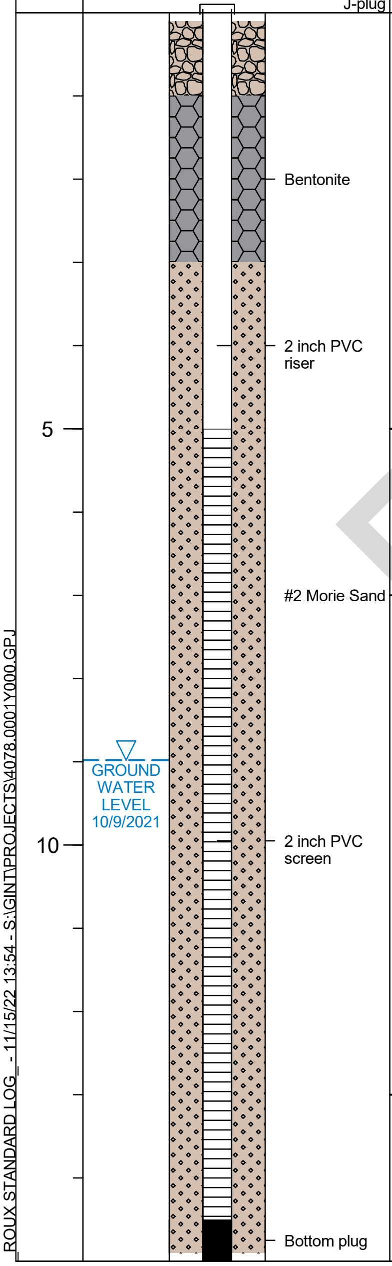
GW-7S

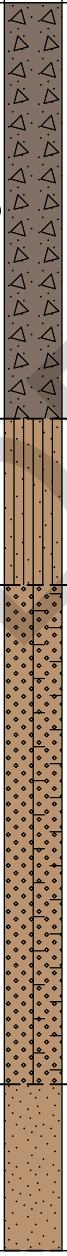
Page 1 of 1

Client: 458 East 99th Street LLC	Site: 458 East 99th Street	Project Number: 4078.0001Y000
Address: 458 East 99th Street	City/State: Brooklyn, New York	Logged By: M. Mueller

Start to Finish Date: 10/9/2021 - 10/9/2021	Contractor: Eastern Environmental	Drill Type: Geoprobe	Sampler Type/Method: 2" Macro-Core
Borehole Depth: 15 feet	Backfill: Cuttings	Borehole Diameter: 3-inches	DTW: 8.98 feet
Area: Brooklyn	Elevation: 14.14	Northing: -73.905103	Easting: 40.64966

Well Depth: 15 feet	Well Dia./Materials: 2-inch SCH 40 PVC	Screen Interval: 5-15 feet	Screen Slot Size: 20-Slot	Sand/Filter Pack Size: Morie #2	Annular Seal: Bentonite





Depth (ft)	USCS	Visual Description	Sample Interval	Recovery (ft)	PID	Notes
0	MIXD	Dark brown, SAND, some Gravel, RCA (FILL); dry	G	5	0.0	Precleared to 5 feet bls.
5	MLS	Brown, SILT, some fine Sand; dry		3	0.0	
7	SW-SM	Brown, fine to course SAND, some silt; wet			0.0	
10				5	0.0	
13	SP	Brown, course to medium SAND, trace gravel; wet			0.0	

Bottom of borehole at 15 feet

ROUX

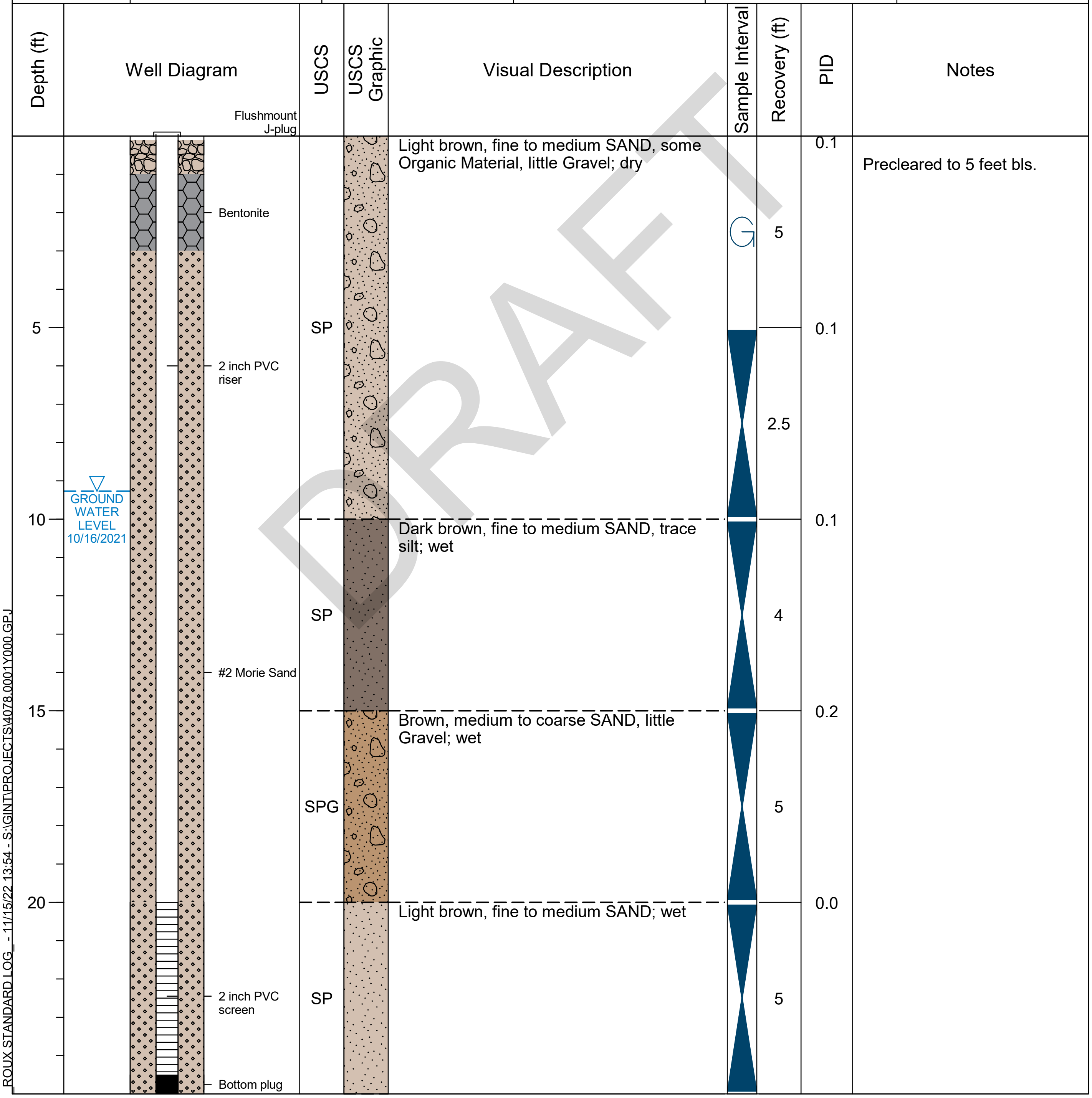
GW-8D

Page 1 of 1

Client: 458 East 99th Street LLC	Site: 458 East 99th Street	Project Number: 4078.0001Y000
Address: 458 East 99th Street	City/State: Brooklyn, New York	Logged By: N. Baragan

Start to Finish Date: 10/16/2021 - 10/16/2021	Contractor: Eastern Environmental	Drill Type: Geoprobe	Sampler Type/Method: 2" Macro-Core
Borehole Depth: 25 feet	Backfill: Cuttings	Borehole Diameter: 3-inches	DTW: 9.27 feet
Area: Brooklyn	Elevation: 14.59	Northing: -73.904887	Easting: 40.649833

Well Depth: 25 feet	Well Dia./Materials: 2-inch SCH 40 PVC	Screen Interval: 20-25 feet	Screen Slot Size: 20-Slot	Sand/Filter Pack Size: Morie #2	Annular Seal: Bentonite



Depth (ft)	USCS	Visual Description	Recovery (ft)	PID	Notes
0-5	SP	Light brown, fine to medium SAND, some Organic Material, little Gravel; dry	5	0.1	Precleared to 5 feet bls.
5-10			2.5	0.1	
10-15	SP	Dark brown, fine to medium SAND, trace silt; wet	4	0.1	
15-20	SPG	Brown, medium to coarse SAND, little Gravel; wet	5	0.2	
20-25	SP	Light brown, fine to medium SAND; wet	5	0.0	

Bottom of borehole at 25 feet

ROUX

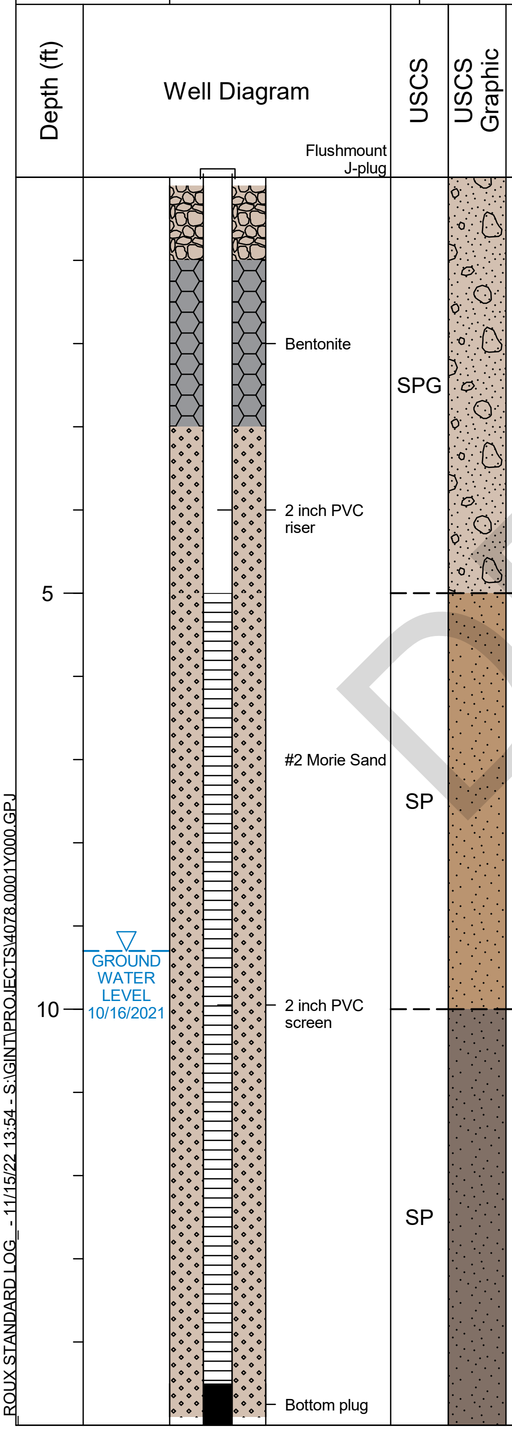
GW-8S

Page 1 of 1

Client: 458 East 99th Street LLC	Site: 458 East 99th Street	Project Number: 4078.0001Y000
Address: 458 East 99th Street	City/State: Brooklyn, New York	Logged By: N. Baragan

Start to Finish Date: 10/16/2021 - 10/16/2021	Contractor: Eastern Environmental	Drill Type: Geoprobe	Sampler Type/Method: 2" Macro-Core
Borehole Depth: 15 feet	Backfill: Cuttings	Borehole Diameter: 3-inches	DTW: 9.3 feet
Area: Brooklyn	Elevation: 14.55	Northing: -73.904885	Easting: 40.649835

Well Depth: 15 feet	Well Dia./Materials: 2-inch SCH 40 PVC	Screen Interval: 5-15 feet	Screen Slot Size: 20-Slot	Sand/Filter Pack Size: Morie #2	Annular Seal: Bentonite



Depth (ft)	USCS	Visual Description	Sample Interval	Recovery (ft)	PID	Notes
	SPG	Light brown, fine to medium SAND, some Gravel; dry	G	2	0.0	Precleared to 5 feet bls.
5	SP	Brown, fine to medium SAND, trace silt; dry		3	0.1	
10	SP	Dark brown, fine to medium SAND, trace silt; wet		1	0.2	

Bottom of borehole at 15 feet

APPENDIX D

Health and Safety Plan and Community Air Monitoring Plan

Site-Specific Health and Safety Plan

458 East 99th Street
Brooklyn, New York

May 20, 2024

Prepared for:

Euro Woodworking LLC
458 East 99th Street
Brooklyn, New York 11236

Prepared by:

Roux Environmental Engineering and Geology, D.P.C.
209 Shafter Street
Islandia, New York 11749

Environmental Consulting
& Management
+1.800.322.ROUX
rouxinc.com

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Appendices

Site-Specific Emergency Information

Emergency Phone Numbers

Most emergency services can be obtained by calling **911**. Where 911 service is not available, use the telephone numbers provided in the below table. The following is a master emergency phone list for use by the project management personnel. A more condensed version of the emergency numbers listed below will be posted throughout project work areas. Emergencies encountered on the Site will be responded to by a combination of off-Site emergency services and Site personnel.

<table>
<tr><th colspan="4">Emergency Contact Information</th></tr>
<tr><th colspan="4">Site Personnel</th></tr>
<tr><th>Title</th><th colspan="2">Contact</th><th>Telephone</th></tr>
<tr><td>Operations Manager (OM)</td><td colspan="2">Jeff Wills</td><td>(6310 630-2366</td></tr>
<tr><td>Project Manager (PM)</td><td colspan="2">Levi Curnutte</td><td>(631) 630-2371</td></tr>
<tr><td>Project Principal (PP)</td><td colspan="2">Noelle Clarke</td><td>(631) 630-2341</td></tr>
<tr><td>Site Supervisor (SS) / Site Health and Safety Officer (SHSO)</td><td colspan="2">Drew Kaplan</td><td>(631) 630-2347</td></tr>
<tr><td>Office Health and Safety Manager (OHSM)</td><td colspan="2">Nevin Pahlad</td><td>(347) 885-6930</td></tr>
<tr><td>Corporate Health and Safety Manager (CHSM)</td><td colspan="2">Brian Hobbs</td><td>(631) 630-2419</td></tr>
<tr><td>Client Emergency Contact</td><td colspan="2">Wolfgang Michelitsch</td><td>(917) 861-5369</td></tr>
<tr><th colspan="4">Outside Assistance</th></tr>
<tr><th>Agency</th><th>Contact</th><th>Telephone</th><th>Address/Location</th></tr>
<tr><td>Ambulance/EMS</td><td>FDNY EMS Station 59</td><td>(718) 927-3400</td><td>10174 Foster Avenue
Brooklyn, New York 11236</td></tr>
<tr><td>Police</td><td>NYPD 69 Precinct</td><td>(718) 257-6211
911</td><td>9720 Foster Avenue, Brooklyn, New York 11216</td></tr>
<tr><td>Fire</td><td>FDNY Engine 257/Ladder 170/Battalion 58</td><td>911</td><td>1361 Rockaway Pkwy, Brooklyn, New York 11210</td></tr>
<tr><td>Site Address</td><td colspan="3">458 East 99th Street, Brooklyn, New York 11236</td></tr>
</table>

Hospital

Brookdale University Hospital Medical Center - 1 Brookdale Plaza, Brooklyn, NY 11212

Urgent Care

City MD Bergen Beach Urgent Care – 2183A Ralph Ave, Brooklyn, NY 11234

The map showing the routes to the hospital and urgent care facilities along with listed directions can be found on Figure 3.

1. Introduction

This Site-specific Health and Safety Plan (HASP) has been prepared by Roux Environmental Engineering and Geology, D.P.C. (Roux) for use during the excavation and construction activities at the 458 East 99th S ("the Site"; see Figure 1). These activities fall within the scope of operations covered by the Occupational Safety and Health Administration (OSHA) standards promulgated at 29 CFR 1910.120 and 29 CFR 1926.65, both commonly referred to as the Hazardous Waste Operations and Emergency Response (HAZWOPER) Standard. In accordance with the HAZWOPER Standard, this Site-specific HASP was prepared to address the safety and health hazards associated with the excavation and construction activities being performed at the Site by Roux and to provide requirements and procedures for the protection of Roux employees, subcontractor personnel, government oversight personnel, Site personnel, and the general public. It also addresses client- and Site-specific requirements for health and safety.

Implementation of this HASP is the joint responsibilities of the Project Manager (PM), the Site Health and Safety Officer (SHSO), and all field staff, with assistance from the Project Principal (PP), Office Health and Safety Manager (OHSM), and Corporate Health and Safety Manager (CHSM). The PM for this project is Levi Curnutte. The Site Supervisor (SS) and Site Health and Safety Officer (SHSO) is Drew Kaplan.

This HASP will be introduced to, reviewed, and signed off on by all Roux personnel through a formal training session prior to commencing work. A copy of the HASP will be kept at the Site at all times. The Roux SHSO or PM will be responsible for posting any changes, amendments, memos, etc. to the HASP. Any revisions to this HASP will be signed by appropriate personnel, which can include Roux's PP, CHSM, and SS. Any changes will be announced to all workers at the next safety meeting.

1.1 Roles and Responsibilities

Overall Roles and Responsibilities (R&Rs) of Roux personnel are provided in Roux's Policies and Procedures Manual. Only those R&Rs specific to HASP requirements are listed below.

Project Manager (PM)

The PM has responsibility and authority to direct all work operations. The PM coordinates safety and health functions with the SHSO, has the authority to oversee and monitor the performance of the SHSO, and bears ultimate responsibility for the proper implementation of this HASP. The specific duties of the PM are:

- Preparing and coordinating the Site work plan;
- Providing Site Supervisor(s) with work assignments and overseeing their performance;
- Coordinating safety and health efforts with the SSHO;
- Ensuring effective emergency response through coordination with the Emergency Response Coordinator (ERC); and
- Serving as primary Site liaison with public agencies and officials and Site contractors.

Site Health and Safety Officer (SHSO)

The SHSO has full responsibility and authority to develop and implement this HASP and to verify compliance. The SHSO reports to the Project Manager. The SHSO is on-Site or readily accessible to the Site during all work operations and has the authority to halt Site work if unsafe conditions are detected. The specific responsibilities of the SHSO include:

- Managing the safety and health functions on this Site;
- Serving as the Site's point of contact for safety and health matters;

- Ensuring Site monitoring, worker training, and effective selection and use of PPE;
- Assessing Site conditions for unsafe acts and conditions and providing corrective action;
- Assisting the preparation and review of this HASP;
- Maintaining effective safety and health records as described in this HASP; and
- Coordinating with the Site Supervisor(s) and others as necessary for safety and health efforts.

Site Supervisor

The SS is responsible for field operations and reports to the PM. The SS ensures the implementation of the HASP requirements and procedures in the field. The specific responsibilities of the SS include:

- Executing the work plan and schedule as detailed by the PM;
- Coordination with the SHSO on safety and health; and
- Ensuring Site work compliance with the requirements of this HASP.

Employees

All Roux employees are responsible for reading and following all provisions of the Corporate Health and Safety Manual, including this HASP. Employees report to the SS at the project Site. Each employee is also responsible for the following:

- Wearing all appropriate PPE as outlined within this HASP;
- Attending all safety meetings;
- Inspecting tools and equipment prior to use, and taking any defective tools or equipment out of service;
- Appropriately documenting field events as they occur within a logbook or equivalent;
- Properly operating machinery and/or equipment only if trained to do so;
- Stopping work operations if unsafe conditions exist;
- Identifying and mitigating hazards when observed;
- Reporting all incidents and near misses to the Roux SHSO and SS immediately; and
- Knowing where emergency equipment is located (e.g., first aid kit, fire extinguisher).

Subcontractors and Visitors

Subcontractors and visitors are responsible for complying with the same health and safety requirements. It is the responsibility of all to make sure subcontractors and visitors comply and uphold the HASP. Subcontractors and visitors have the following additional responsibilities:

- Designating a qualified safety representative for the project that can make the necessary changes in work practices, as necessary;
- Attending all safety meetings while participating in roux site work activities;
- Reporting all incidents and near misses to Roux SHSO and SS immediately;
- Conducting initial and periodic equipment inspections in accordance with manufacturer and regulatory guidelines; and
- Providing copies of all safety data sheets (SDS) to Roux SHSO for materials brought to the Site.

2. Background

Relevant background information is provided below, including a general description of the Site; a brief review of the Site's history with respect to hazardous material use, handling, and/or storage; and a review of known and potential releases of hazardous substances at the Site.

2.1 Site Description

The site (458 E. 99th Street, Kings County, Brooklyn, N.Y.) consists of an approximately 0.14 acre (6,000 ft^2) parcel of land improved with: (i) a one-story masonry and steel office/warehouse building (±50' x 100' or 5,000 ft^2) with on-grade concrete slab (no basement); and (ii) a concrete driveway or alleyway (±10' x 100' or 1,000 ft^2), located on the north side of the building. The building covers the majority of the lot, with the exception of the noted driveway or alleyway. The site is enrolled in the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP) (assigned Site No. 224524).

The Site is located 180 feet northwest of the intersection of East 99th Street and Foster Avenue, on the southwest side of East 99th Street. The boundary survey of the site indicates that the site is located at Latitude: 40o 38' 59.1468" and Longitude: -73o 54' 17.4276". The surrounding neighborhood of Kings County, wherein the site is located, consists of manufacturing, industrial, commercial, and warehouse-type facilities and is located within a M1-1 Manufacturing zoning district.

Prior to construction of the existing building during 1952, the site consisted of undeveloped vacant land. A variety of operations, including Abe's Radio, Bagels by Bell, and Pinnacle Lift of NY, have occupied the site since construction of the existing building during 1952. Notably, historical records for the site revealed that the building was occupied from 1966 through 1973 by a dry cleaning chemical warehousing operation. Surrounding land usage has historically been industrial, commercial, and manufacturing in nature, including, but not limited to, printing, automobile repair, iron works, etc.

The site is currently occupied solely by Euro Woodworking, LLC as an active woodworking shop. There is no redevelopment or change in use proposed for the office/warehouse building or the site, and Euro Woodworking will continue to operate at the site.

3. Scope of Work

The proposed Scope of Work to be conducted by Roux include implementation of the NYSDEC Remedial Investigation Work Plan (RIWP) is to further investigate current site conditions. The proposed RAWP scope of work includes the following:

- Limited soil excavation by subs-slab depressurization system/soil vapor extraction system (SSDS/SVES) installer contractor necessary to install SSDS/SVES;
- Excavation, loadout, and off-Site disposal of Site soils at permitted facilities;
- Import of approved backfill to restore foundation slab; and
- Construction and startup of a retrofitted SSDS/SVES beneath the building.

Non-routine activities that may be performed by Roux personnel include the following:

- Limited Site inspections;
- Oversight of Roux subcontractor personnel during horizontal/vertical datum and geophysical surveying activities; and
- Oversight of Roux subcontractor personnel during disposal of investigation-derived waste.

If there are any changes to the Scope of Work, the HASP will be altered to address any new hazards.

4. Site Control

This Site Control Program is designed to reduce the spread of hazardous substances from contaminated areas to clean areas; to identify and isolate contaminated areas of the Site; to facilitate emergency evacuation and medical care; to prevent unauthorized entry to the Site; and to deter vandalism and theft.

4.1 Site Map

A map of this Site, showing Site boundaries, designated work zones, and points of entry and exit is provided in Figure 2.

4.2 Site Access

Access to the Site is restricted to reduce the potential for exposure to its safety and health hazards. During hours of Site operation, Site entry and exit is authorized by the Site tenant who will grant access to the building's (1) entry door; and (2) roll-up doors. Doors will be locked during non-work hours.

4.3 Buddy System

While working in the Exclusion Zone and on the sidewalks outside of the Site, Site workers use the buddy system. The buddy system means that personnel work in pairs and stay in close visual contact to be able to observe one another and summon rapid assistance in case of an emergency. The responsibilities of workers using the buddy system include:

- Remaining in close visual contact with partner;
- Providing partner with assistance as needed or requested;
- Observing partner for signs of heat stress or other difficulties;
- Periodically checking the integrity of partner's PPE; and
- Notifying the Site manager or other Site personnel if emergency assistance is needed.

4.4 Site Communications

The following communication equipment is used to support on-Site communication:

- Hand signals to communicate with drilling operators; and
- Cell phones, as needed.

As applicable, hand signals will be used according to the following:

Hand Signals

SIGNAL	MEANING
Hand gripping throat	Out of air, can't breathe
Grip partner's wrist	Leave area immediately
Hands on top of head	Need assistance
Thumbs up	I'm all right, okay
Thumbs down	No, negative

A current list of emergency contact numbers is included in the Site-Specific Emergency Information provided at the beginning of this HASP.

4.5 Site Work Zones

The SOW does not require the implementation of work zones; however, should the need arise, this section provides details for the proper execution of work zones at this Site.

This Site is divided into three (3) major zones, described below. These zones are characterized by the presence or absence of biological, chemical, or physical hazards and the activities performed within them. Zone boundaries are clearly marked at all times and the flow of personnel among the zones is controlled. The Site is monitored for changing conditions that may warrant adjustment of zone boundaries. Zone boundaries are adjusted as necessary to protect personnel and clean areas. Whenever boundaries are adjusted, zone markings are also changed and workers are immediately notified of the change.

Exclusion Zone

The area where contamination exists is the Exclusion Zone (EZ). All areas where excavation and handling of contaminated materials take place are considered the EZ. This zone will be delineated by orange high visibility fencing. Safety tape may be used as a secondary delineation within the EZ. The zone delineation markings may be opened in areas for varying lengths of time to accommodate equipment operation or specific construction activities. The SHSO may establish more than one EZ where different levels of protection may be employed or where different hazards exist. Personnel are not allowed in the EZ without:

- A buddy (co-worker);
- Required minimum level PPE;
- Medical Authorization;
- Training certification; and
- Requirement to be in the zone.

Contamination Reduction Zone

A Contamination Reduction Zone (CRZ) is established between the exclusion zone and the support zone. The CRZ contains the Contamination Reduction Corridor (CRC) and provides an area for decontamination of personnel and equipment. The CRZ will be used for general Site entry and egress in addition to access for heavy equipment and emergency support services. Personnel are not allowed in the CRZ without:

- A buddy (co-worker);
- Appropriate PPE;
- Medical authorization;
- Training certification; and
- Requirement to be in the zone.

Support Zone

The Support Zone (SZ) is an uncontaminated area that will be the field support area for the Site operations. The SZ will contain a temporary project trailer or work vehicle. Appropriate sanitary facilities and safety equipment will be located in this zone. Potentially contaminated personnel or materials are not allowed in this zone. The only exception will be appropriately packaged/decontaminated and labeled samples.

5. Job Hazard Evaluation

Roux's work at the Site is expected to entail a variety of physical, chemical, and biological hazards, all of which must be sufficiently managed to allow the work to be performed safely. Some of the hazards are Site-specific, i.e., they are associated with the nature, physical characteristics, and/or routine operation of the Site itself, while others are activity-specific, i.e., they are associated with (or arise from) the particular activity being performed. The various hazards can be grouped into the following categories:

> **Caught/Crushed** – the potential to become caught in, under, between, or by an object or parts of an object, such as equipment with parts that open and close or move up and down ("pinch points") or equipment that rotates, and the accompanying potential to have body parts cut, mangled, or crushed thereby.
>
> **Contact** – the potential to be struck by or against moving or stationary objects that can cause physical injury, such as heavy machinery, overhead piping, moving vehicles, falling objects, and equipment (including tools and hand-held equipment) or infrastructure with the ability to cut or impale.
>
> **Energy Sources** – the potential for bodily harm associated with energy sources, most notably electricity, but also including latent energy sources such as compressed air and equipment under tension (which when released could cause injurious contact or a fall).
>
> **Ergonomics** – the potential for musculoskeletal injury associated with lifting/carrying, pushing/pulling, bending, reaching, and other physical activity attributable to poor body position/mechanics, repetitive motion, and/or vibration.
>
> **Exposure** – the potential for injury/illness due to physical, chemical, or biological exposures in the work environment, including but not limited to temperature extremes, solar radiation, and noise (physical), chemical splashes and hazardous atmospheres (chemical), and animal/insect bites and poisonous plants (biological).
>
> **Falls** – the potential to slip or trip and thus fall or drop a load, resulting in bodily injury to oneself or others

The foregoing is intended to provide Roux employees with a general awareness of the hazards involved with Site work. A more detailed review of the potential hazards associated with each specific activity planned for the Site (or ongoing activity, as the case may be) is provided in the activity-specific Job Safety Analysis (JSA) forms in Appendix A. As can be seen in the JSA forms, the hazards are identified by category per the above, and specific measures designed to mitigate/manage those hazards are also identified. In preparing the JSA forms, all categories of hazards were considered, and all anticipated potential hazards were identified to the extent possible based on the experience of the personnel preparing and reviewing the JSA forms. However, there is always the possibility for an unanticipated hazard to arise, potentially as condition change over the course of the workday. Roux personnel must maintain a continual awareness of potential hazards in the work zone, regardless of whether the hazard is identified in the JSA form. Particular attention should be paid to hazards associated with exposure to hazardous substances (see Table 1 for a listing of the hazardous substances most likely to be encountered in environmental media at the Site) and to Site personnel being located "in the line of fire" with respect to moving equipment, pinch points, and latent energy, e.g., being located or having body parts located within the swing radius of an excavator, between two sections of pipe being connected, below a piece of suspended equipment, or adjacent to a compressed air line.

5.1 Employee Notification of Hazards and Overall Site Information Program

The information in the JSAs and safety data sheets is made available to all employees and subcontractors who could be affected by it prior to the time they begin their work activities. Modifications to JSAs are communicated during routine pre-work briefings.

The information in the JSAs and Safety Data Sheets (SDSs) is made available to all employees and subcontractors who could be affected by an exposure to the hazards covered in them prior to the time they begin their work activities. Modifications to JSAs are communicated during routine pre-work briefings, and periodically updated as needed in the HASP. SDSs will be maintained by the SHSO/SS for new chemicals brought on-Site as needed. Copies of SDSs can be found in Appendix B.

6. Emergency Response Plan

This emergency response plan details actions to be taken in the event of Site emergencies. The PM and SHSO is responsible for the implementation of emergency response procedures on-Site. The SHSO/PM provides specific direction for emergency action based upon information available regarding the incident and response capabilities and initiates emergency procedures and notification of appropriate authorities. In the event of an emergency, Site personnel are evacuated and do not participate in emergency response activities, response is facilitated through external emergency services.

6.1 Emergency Response

The SHSO, after investigating the incident and relevant information, shall determine the level of response required for containment, rescue, and medical care. Limited on-Site emergency response activities could occur therefore the SHSO is responsible for notifying external emergency response agencies. The SHSO provides relevant information to the responding organizations, including but not limited to the hazards associated with the emergency incident, potential containment problems, and missing Site personnel.

6.2 Emergency Alerting and Evacuation

If evacuation notice is given, Site workers leave the worksite, if possible, by way of the nearest exit. Appropriate primary and alternate evacuation routes and assembly areas have been identified and are shown on the Site Plan with Emergency Muster Point (Figure 2). The routes and assembly area will be determined by conditions at the time of the evacuation based on wind direction, the location of the hazard source, and other factors as determined by SHSO/PM.

Personnel exiting the Site gather at a designated assembly point. To determine that everyone has successfully exited the Site, personnel will be accounted for at the assembly area. If any worker cannot be accounted for, notification is given to so that appropriate action can be initiated. Subcontractors on this Site have coordinated their emergency response plans to ensure that these plans are compatible and potential emergencies are recognized, alarm systems are clearly understood, and evacuation routes are accessible to all personnel relying upon them.

6.3 Emergency Medical Treatment and First Aid

In the event of a work-related injury or illness, employees are required to follow the procedures outlined below. All work-place injury and illness situations require Roux's Project and Corporate Management Team to be notified when an injury/ illness incident occurs, and communication with the contracted Occupational Health Care Management Provider, AllOne Health, is initiated. The Injury/Illness Notification Flowchart is provided below and within Roux's Incident Investigation and Reporting program included as Appendix F.

In addition, if the person is suspected to be infected with COVID-19 or is suspected to have come into contact with someone infected with COVID-19, follow the COVID-19 Safety Guidance outlined in Appendix I.

If on-Site personnel require any medical treatment, the following steps will be taken:

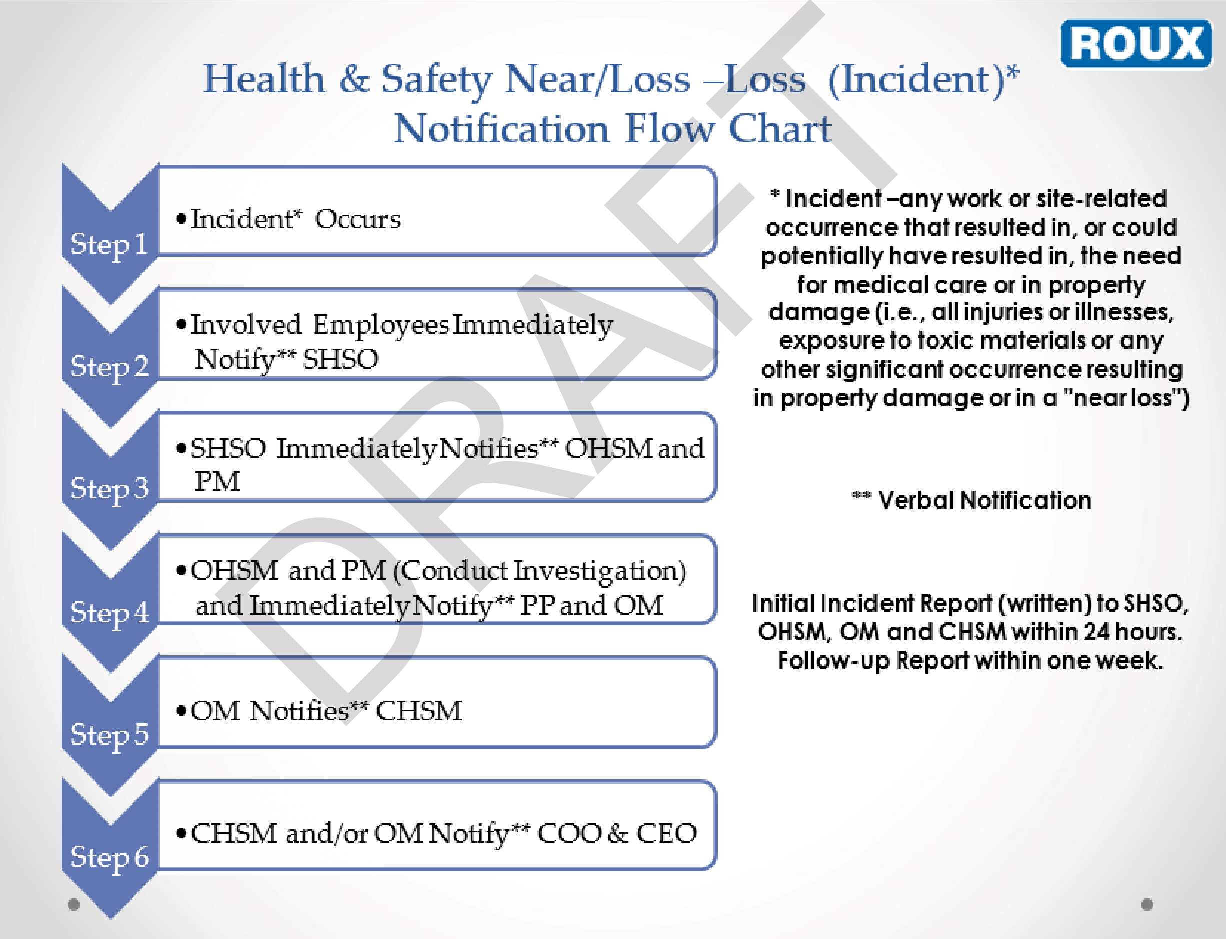
a. Notify Roux's Project and Corporate Management Team for any work-related injury and/or illness occurrence and communicate with the contracted Occupational Health Care Management Provider, AllOne Health, immediately following the notifications provided above.

b. Based on discussions with the Project Team, Corporate Management and the AOH evaluation, if medical attention beyond on-Site First Aid is warranted, transport the injured / ill person (IP) to the Urgent Care Center, or notify the Fire Department or Ambulance Emergency service and request an ambulance or transport the victim to the hospital, and continue communications with Corporate Management Team. An Hospital/Urgent Care Route map to City MD Bergen Beach Urgent Care and Brookdale University Hospital Medical Center is included as Figure 3.

c. Decontaminate to the extent possible prior to administration of first aid or movement to medical or emergency facilities.

d. First aid medical support will be provided by on-Site personnel trained and certified in First Aid, Cardio Pulmonary Resuscitation (CPR), Automatic External Defibrillation (AED), and Blood-Borne Pathogens (BBP) Awareness, until relieved by emergency medical services (EMS).

e. The SHSO and Project Manager will perform a Loss Investigation (LI) and the Project Team will complete the final Loss Report. If a Roux employee is involved in a vehicular incident, the employee must also complete the Acord Automobile Loss Notice.



Health & Safety Near/Loss –Loss (Incident)*
Notification Flow Chart

Step 1 • Incident* Occurs

Step 2 • Involved Employees Immediately Notify** SHSO

Step 3 • SHSO Immediately Notifies** OHSM and PM

Step 4 • OHSM and PM (Conduct Investigation) and Immediately Notify** PP and OM

Step 5 • OM Notifies** CHSM

Step 6 • CHSM and/or OM Notify** COO & CEO

* Incident –any work or site-related occurrence that resulted in, or could potentially have resulted in, the need for medical care or in property damage (i.e., all injuries or illnesses, exposure to toxic materials or any other significant occurrence resulting in property damage or in a "near loss")

** Verbal Notification

Initial Incident Report (written) to SHSO, OHSM, OM and CHSM within 24 hours. Follow-up Report within one week.

6.4 Adverse Weather Conditions

In the event of adverse weather conditions, the SHSO or project principal will determine if work can continue without sacrificing the health and safety of all field workers. Some of the items to be considered prior to determining if work should continue are:

- Potential for heat stress and heat-related injuries.

- Potential for cold stress and cold-related injuries.
- Treacherous weather-related conditions.
- Limited visibility.
- Electrical storm potential.

Site activities will be limited to daylight hours and acceptable weather conditions. Inclement working conditions include heavy rain, fog, high winds, and lightning. Observe daily weather reports and evacuate if necessary in case of inclement weather conditions.

6.5 Electrical Storm Guidelines

In the event that lightning and/or thunder are observed while working on-Site, all on-Site activities shall stop and personnel shall seek proper shelter (e.g., substantial building, enclosed vehicle, etc.). Work shall not resume until the threat of lighting has subsided and no lightning or thunder has been observed for 30 minutes. If the possibility of lightning is forecast for the day, advise the on-Site personnel on the risks and proper procedure at the pre-work safety briefing. Continuously monitor for changing weather conditions and allow enough time to properly stop work if lightning is forecast.

7. Safety Procedures

This section of the HASP presents the specific safety procedures to be implemented during Roux's activities at the Site in order to protect the health and safety of various on-Site personnel. Minimum OSHA-mandated procedures are presented first, followed by client- and Site-specific procedures. Lastly, activity-specific procedures are discussed. These Site- and activity-specific procedures supplement the general safety procedures included in Roux's Corporate Health and Safety Manual, which also must be followed in their entirely.

7.1 Training

At a minimum, Site personnel who will perform work in areas where there exists the potential for toxic exposure will be health and safety-trained prior to performing work on Site per OSHA 29 CFR 1910.120(e) and 29 CFR 1926.65(e). More specifically, all Roux, subcontractor, and other personnel engaged in sampling and remedial activities at the Site and who are exposed or potentially exposed to hazardous substances, health hazards, or safety hazards must have received at a minimum the 40 hour initial HAZWOPER training consistent with the requirements of 29CFR 1910.120(e)(3)(i) training and a minimum of 3 days' actual field experience under the direct supervision of a trained experienced supervisor, plus 8 hours of refresher training on an annual basis. Depending on tasks performed, less training may be permitted. Evidence of such training must be maintained at the Site at all times. Furthermore, all on-Site management and supervisory personnel directly responsible for or who supervise the employees engaged in Site remedial operations, must have received an additional 8 hours of specialized training at the time of job assignment on topics including, but not limited to, the employer's safety and health program and the associated employee training program, personal protective equipment program, spill containment program, and health hazard monitoring procedure and techniques, plus 8 hours of refresher training on an annual basis.

Roux personnel training records are maintained in a corporate database with records available upon request from either the OHSM/SHSO/CHSM or Human Resources Department.

7.2 Site-Specific Safety Briefings for Visitors

A Site-specific briefing is provided to all Site visitors who enter this Site beyond the Site entry point. For visitors, the Site-specific briefing provides information about Site hazards, the Site lay-out including work zones and places of refuge, the emergency alarm system and emergency evacuation procedures, and other pertinent safety and health requirements as appropriate.

7.3 HASP Information and Site-Specific Briefings for Workers

Site personnel review this HASP and are provided a Site-specific tailgate briefing prior to the commencement of work to ensure that employees are familiar with this HASP and the information and requirements it contains as well as relevant JSAs. Additional briefings are provided as necessary to notify employees of any changes to this HASP as a result of information gathered during ongoing Site characterization and analysis. Conditions for which we schedule additional briefings include, but are not limited to: changes in Site conditions, changes in the work schedule/plan, newly discovered hazards, and incidents occurring during Site work.

7.4 Medical Surveillance

The medical surveillance section of the Health and Safety Plan describes how worker health status is monitored at this Site. Medical surveillance is used when there is the potential for worker exposure to hazardous substance at levels above OSHA permissible exposure limits or other published limits. The purpose of a medical surveillance program is to medically monitor worker health to ensure that personnel are not adversely affected by Site hazards. The provisions for medical surveillance at this Site are based on the Site characterization and job hazard analysis found in Section 4 of this HASP and are consistent with OSHA requirements in 29 CFR 1910.120(f) as applicable.

7.4.1 Site Medical Surveillance Program

Medical surveillance requirements are based on a worker's potential for exposure as determined by the Site characterization and job hazard analysis documented in Section 4 and JSAs within Appendix A of this HASP and in compliance with the requirements of 29 CFR 1910.120(f)(2). Based on Site information and use of direct reading instruments, limited use of respirators (less than 30 days per year), and the absence of an employee-staffed HAZMAT team, a limited medical surveillance program is required and implemented at this Site. The medical surveillance program provides that:

1. Workers assigned to tasks requiring the use of respirators receive medical examinations in accordance with 29 CFR 1910.134(e) to ensure they are physically capable to perform the work and use the equipment, and
2. If a worker is injured, becomes ill, or develops signs or symptoms of possible over-exposure to hazardous substance or health hazards, medical examinations are provided to that worker as soon as possible after the occurrence and as required by the attending physician.
3. These medical examinations and procedures are performed by or under the supervision of a licensed physician and are provided to workers free of cost, without loss of pay, and at a reasonable time and place. In addition, the need to implement a more comprehensive medical surveillance program will be re-evaluated after any apparent over-exposure.

7.4.2 Medical Recordkeeping Procedures

Medical recordkeeping procedures are consistent with the requirements of 29 CFR 1910.1020 and are described in the company's overall safety and health program. A copy of that program is available at our Islandia, New York office.

The following items are maintained in worker medical records:

- Respirator fit test and selection;
- Physician's medical opinion of fitness for duty (pre-placement, periodic, termination);
- Physician's medical opinion of fitness for respirator protection (pre-placement, periodic); and
- Exposure monitoring results.

7.4.3 Program Review

The medical program is reviewed to ensure its effectiveness. The Corporate Health and Safety Manager in coordination with the Human Resources Director is responsible for this review. At minimum, this review consists of:

- Review of accident and injury records and medical records to determine whether the causes of accidents and illness were promptly investigated and whether corrective measures were taken wherever possible;

- Evaluation of the appropriateness of required medical tests based on Site exposures; and
- Review of emergency treatment procedures and emergency contacts list to ensure they were Site-specific, effective, and current.

7.5 Personnel Protection

Site safety and health hazards are eliminated or reduced to the greatest extent possible through engineering controls and work practices. Where hazards are still present, a combination of engineering controls, work practices and PPE are used to protect employees. Appropriate personal protective equipment (PPE) shall be worn by Site personnel when there is a potential exposure to chemical hazards or physical hazards (e.g., falling objects, flying particles, sharp edges, electricity, and noise), as determined by the SHSO. The level of personal protection, type and kind of equipment selected will depend on the hazardous conditions and in some cases cost, availability, compatibility with other equipment, and performance. An accurate assessment of all these factors will be made before work can be safely executed.

Roux maintains a comprehensive written PPE program that addresses proper PPE selection, use, maintenance, storage, fit and inspection. Roux's PPE program can be found within Appendix C. PPE to be used at the Site will meet the appropriate American National Standards Institute (ANSI) standards and the following OSHA (General Industry) standards for minimum PPE requirements.

The minimum level of PPE for entry onto the Site is Level D. The following equipment shall be worn:

- Work uniform (long pants, sleeved shirt);
- Hard hat;
- Steel or composite toe work boots;
- Safety Glasses (must comply with one of the following ANSI/ISEA Z87.1-2010, ANSI Z87.1-2003, ANSI Z87.1-2003);
- Boot Covers (as needed);
- Hearing Protection (as needed);
- High visibility clothing (shirt/vest); and
- Hand Protection (e.g., minimum cut resistance meeting ANSI 105-2000 Level 2).

Note that jewelry shall be removed or appropriately secured to prevent it from becoming caught in rotating equipment or unexpectedly snagged on a fixed object. (e.g., wrist watches bracelets, rings, chains and necklaces, open earrings). Do not wear loose clothing and all shoulder length hair should be tied back.

Site specific PPE ensembles and materials are identified within task specific JSAs located within Appendix A, and any upgrades or downgrades of the level of protection (i.e., not specified in the JSA) must be immediately communicated to all Roux personnel and subcontractors as applicable. PPE is used in accordance with manufacturer's recommendations.

7.5.1 Hearing Conservation

Hearing protection is made available when noise exposures equal or exceed an 8-hour time-weighted average sound level of 85 dBA. Hearing protection is required when the 8-hour time weighted average sound level $\geq$ 90 dBA. Where noise exposure meets or exceeds this level, noise is listed as a physical hazard in the JSA for the tasks/operation, and hearing protection is included as one of the control measures (PPE).

7.6 Monitoring

An air monitoring program is important to the safety of on- and off-Site personnel, and the surrounding area. A preliminary survey, to establish background conditions in the immediate sampling area, may be made prior to the initiation of Site work including, but not limited to, monitoring wind direction (e.g., wind socks) and approximate temperature during all invasive Site activities. This survey will be conducted with the appropriate pre-calibrated air monitoring instrument(s), as warranted by the field activity. Once this survey has been complete, any changes in the type of PPE will be determined and relayed to those working on-Site.

- In accordance with the DER-10 Technical Guidance for Site Investigation and Remediation dated May 2010 (DER-10) issued by the New York State Department of Environmental Conservation (NYSDEC), a community air monitoring plan (CAMP) will be implemented during intrusive Site activities. The Generic CAMP as provided in DER-10, Appendix 1A, is included in Appendix G of this HASP and includes action levels; and
- As part of the CAMP, a Photo-Ionization Detector (PID) with a lamp energy of 10.6 eV will be used to provide direct readings of organic vapor concentrations as well as a Dust-Trak to measure dust particulates during intrusive activities to determine that personnel protection is adequate. Concentrations shall be recorded during intrusive activities with the potential to encounter contaminant vapors or excessive dust particulates.

Work zone air monitoring will be performed to verify that the proper level of PPE is used, and to determine if increased protection or work stoppage is required. The following equipment shall be used to monitor conditions:

- As part of breathing zone monitoring and protection due do intrusive work being completed indoors, a pre-calibrated multi-gas meter with combustible Lower Explosive Limit (LEL), oxygen (O2), carbon monoxide (CO), and hydrogen sulfide (H2S) sensors shall be used to monitor the potential for oxygen-deficient atmospheres, explosive concentrations of organic vapors, and toxic gases during intrusive operations. Monitoring will be performed according to the action levels for oxygen and combustible gases provided in this section. The calibration for this device will be performed using a known gas composition calibration mixture.
- Personal exposure monitoring utilizing activated charcoal tubes may be considered based on whether or not the area sample results are at or above half of the PEL. The decision to perform the monitoring will be made by, and under the control of, the CHSM.
- Below are monitoring action levels for Site-specific chemicals of concern. In the event PID readings above the thresholds identified below are sustained for 5 minutes in the breathing zone, worker protection will require upgrading following notification to the OHSM and applicable parties (e.g., client, board of health, regulators, etc.).

7.6.1 Action Levels for Air Monitoring

PPE can remain at Level D if breathing zone VOC concentrations are less than 5 ppm and benzene is non-detect. Personnel are required to evacuate the Site when breathing zone VOC readings exceed 25 ppm.

The following table includes a summary of the air monitoring, work practices, and action levels for the expected contaminants. The action levels to initiate testing with colorimetric tubes for airborne volatiles is 1 ppm (PID reading) and is based on the Permissible Exposure Limit (PEL) for benzene (1 ppm). The colorimetric tubes are used to confirm the presence or absence of specific constituents, and they do not provide a measured concentration.

Air Monitoring Summary and Action Levels Organic Vapors	
PID Reading in Breathing Zone (ppm)[1]	**Action**
0-1 ppm above background[2]	Continue monitoring
1-5 ppm sustained 60 seconds	Continue monitoring if applicable initiate additional collection of benzene using colorimetric tubes.
<5 ppm and no presence of benzene	Continue Monitoring, ventilate space
$\geq$ 5 ppm - $\leq$ 25 ppm and no presence of benzene	Ventilate space until PID reads < 5 ppm. If < 25 ppm cannot be achieved, upgrade to Level C[3].
$\geq$ 25 ppm	Ventilate space and evacuate area.

[1] Based on relative response/sensitivity of PID to benzene.

[2] Background concentrations should be established at the beginning of each work day. It may be necessary to re-establish background concentrations and ambient conditions vary through the day.

[3] Measured air concentrations of known organic vapors will be reduced by the respirator to one half of the PEL or lower, and the individual and combined compound concentrations shall be within the service limit of the respirator cartridge.

Air Monitoring Summary and Action Levels Oxygen	
O_2 Reading in Breathing Zone (%)[1]	**Action**
20.9% O_2	Oxygen level normal
< 19.5% O_2	Oxygen deficient Interrupt task/Evacuate area
>23.5% O_2	Oxygen enriched Interrupt task/Evacuate area

1. Action levels based on USEPA Standard Operating Safety Guides; Table 5-1, Atmospheric Hazard Action Guidelines may be further restricted based on the CHSM's professional judgment and experience.

Air Monitoring Summary and Action Levels Carbon Monoxide	
CO Reading in Breathing Zone (ppm)[1]	**Action**
<25 ppm	Inspect exhaust system for leaks or other sources of CO. Monitor initially and every 15 minutes during use of CO-generating equipment
25-50 ppm	Ventilate area. Monitor continuously and record measurements. Contact PM.
>50 ppm	Cease Field Operations. Ventilate area.

1. Based upon the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV) of 25 ppm as an 8-hour time weighted average (TWA) and OSHA's Permissible Exposure Limit (PEL) of 50 ppm as an 8-hour TWA concentration.

Air Monitoring Summary and Action Levels Combustible Gases	
Lower Explosive Limit (LEL) Reading	**Action**
< 4% LEL (<2,000 ppm)	Site activities will continue with normal monitoring
4% – 20% LEL (2,000 – 10,000 ppm)	Stop work until levels dissipate to <4% LEL
> 20% LEL (>10,000 ppm)	Potential explosion hazard. Halt all site activities, research source of release, aerate work area, suppress source

Air Monitoring Summary and Action Levels Hydrogen Sulfide	
Hydrogen Sulfide (H_2S) Reading	**Action**
<10 ppm	Site activities will continue with normal monitoring
>10 ppm	Stop work until levels dissipate to <10 ppm; use mechanical ventilation if possible
Cannot use air purifying respirators for H_2S because of olfactory fatigue	

7.6.2 Air Monitoring Equipment and Calibration

A PID calibrated to an appropriate calibration mixture will be used to detect organic vapors in and around the work areas. A zero calibration of the Dust-Trak will be completed as well. Monitoring will be conducted in and around all work areas and at the workers breathing zone before activities commence to establish a background level, then at 15-minute intervals throughout the day. All equipment will be calibrated according to the manufacturer's recommendation. A calibration log will be maintained and will include the name of the person who performed the calibration, the date and time calibrated, and the instrument reading at the time of calibration. A manual bellows pump or equivalent with colorimetric tubes for formaldehyde will be utilized to determine the course of action related to upgrading or downgrading the level of respiratory protection, as applicable.

If air monitoring data indicate safe levels of potentially harmful constituents at consistent intervals (5-minute intervals), then monitoring can be conducted less frequently (every 30 minutes). This determination will be made by the on-Site SHSO. Monitoring data, including background readings and calibration records, will be documented. Work to be performed on-Site will conform to Roux Associates' Standard Operating Procedures (SOPs). Conformance with these guidelines as well as the guidelines described in this HASP will aid in mitigating the physical and chemical hazards mentioned throughout this HASP.

7.7 Tailgate Safety Meetings

A designated Site worker will provide daily safety briefings (e.g., tailgate meetings) including, but not limited to, the following scenarios:

- When new operations are to be conducted;
- Whenever changes in work practices must be implemented; and
- When new conditions are identified and/or information becomes available.

Daily safety briefings shall be recorded on the Roux Daily Tailgate Health and Safety Meeting Log/Daily Site Safety Checklist, and all completed forms will become a part of the project file.

7.8 Spill Containment

Spill containment equipment and procedures should, at a minimum, meet the requirements of the facility's Spill Prevention, Control and Countermeasure Plan, if applicable. Otherwise, spill containment equipment and procedures must be considered depending on the task including, but no limited to, chemical/product transfer points and handling.

7.8.1 Initial Spill Notification and Response

Any worker who discovers a hazardous substance spill will immediately notify the Roux SS/SHSO once that person is determined or the Roux PM. The worker will, to his/her best ability, report the hazardous substance involved, the location of the spill, the estimated quantity of material spilled, the direction/flow of the spill material, related fire/explosion incidents, and any associated injuries without compromising their own safety.

7.8.2 Spill Evaluation and Response

Any worker who discovers a hazardous substance spill is responsible for evaluating spills and determining the appropriate response. When this evaluation is being made, the spill area will be isolated and demarcated to the extent possible. If necessary to protect nearby community members, notification of the appropriate authorities is made by the PM as appropriate. On-Site response is limited to small spills (e.g., <10 gallons), large spills require external emergency responders who will be contacted by the SHSO.

7.9 Decontamination

The decontamination section of the HASP describes how personnel and equipment are decontaminated when they leave the Exclusion Zone. This section also describes how residual waste from decontamination processes is disposed. The Site decontamination procedures are designed to achieve an orderly, controlled removal or neutralization of contaminants that may accumulate on personnel or equipment. These procedures minimize worker contact with contaminants and protect against the transfer of contaminants to clean areas of the Site and off-Site. They also extend the useful life of PPE by reducing the amount of time that contaminants contact and can permeate PPE surfaces. Decontamination is facilitated within the contamination reduction zone at this Site.

7.9.1 Decontamination Procedures for Personnel and PPE

The following are general decontamination procedures established and implemented at this Site.

1. Decontamination is required for all workers exiting a contaminated area. Personnel may re-enter the Support Zone only after undergoing the decontamination procedures described below in the next section.
2. Protective clothing is decontaminated, cleaned, laundered, maintained and/or replaced as needed to ensure its effectiveness.
3. PPE used at this Site that requires maintenance or parts replacement is decontaminated prior to repairs or
4. PPE used at this Site is decontaminated or prepared for disposal on the premises. Personnel who handle contaminated equipment have been trained in the proper means to do so to avoid hazardous exposure.
5. This Site uses an off-Site laundry for decontamination of PPE. The Site has informed that facility of the hazards associated with contaminated PPE from this Site.
6. The Site requires and trains workers that if their permeable clothing is splashed or becomes wetted with a hazardous substance, they will immediately exit the work zone, perform applicable decontamination procedures, shower, and change into uncontaminated clothing.
7. Procedures for disposal of decontamination waste meet applicable local, State, and Federal regulations.

7.9.2 Decontamination Procedures for Equipment

All tools, equipment, and machinery from the Exclusion Zone or CRZ are decontaminated in the CRZ prior to removal to the Support Zone. Equipment decontamination procedures are designed to minimize the potential for hazardous skin or inhalation exposure and to avoid cross-contamination and chemical incompatibilities.

General Equipment Decontamination Procedures:

1. Decontamination is required for all equipment exiting a contaminated area. Equipment may re-enter the Support Zone only after undergoing the equipment decontamination procedures.
2. Vehicles that travel regularly between the contaminated and clean areas of the Site are carefully decontaminated each time they exit the Exclusion Zone and the effectiveness of that decontamination is monitored to reduce the likelihood that contamination will be spread to other parts of the Site.
3. Particular attention is given to decontaminating tires, scoops, and other parts of heavy equipment that are directly exposed to contaminants and contaminated soil.

The following items may be used to decontaminate equipment:

- Fresh water rinse;
- Non-phosphorus detergent wash;

- Distilled water rinse;
- Acetone rinse;
- Distilled water rinse; and
- A steam cleaner or pressure washer (heavy equipment only).

7.9.3 Monitoring the Effectiveness of Decontamination Procedures

Visual examination and sampling are used to evaluate the effectiveness of decontamination procedures. Visual examination is used to ensure that procedures are implemented as described and that they appear to control the spread of contaminants under changing Site conditions. Visual examination is also used to inspect for signs of residual contamination or for contaminant permeation of PPE.

Personnel who work in contaminated areas of the Site, either the Contamination Reduction Zone (CRZ) or the Exclusion Zone, are trained in the principles and practices of decontamination described in this section of the HASP and in related SOPs. If Site procedures are changed as a result of inspection and monitoring, all affected employees are notified of these changes.

7.10 Confined Space Entry

No Confined Space Entry (CSE) is anticipated to occur.

If CSE is required, the following will be followed:

The following is a list of the safety requirements for confined space entry at the Site:

- ROUX PERSONNEL ARE NOT AUTHORIZED TO ENTER AN OSHA PERMIT REQUIRED CONFINED SPACE;
- Currently the scope of work **DOES NOT** require personnel to enter permitted confined space for this project; and
- Any changes to the field activities that may necessitate confined space entry will be reported to the Project Principal and OHSM.

Confined space is defined as any space, depression, or enclosure that:

- Has limited opening for entry and egress;
- Is large enough for and employee to enter and perform assigned work; and
- Is not intended for continuous occupancy.

A permit required confined space is one that meets the definition of a confined space and has one or more of the following characteristics:

- May contain or produce life-threatening atmospheres due to oxygen deficiency the presence of toxic, flammable, or corrosive contaminants;
- Contains a material that has the potential for engulfment;
- Has an internal configuration that may cause an entrant to be trapped or asphyxiated by inwardly converging walls or by a floor that slopes downward and tapers to a smaller cross-section; and
- Contains any other serious safety or health hazards.

Although Roux personnel will not perform confined space entry, it is expected that subcontractors performing cleaning and mitigation and/or remedial measures activities may be required to enter structures that are considered to be a permit required confined space. Permitting of the confined space as well as hazard mitigation for entry will be completed by the subcontractor in accordance with 1910.146.

7.11 Client and Site-Specific

In addition to the OSHA-specific procedures discussed above, there may be client and Site-specific safety procedures that must be adhered to during the performance of remedial activities at the Site. If necessary, those provisions will be followed.

7.12 Unusual or Significant Risks

Field activities that appear to have unusual or significant risks that cannot be adequately managed with existing risk tools such as LPS, HASPs, traffic safety plans, work permits, design and O&M practices, equipment HAZOPS or other safety tools must be referred to the CHSM to help with the assessment and management of the associated potential safety risks. Examples include the use of explosives for demolition, use of firearms to control wildlife, rappelling, demolition over water, etc.

7.13 Activity-Specific

In addition to the general hazards discussed above, there are activity-specific hazards associated with each work activity planned for the Site. An activity-specific JSA has been completed for each of the activities planned for the Site. JSAs are provided in Appendix A. In the event that new work activities or tasks are planned, JSAs will be developed and implemented prior to performing the new activities. In the absence of a JSA, the personnel performing work must prepare a field JSA and receive clearance from a designated competent safety official prior to performing any task with significant risk. In emergency situations where time is critical SPSAs will be utilized to identify the task, associated hazards and mitigative actions to take. For lower risk activities (as deemed by the discretion of a Competent Person) where a JSA is determined to not be needed, the individual(s) conducting the activities must perform SPSAs prior to and during the work.

7.13.1 Electrical and Other Utility Assessment and Accommodations

Roux shall perform a Site walk to identify any potential overhead electrical or utility lines. All applicable guidelines will be followed in the vicinity of overhead power and utility lines (see Section 7.13.3 below).

Roux will instruct the drilling subcontractor to call in public markouts and Roux will be hiring a separate subcontractor to perform Ground Penetrating Radar (GPR) to search for potential utilities or anomalies private markouts survey prior to determining final sample locations.

7.13.2 Subsurface Work

Subsurface work activities will require adherence to Roux's Corporate Subsurface Utility Clearance Management Program found within Appendix D.

7.13.3 Heavy Equipment

Use of heavy equipment at the Site will require adherence to Roux's Corporate Heavy Equipment Exclusion Zone Management Program found within Appendix E. Additionally, operation of the drill rig/other heavy equipment will maintain clearances from overhead power lines in accordance with OSHA 29 CFR1926.1408 Table A Minimum Clearance Distances provided below.

Minimum Required Clearances for Energized Overhead Power Lines

Nominal System Voltage of Power Line (K V)	Minimum Required Clearance (feet)
0-50	10
51-100	12
101-200	15
201-300	20
301-500	25
501-750	35
751-1000	45

1 kilovolt (KV) = 1,000 volts

7.14 Heat Stress

The National Oceanic and Atmospheric Administration (NOAA) records average minimum/maximum temperatures of 10/95 degrees Fahrenheit during the year in Brooklyn, New York.

7.14.1 Heat Stress

Heat stress is a significant potential hazard and can be associated with heavy physical activity and/or the use of personal protective equipment in hot weather environments. Heat cramps are brought on by prolonged exposure to heat. As an individual sweats, water and salts are lost by the body resulting in painful muscle cramps. The signs and symptoms of heat stress are as follows:

- Severe muscle cramps, usually in the legs and abdomen;
- Exhaustion, often to the point of collapse; and
- Dizziness or periods of faintness.

First aid treatment includes, but is not limited to, shade, rest, and fluid replacement. Typically, the individual should recover within one-half hour while being monitored constantly. If the individual has not improved substantially within 30 minutes and the body temperature has not decreased, the individual should be transported to a hospital for medical attention.

7.14.2 Heat Exhaustion

Heat exhaustion may occur in a healthy individual who has been exposed to excessive heat while working or exercising. The circulatory system of the individual fails as blood collects near the skin to rid the body of excess heat through transference. The signs and symptoms of heat exhaustion are as follows:

- Rapid and shallow breathing;
- Weak pulse;
- Cold and clammy skin with heavy perspiration;
- Skin appears pale;
- Fatigue and weakness;

- Dizziness; and
- Elevated body temperature.

First aid treatment includes, but is not limited to, cooling the victim, elevating the feet, and replacing fluids.

If the individual is not substantially improved within 30 minutes and the body temperature has not decreased, the individual should be transported to the hospital for medical attention.

7.14.3 Heat Stroke

Heat stroke occurs when an individual is exposed to excessive heat and stops sweating. This condition is classified as a MEDICAL EMERGENCY requiring immediate cooling of the victim and transport to a medical facility. The signs and symptoms of heat stroke are as follows:

- Dry, hot red skin;
- Body temperature approaching or above 105 degrees F;
- Confusion, altered mental state, slurred speech;
- Seizures;
- Large (dilated) pupils; and
- Loss of consciousness – the individual may go into a coma.

First aid treatment requires immediate cooling and transportation to a medical facility. Heat stress is a significant hazard if any type of protective equipment (semi-permeable or impermeable) that prevents evaporative cooling is worn in hot weather environments.

7.15 Cold Stress

Cold stress is a danger at low temperatures and when the wind-chill factor is low. Prevention of cold-related illnesses is a function of whole-body protection. Adequate insulating clothing must be used when the air temperature is below 60°F. A work/rest regimen will be initiated when ambient temperatures and protective clothing cause a stressful situation. In addition, reduced work periods followed by rest in a warm area may be necessary in extreme conditions. The signs and symptoms of cold stress include the following:

- Severe shivering;
- Abnormal behavior;
- Slowing;
- Weakness;
- Stumbling or repeated falling;
- Inability to walk;
- Collapse; and/or
- Unconsciousness.

First aid requires removing the victim from the cold environment and seeking medical attention immediately. Also, prevent further body heat loss by covering the victim lightly with blankets. <u>Do not cover the victim's face</u>. If the victim is still conscious, administer hot drinks and encourage activity such as walking, wrapped in a blanket.

8. Field Team Review

Each person performing work at or visiting this Site shall sign this section after Site-specific training is completed and before being permitted to access the CRZ or Exclusion Zone.

I have read and understand this Site-Specific Health and Safety Plan. I will comply with the provision contained therein.

Site/Project: 458 East 99th Street, Brooklyn, NY

Name Printed	Signature	Date

9. Approvals

By their signature, the undersigned certify that this HASP is approved and will be utilized at 458 E. 99th St.

May 20, 2024

Drew Kaplan – Site Supervisor and Site Health and Safety Officer

Date

May 20, 2024

Nevin Pahlad – Office Health and Safety Manager

Date

Levi Curnutte

May 20, 2024

Levi Curnutte – Project Manager

Date

May 20, 2024

Noelle Clarke– Project Principal

Date

TABLES

1. Toxicological Properties of Hazardous Substances Present at the Site

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at the Site.

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
ORGANOCHLORINE PESTICIDES (OCP)									
DDT	50-29-3	TWA 1 mg/m3	TWA 0.5 mg/m3	TWA 1 mg/m3	500 mg/m3	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin; paresthesia tongue, lips, face; tremor; anxiety, dizziness, confusion, malaise (vague feeling of discomfort), headache, lassitude (weakness, exhaustion); convulsions; paresis hands; vomiting; [potential occupational carcinogen]	Eyes, skin, central nervous system, kidneys, liver, peripheral nervous system	White, odorless and tasteless, very stable, water-insoluble, synthetic BP: 260°F Fl.Pt. = 162-171°F LEL: NA UEL: NA
Aldrin	309-00-2	TWA 0.1 mg/m3	TWA 0.25 mg/m3	TWA 0.25 mg/m3	25 mg/m3	Inhalation, ingestion, skin and/or eye contact	headache, dizziness; nausea, vomiting, malaise (vague feeling of discomfort); myoclonic jerks of limbs; clonic, tonic convulsions; coma; hematuria (blood in the urine), azotemia; [potential occupational carcinogen]	Developmemntal, Endocrine, Liver, Immune System, Nervous System,	Colorless to dark-brown crystalline solid with a mild chemical odor. BP: 293°F Fl.Pt. = 150°F LEL: NA UEL: NA
Lindane (gamma-BHC)	58-89-9	TWA 0.5 mg/m3	TWA 0.5 mg/m3	TWA 0.5 mg/m3	50 mg/m3	Inhalation, ingestion, skin and/or eye contact	irritation eyes, skin, nose, throat; headache; nausea; clonic convulsions; resp difficulty; cyanosis; aplastic anemia; muscle spasm; In Animals: liver, kidney damage	Eyes, skin, respiratory system, central nervous system, blood, liver, kidneys	White to yellow, crystalline powder with a slight, musty odor. BP: 614°F Fl.Pt. = 150°F LEL: NA UEL: NA
Dieldrin	860-57-1□	TWA 0.1 mg/m3	TWA 0.25 mg/m3	TWA 0.25 mg/m3	25 mg/m3	Inhalation, ingestion, skin and/or eye contact	headache, dizziness; nausea, vomiting, malaise (vague feeling of discomfort), sweating; myoclonic limb jerks; clonic, tonic convulsions; coma; ; In Animals: liver, kidney damage [potential occupational carcinogen]	Developmemntal, Endocrine, Liver, Immune System, Nervous System,	Colorless to light-tan crystals with a mild, chemical odor. BP: NA (Decomposes) Fl.Pt. = NA LEL: NA UEL: NA
VOLATILE ORGANIC COMPOUNDS (VOCs)									
1,1,1-Trichloroethane	71-55-6	TWA 350 ppm STEL 450 ppm	C 350 ppm (1900 mg/m^3) [15-minute]	TWA 350 ppm (1900 mg/m^3)	700 ppm	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin; headache, lassitude (weakness, exhaustion), central nervous system depression, poor equilibrium; dermatitis; cardiac arrhythmias; liver damage	Eyes, skin, central nervous system, cardiovascular system, liver	Colorless liquid with a mild, chloroform-like odor. BP: 165°F Fl.Pt. = NA LEL: 7.5% UEL: 12.5% Combustible Liquid, but burns with difficulty
1,1,2,2-Tetrachloroethane	79-34-5	TWA 1 ppm [skin]	Ca TWA 1 ppm (7 mg/m^3) [skin]	TWA 5 ppm (35 mg/m^3) [skin]	Ca [100 ppm]	Inhalation, skin absorption, ingestion, skin and/or eye contact	Nausea, vomiting, abdominal pain; tremor fingers; jaundice, hepatitis, liver tenderness; dermatitis; leukocytosis (increased blood leukocytes); kidney damage; [potential occupational carcinogen]	Skin, liver, kidneys, central nervous system, gastrointestinal tract	Colorless to pale-yellow liquid with a pungent, chloroform-like odor BP: 296°F Fl.Pt. = NA LEL: NA UEL: NA Noncombustible Liquid
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	TWA 1000 ppm STEL 1250 ppm	TWA 1000 ppm (7600 mg/m3) ST 1250 ppm (9500 mg/m3)	TWA 1000 ppm (7600 mg/m3)	2000 ppm	Inhalation, ingestion, skin and/or eye contact	Irritation skin, throat, drowsiness, dermatitis; central nervous system depression; In Animals: cardiac arrhythmias, narcosis	Skin, heart, central nervous system, cardiovascular system	Colorless to water-white liquid with an odor like carbon tetrachloride at high concentrations. [Note: A gas above 118°F.] BP: 118°F Fl.Pt. = NA LEL: NA UEL: NA
1,1,2-Trichloroethane	79-00-5	TWA 10 ppm [skin]	Ca TWA 10 ppm (45 mg/m3) [skin]	TWA 10 ppm (45 mg/m3) [skin]	Ca [100 ppm]	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, nose; central nervous system depression; liver, kidney damage; dermatitis; [potential occupational carcinogen]	Eyes, respiratory system, central nervous system, liver, kidneys	Colorless liquid with a sweet, chloroform-like odor BP: 237°F Fl.Pt. = NA LEL: 6% UEL: 15.5% Combustible Liquid, forms dense soot
1,1-Dichloroethane	75-34-3	TWA 100 ppm	TWA 100 ppm (400 mg/m^3)	TWA 100 ppm (400 mg/m^3)	3,000 ppm	Inhalation, ingestion, skin and/or eye contact	Irritation skin; central nervous system depression; liver, kidney, lung damage	Skin, liver, kidneys, lungs, central nervous system	Colorless, oily liquid with a chloroform-like odor. BP: 135°F Fl.Pt. = 2°F LEL: 5.4% UEL: 11.4% Class IB Flammable Liquid Fl.P. below 73°F and BP at or above 100°F.

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at the Site.

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
1,1-Dichloroethene	75-35-4	TWA 5 ppm	Ca	None	Ca	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, throat; dizziness, headache, nausea, dyspnea (breathing difficulty); liver, kidney disturbance; pneumonitis; [potential occupational carcinogen]	Eyes, skin, respiratory system, central nervous system, liver, kidneys	Colorless liquid or gas (above 89°F) with a mild, sweet, chloroform-like odor BP: 89°F Fl.Pt. = -2°F LEL: 6.5% UEL: 15.5% Class IA Flammable Liquid: Fl.P. below 73°F and BP below 100°F
1,2,3-Trichlorobenzene	87-61-6	Cameo Chemicals Source https://cameochemicals.noaa.gov/chemical/10051	NA	NA	NA	Inhalation, skin absorption, ingestion, skin and/or eye contact	Inhalation may cause irritation of respiratory tract. Irritating to the eyes. May redden skin on contact. Ingestion may cause liver damage.	Skin, eyes, respiratory tract, liver	A white solid with a sharp chlorobenzene odor. Insoluble in water and denser than water. Hence sinks in water Fl.Pt. = 234.9°F
1,2,4-Trichlorobenzene	120-82-1	C 5 ppm	C 5 ppm (40 mg/m3)	None	N.D.	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation eyes, skin, mucous membrane; In Animals: liver, kidney damage; possible teratogenic effects	Eyes, skin, respiratory system, liver, reproductive system	Colorless liquid or crystalline solid (below 63°F) with an aromatic odor BP: 416°F Fl.Pt. = 222°F LEL (302°F): 2.5% UEL (302°F): 6.6% Class IIIB Combustible Liquid: Fl.P. at or above 200°F. Combustible Solid
1,2-Dibromo-3-chloropropane	96-12-8	NA	Ca	TWA 0.001 ppm	Ca	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, throat; drowsiness; nausea, vomiting; pulmonary edema; liver, kidney injury; sterility; [potential occupational carcinogen]	Eyes, skin, respiratory system, central nervous system, liver, kidneys, spleen, reproductive system, digestive system	Dense yellow or amber liquid with a pungent odor at high concentrations. [pesticide] [Note: A solid below 43°F.] BP: 384°F Fl.Pt. = (oc) 170°F LEL: NA UEL: NA Class IIIA Combustible Liquid: Fl.P. at or above 140°F and below 200°F.
1,2-Dibromoethane	106-93-4	None listed Skin	Ca TWA 0.045 ppm C 0.13 ppm [15-minute]	TWA 20 ppm C 30 ppm 50 ppm [5-minute maximum peak]	Ca [100 ppm]	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, respiratory system; dermatitis with vesiculation; liver, heart, spleen, kidney damage; reproductive effects; [potential occupational carcinogen]	Eyes, skin, respiratory system, liver, kidneys, reproductive system	Colorless liquid or solid (below 50°F) with a sweet odor. [fumigant] BP: 268°F Fl.Pt. = 50°F LEL: NA UEL: NA Noncombustible Liquid
1,2-Dichlorobenzene	95-50-1	TWA 25 ppm STEL 50 ppm	C 50 ppm (300 mg/m3)	C 50 ppm (300 mg/m3)	200 ppm	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, nose; liver, kidney damage; skin blisters	Eyes, skin, respiratory system, liver, kidneys	Colorless to pale-yellow liquid with a pleasant, aromatic odor. [herbicide] BP: 357°F Fl.Pt. = 1°F LEL: 2.2% UEL: 9.2% Class IIIA Combustible Liquid: Fl.P. at or above 140°F and below 200°F.
1,2-Dichloroethane	107-06-2	TWA 10 ppm	Ca TWA 1 ppm (4 mg/m3) ST 2 ppm (8 mg/m3)	TWA 50 ppm C 100 ppm 200 ppm [5-minute maximum peak in any 3 hours]	Ca [50 ppm]	Inhalation, ingestion, skin absorption, skin and/or eye contact	Irritation eyes, corneal opacity; central nervous system depression; nausea, vomiting; dermatitis; liver, kidney, cardiovascular system damage; [potential occupational carcinogen]	Eyes, skin, kidneys, liver, central nervous system, cardiovascular system	Colorless liquid with a pleasant, chloroform-like odor. [Note: Decomposes slowly, becomes acidic & darkens in color.] BP: 182°F Fl.Pt. = 56°F LEL: 6.2% UEL: 16% Class IB Flammable Liquid Fl.P. below 73°F and BP at or above 100°F.
1,2-Dichloropropane	78-87-5	TWA 10 ppm Dermal Sensitizer (DSEN)	Ca	TWA 75 ppm (350 mg/m3)	Ca [400 ppm]	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, respiratory system; drowsiness, dizziness; liver, kidney damage; In Animals: central nervous system depression; [potential occupational carcinogen]	Eyes, skin, respiratory system, liver, kidneys, central nervous system	Colorless liquid with a chloroform-like odor. [pesticide] BP: 206°F Fl.Pt. = 60°F LEL: 3.4% UEL: 14.5% Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.
1,3-Dichlorobenzene	541-73-1	https://cameochemicals.noaa.gov/chemical/8514				Inhalation, skin absorption, ingestion, skin and/or eye contact	INHALATION: Causes headache, drousiness, unsteadiness. Irritating to mucous membranes. EYES: Severe irritation. SKIN: Severe irritation. INGESTION: Irritation of gastric mucosa, nausea, vomiting, diarrhea, abdominal cramps and cyanosis.		Colorless liquid. Sinks in water. BP: 343°F Fl.Pt. = 146°F LEL: 2.02% UEL: 9.2%
1,4-Dichlorobenzene	106-46-7	TWA 10 ppm	Ca	TWA 75 ppm (450 mg/m3)	Ca [150 ppm]	Inhalation, skin absorption, ingestion, skin and/or eye contact	Eye irritation, swelling periorbital (situated around the eye); profuse rhinitis; headache, anorexia, nausea, vomiting; weight loss, jaundice, cirrhosis; In Animals: liver, kidney injury; [potential occupational carcinogen]	Liver, respiratory system, eyes, kidneys, skin	Colorless or white crystalline solid with a mothball-like odor. [insecticide] BP: 345°F Fl.Pt. = 150°F LEL: 2.5% UEL: NA Combustible Solid, but may take some effort to ignite.

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at the Site.

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
1,4-Dioxane	123-91-1	TWA 20 ppm [skin]	Ca C 1 ppm (3.6 mg/m3) [30-minute]	TWA 100 ppm (360 mg/m3) [skin]	Ca [500 ppm]	Inhalation, skin absorption, ingestion, skin and/or eye contact	irritation eyes, skin, nose, throat; drowsiness, headache; nausea, vomiting; liver damage; kidney failure; [potential occupational carcinogen]	Eyes, skin, respiratory system, liver, kidneys	Colorless liquid or solid (below 53°F) with a mild, ether-like odor. BP: 214°F Fl.Pt. = 55°F LEL: 2.0% UEL: 22% Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F
2-Butanone	78-93-3	TWA 200 ppm STEL 300 ppm	TWA 200 ppm (590 mg/m3) ST 300 ppm (885 mg/m3)	TWA 200 ppm (590 mg/m3)	3000 ppm	inhalation, ingestion, skin and/or eye contact	irritation eyes, skin, nose; headache; dizziness; vomiting; dermatitis	Eyes, skin, respiratory system, central nervous system	Colorless liquid with a moderately sharp, fragrant, mint- or acetone-like odor BP: 175°F Fl.Pt. = 16°F LEL (200°F): 1.4% UEL (200°F): 11.4% Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F
2-Hexanone	591-78-6	TWA 5 ppm STEL 10 ppm [skin]	TWA 1 ppm (4 mg/m3)	TWA 100 ppm (410 mg/m3)	1600 ppm	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, nose; peripheral neuropathy: lassitude (weakness, exhaustion), paresthesia; dermatitis; headache, drowsiness	Eyes, skin, respiratory system, central nervous system, peripheral nervous system	Colorless liquid with an acetone-like odor BP: 262°F Fl.Pt. = 77°F LEL: NA UEL: 8.0% Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F
4-Methyl-2-pentanone	108-10-1	TWA 20 ppm STEL 75 ppm	TWA 50 ppm (205 mg/m3) ST 75 ppm (300 mg/m3)	TWA 100 ppm (410 mg/m3)	500 ppm	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, mucous membrane; headache, narcosis, coma; dermatitis; In Animals: liver, kidney damage	Eyes, skin, respiratory system, central nervous system, liver, kidneys	Colorless liquid with a pleasant odor BP: 242°F Fl.Pt. = 64°F LEL (200°F): 1.2% UEL (200°F): 8.0% Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F
Acetone	67-64-1	TWA 250 ppm STEL 500 ppm	TWA 250 ppm (590 mg/m^3)	TWA 1000 ppm (2400 mg/m^3)	2500 ppm [10% LEL]	Inhalation, ingestion, skin and/or eye contact	irritation eyes, nose, throat; headache, dizziness, central nervous system depression; dermatitis	Eyes, skin, respiratory system, central nervous system	Colorless liquid with a fragrant, mint-like odor BP: 133°F Fl.Pt. = 0°F LEL: 12.8% UEL: 2.5% Class IB Flammable liquid: Fl.P. below 73°F and BP at or above 100°F.
Benzene	71-43-2	TWA 0.5 ppm STEL 2.5 ppm	Ca TWA 0.1 ppm ST 1 ppm	TWA 1 ppm ST 5 ppm	Ca [500 ppm]	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; anorexia, lassitude (weakness, exhaustion); dermatitis; bone marrow depression; [potential occupational carcinogen]	Eyes, skin, respiratory system, blood, central nervous system, bone marrow	Colorless to light yellow liquid with an aromatic odor [Note: Solid below 42 °F] BP: 176°F Fl.Pt. = 12°F LEL: 1.2% UEL: 7.8% Class IB Flammable liquid. Fl.P. below 73°F and BP at or above 100°F.
Bromochloromethane	74-97-5	TWA 200 ppm	TWA 200 ppm (1050 mg/m3)	TWA 200 ppm (1050 mg/m3)	2000 ppm	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, throat; confusion, dizziness, central nervous system depression; pulmonary edema	Eyes, skin, respiratory system, liver, kidneys, central nervous system	Colorless to pale-yellow liquid with a chloroform-like odor. [Note: May be used as a fire extinguishing agent.] BP: 155°F Fl.Pt. = NA LEL: NA UEL: NA Noncombustible Liquid
Bromodichloromethane	75-27-4	https://cameochemicals.noaa.gov/chemical/16064				Inhalation, ingestion, skin and/or eye contact	Symptoms of exposure to this compound may include irritation of the skin, eyes, mucous membranes and respiratory tract. It may also cause narcosis. Other symptoms may include nausea, dizziness and headache.	Liver and kidney damage. Central nervous system effects may also occur.	Clear colorless liquid BP: 189°F Fl.Pt. = NA LEL: NA UEL: NA
Bromoform	75-25-2	TWA 0.5 ppm	TWA 0.5 ppm (5 mg/m3) [skin]	TWA 0.5 ppm (5 mg/m3) [skin]	850 ppm	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, respiratory system; central nervous system depression; liver, kidney damage	Eyes, skin, respiratory system, central nervous system, liver, kidneys	Colorless to yellow liquid with a chloroform-like odor. [Note: A solid below 47°F.] BP: 301°F Fl.Pt. = NA LEL: NA UEL: NA Noncombustible Liquid
Bromomethane	74-83-9	TWA 1 ppm [skin]	Ca	C 20 ppm (80 mg/m3) [skin]	Ca [250 ppm]	Inhalation, skin absorption (liquid), skin and/or eye contact (liquid)	Irritation eyes, skin, respiratory system; muscle weak, incoordination, visual disturbance, dizziness; nausea, vomiting, headache; malaise (vague feeling of discomfort); hand tremor; convulsions; dyspnea (breathing difficulty); skin vesiculation; liquid: frostbite; [potential occupational carcinogen]	Eyes, skin, respiratory system, central nervous system	Colorless gas with a chloroform-like odor at high concentrations. [Note: A liquid below 38°F. Shipped as a liquefied compressed gas.] BP: 38°F Fl.Pt. = NA (Gas) LEL: 10% UEL: 16.0% Flammable Gas, but only in presence of a high energy ignition source.

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at the Site.

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
Carbon disulfide	75-15-0	TWA 1 ppm [skin]	TWA 1 ppm (3 mg/m3) ST 10 ppm (30 mg/m3) [skin]	TWA 20 ppm C 30 ppm 100 ppm (30-minute maximum peak)	500 ppm	Inhalation, skin absorption, ingestion, skin and/or eye contact	Dizziness, headache, poor sleep, lassitude (weakness, exhaustion), anxiety, anorexia, weight loss; psychosis; polyneuropathy; Parkinson-like syndrome; ocular changes; coronary heart disease; gastritis; kidney, liver injury; eye, skin burns; dermatitis; reproductive effects	Central nervous system, peripheral nervous system, cardiovascular system, eyes, kidneys, liver, skin, reproductive system	Colorless to faint-yellow liquid with a sweet ether-like odor. [Note: Reagent grades are foul smelling.] BP: 116°F Fl.Pt. = -22°F LEL: 1.3% UEL: 50.0% Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.
Carbon tetrachloride	56-23-5	TWA 5 ppm STEL 10 ppm [skin]	Ca ST 2 ppm (12.6 mg/m3) [60-minute]	TWA 10 ppm C 25 ppm 200 ppm (5-minute maximum peak in any 4 hours)	Ca [200 ppm]	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin; central nervous system depression; nausea, vomiting; liver, kidney injury; drowsiness, dizziness, incoordination; [potential occupational carcinogen]	Central nervous system, eyes, lungs, liver, kidneys, skin	Colorless liquid with a characteristic ether-like odor BP: 170°F Fl.Pt. = NA LEL: NA UEL: NA Noncombustible Liquid
Chlorobenzene	108-90-7	TWA 10 ppm	NA	TWA 75 ppm (350 mg/m3)	1000 ppm	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, nose; drowsiness, incoordination; central nervous system depression; In Animals: liver, lung, kidney injury	Eyes, skin, respiratory system, central nervous system, liver	Colorless liquid with an almond-like odor BP: 270°F Fl.Pt. = 82°F LEL: 1.3% UEL: 9.6% Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F.
Chloroethane	75-00-3	TWA 100 ppm [skin]	Handle with caution in the workplace	TWA 1000 ppm (2600 mg/m3)	3800 ppm [10%LEL]	Inhalation, skin absorption (liquid), ingestion (liquid), skin and/or eye contact	Incoordination, inebriation; abdominal cramps; cardiac arrhythmias, cardiac arrest; liver, kidney damage	Liver, kidneys, respiratory system, cardiovascular system, central nervous system	Colorless gas or liquid (below 54°F) with a pungent, ether-like odor. [Note: Shipped as a liquefied compressed gas.] BP: 54°F Fl.Pt. = NA (gas), -58°F (liquid) LEL: 3.8% UEL: 15.4% Flammable Gas
Chloroform	67-66-3	TWA 10 ppm	Ca ST 2 ppm (9.78 mg/m3) [60-minute]	C 50 ppm (240 mg/m3)	Ca [500 ppm]	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin; dizziness, mental dullness, nausea, confusion; headache, lassitude (weakness, exhaustion); anesthesia; enlarged liver; [potential occupational carcinogen]	Liver, kidneys, heart, eyes, skin, central nervous system	Colorless liquid with a pleasant odor BP: 143°F Fl.Pt. = -82°F LEL: NA UEL: NA Noncombustible Liquid
Chloromethane	74-87-3	TWA 50 ppm STEL 100 ppm	Ca	TWA 100 ppm C 200 ppm 300 ppm (5-minute maximum peak in any 3 hours)	Ca [2000 ppm]	Inhalation, skin and/or eye contact (liquid)	Dizziness, nausea, vomiting; visual disturbance, stagger, slurred speech, convulsions, coma; liver, kidney damage; liquid: frostbite; reproductive, teratogenic effects; [potential occupational carcinogen]	Central nervous system, liver, kidneys, reproductive system	Colorless gas with a faint, sweet odor which is not noticeable at dangerous concentrations. [Note: Shipped as a liquefied compressed gas.] BP: -12°F Fl.Pt. = NA (Gas) LEL: 8.1% UEL: 17.4% Flammable Gas
cis-1,2-Dichloroethene	156-59-2	TWA 200 ppm (All isomers)	TWA 200 ppm (790 mg/m3)	TWA 200 ppm (790 mg/m3)	1000 ppm	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, respiratory system; central nervous system depression	Eyes, respiratory system, central nervous system	Colorless liquid (usually a mixture of the cis & trans isomers) with a slightly acrid, chloroform-like odor. BP: 118-140°F Fl.Pt. = 36-39°F LEL: 5.6% UEL: 12.8% Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F
cis-1,3-Dichloropropene	10061-01-5	https://cameochemicals.noaa.gov/chemical/20168				Inhalation, ingestion, skin and/or eye contact	Symptoms of exposure to this compound may include local irritation of the eyes skin and respiratory tract; dermatitis, gasping, coughing, substernal pain, extreme respiratory distress, lacrimation, central nervous system depression, skin irritation, acute gastrointestinal distress with pulmonary congestion and edema. It also may cause injury to the liver, kidneys and heart.	Skin, eyes, mucous membranes, liver, kidney, heart	Colorless to amber liquid with a sweetish odor. BP: 219.7°F Fl.Pt. = NA LEL: NA UEL: NA
Cyclohexane	110-82-7	TWA 100 ppm	TWA 300 ppm (1050 mg/m3)	TWA 300 ppm (1050 mg/m3)	1300 ppm [10%LEL]	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, respiratory system; drowsiness; dermatitis; narcosis, coma	Eyes, skin, respiratory system, central nervous system	Colorless liquid with a sweet, chloroform-like odor. [Note: A solid below 44°F.] BP: 177°F Fl.Pt. = 0°F LEL: 1.3% UEL: 8.0% Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.
Dibromochloromethane	124-48-1	https://cameochemicals.noaa.gov/chemical/16183				Inhalation, ingestion, skin and/or eye contact	Symptoms of exposure to this compound may include irritation of the skin, eyes, mucous membranes and upper respiratory tract. It may also cause fatigue. Other symptoms may include central nervous system effects, lung and cornea irritation and liver and kidney damage. Prolonged exposure can cause nausea, dizziness, headache and narcosis.	Skin, eyes, mucous membranes, upper respiratory tract	Clear colorless to yellow-orange liquid BP: 246-248°F Fl.Pt. = Greater than 200°F LEL: NA UEL: NA

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at the Site.

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
Dichlorodifluoromethane	75-71-8	TWA 1000 ppm	TWA 1000 ppm (4950 mg/m3)	TWA 1000 ppm (4950 mg/m3)	15,000 ppm	Inhalation, skin and/or eye contact (liquid)	Dizziness, tremor, asphyxia, unconsciousness, cardiac arrhythmias, cardiac arrest; liquid: frostbite	Cardiovascular system, peripheral nervous system	Colorless gas with an ether-like odor at extremely high concentrations. [Note: Shipped as a liquefied compressed gas.] BP: -22°F Fl.Pt. = NA LEL: NA UEL: NA Nonflammable Gas
Ethyl benzene	100-41-4	TWA 20 ppm	TWA 100 ppm (435 mg/m^3) ST 125 ppm (545 mg/m^3)	TWA 100 ppm (435 mg/m^3)	800 ppm [10%LEL]	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, mucous membrane; headache; dermatitis; narcosis, coma	Eyes, skin, respiratory system, central nervous system	Colorless liquid with an aromatic odor. BP: 277°F Fl.Pt. = 55°F LEL: 0.8% UEL: 6.7% Class IB Flammable Liquid below 73°F and BP at or above 100°F
Isopropyl benzene	98-82-8	TWA 5 ppm	TWA 50 ppm (245 mg/m3) [skin]	TWA 50 ppm (245 mg/m3) [skin]	900 ppm [10%LEL]	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, mucous membrane; dermatitis; headache, narcosis, coma	Eyes, skin, respiratory system, central nervous system	Colorless liquid with a sharp, penetrating, aromatic odor BP: 306°F Fl.Pt. = 96°F LEL: 0.9% UEL: 6.5% Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F
Methyl Acetate	79-20-9	TWA 200 ppm STEL 250 ppm	TWA 200 ppm (610 mg/m3) ST 250 ppm (760 mg/m3)	TWA 200 ppm (610 mg/m3)	3100 ppm [10%LEL]	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, throat; headache, drowsiness; optic nerve atrophy; chest tightness; In Animals: narcosis	Eyes, skin, respiratory system, central nervous system	Colorless liquid with a fragrant, fruity odor BP: 135°F Fl.Pt. = 14°F LEL: 3.1% UEL: 16% Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.
Methylcyclohexane	108-87-2	TWA 400 ppm	TWA 400 ppm (1600 mg/m3)	TWA 500 ppm (2000 mg/m3)	1200 ppm [LEL]	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, throat; dizziness, drowsiness; In Animals: narcosis	Eyes, skin, respiratory system, central nervous system	Colorless liquid with a faint, benzene-like odor BP: 214°F Fl.Pt. = 25°F LEL: 1.2% UEL: 6.7% Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.
Methylene chloride	75-09-2	TWA 50 ppm [skin] STEL 100 ppm	Ca	[1910.1052] TWA 25 ppm ST 125 ppm	Ca [2300 ppm]	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin; lassitude (weakness, exhaustion), drowsiness, dizziness; numb, tingle limbs; nausea; [potential occupational carcinogen]	Eyes, skin, cardiovascular system, central nervous system	Colorless liquid with a chloroform-like odor. [Note: A gas above 104°F.] BP: 104°F Fl.Pt. = NA LEL: 13% UEL: 23% Combustible Liquid
Methyl-t-butyl ether	1634-04-4	TWA 50 ppm	NA	NA	NA	Inhalation, skin absorption, ingestion, skin and/or eye contact	May cause dizziness or suffocation. Contact may irritate or burn eyes or skin. May be harmful if swallowed.	Eyes, skin	A colorless liquid with a distinctive anesthetic-like odor. BP: 131°F Fl.Pt. = -14°F LEL: NA UEL: NA
o-Xylene	95-47-6	TWA 20 ppm (All isomers)	TWA 100 ppm (435 mg/m3) ST 150 ppm (655 mg/m3)	TWA 100 ppm (435 mg/m3)	900 ppm	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; corneal vacuolization; anorexia, nausea, vomiting, abdominal pain; dermatitis	Eyes, skin, respiratory system, central nervous system, gastrointestinal tract, blood, liver, kidneys	Colorless liquid with an aromatic odor BP: 292°F Fl.Pt. = 90°F LEL: 0.9% UEL: 6.7% Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F
Styrene	100-42-5	TWA 10 ppm STEL 20 ppm OTO (ototoxicant)	TWA 50 ppm (215 mg/m3) ST 100 ppm (425 mg/m3)	TWA 100 ppm C 200 ppm 600 ppm (5-minute maximum peak in any 3 hours)	700 ppm	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, nose, respiratory system; headache, lassitude (weakness, exhaustion), dizziness, confusion, malaise (vague feeling of discomfort), drowsiness, unsteady gait; narcosis; defatting dermatitis; possible liver injury; reproductive effects	Eyes, skin, respiratory system, central nervous system, liver, reproductive system	Colorless to yellow, oily liquid with a sweet, floral odor BP: 293°F Fl.Pt. = 88°F LEL: 0.9% UEL: 6.8% Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F
Tetrachloroethene	127-18-4	TWA 25 ppm STEL 100 ppm	Ca Minimize workplace exposure concentrations	TWA 100 ppm C 200 ppm (for 5 minutes in any 3-hour period), with a maximum peak of 300 ppm	Ca [150 ppm]	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, throat, respiratory system; nausea; flush face, neck; dizziness, incoordination; headache, drowsiness; skin erythema (skin redness); liver damage; [potential occupational carcinogen]	Eyes, skin, respiratory system, liver, kidneys, central nervous system	Colorless liquid with a mild, chloroform-like odor BP: 250°F Fl.Pt. = NA LEL: NA UEL: NA Noncombustible Liquid, but decomposes in a fire to hydrogen chloride and phosgene

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at the Site.

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
Sodium Hydroxide	1310-73-2	Ceiling 2 mg/m^3	C 2 mg/m^3	TWA 2 mg/m^3	10 mg/m^3	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, mucous membrane; pneumonitis; eye, skin burns; temporary loss of hair	Eyes, skin, respiratory system	Colorless to white, odorless solid (flakes, beads, granular form). BP: 2534°F Fl.Pt. = NA LEL: NA UEL: NA Noncombustible Solid, but when in contact with water may generate sufficient heat to ignite combustible materials.
Sulfuric Acid	7664-93-9	TWA 0.2 mg/m^3 (as thoracic particulate mass)	TWA 1 mg/m^3	TWA 1 mg/m^3	15 mg/m^3	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, throat; pulmonary edema, bronchitis; emphysema; conjunctivitis; stomatis; dental erosion; eye, skin burns; dermatitis	Eyes, skin, respiratory system, teeth	Colorless to dark-brown, oily, odorless liquid.[Note: Pure compound is a solid below 51°F. Often used in an aqueous solution.] BP = 554°F Fl.Pt. = NA LEL = NA UEL = NA Noncombustible Liquid, but capable of igniting finely divided combustible materials.
trans-1,2-Dichloroethene	156-60-5	200 ppm (All isomers)	TWA 200 ppm (790 mg/m3)	TWA 200 ppm (790 mg/m3)	1000 ppm	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, respiratory system; central nervous system depression	Eyes, respiratory system, central nervous system	Colorless liquid (usually a mixture of the cis & trans isomers) with a slightly acrid, chloroform-like odor. BP: 118-140°F Fl.P: 36-39°F LEL: 5.6% UEL: 12.8% Class IB Flammable Liquid Fl.P. below 73°F and BP at or above 100°F.
trans-1,3-Dichloropropene	10061-02-6	https://cameochemicals.noaa.gov/chemical/18110				Inhalation, ingestion, skin and/or eye contact	Symptoms of exposure to this compound may include local irritation of the eyes skin and respiratory tract, dermatitis, gasping, coughing, substernal pain, extreme respiratory distress, lacrimation, central nervous system depression, acute gastrointestinal distress with pulmonary congestion and edema. It may also cause injury to the liver, kidneys and heart	Skin, eyes, mucous membranes, liver, kidney, heart	A clear colorless liquid with chloroform odor BP: 234°F Fl.P: NA LEL: NA UEL: NA
Toluene	108-88-3	TWA 20 ppm (ototoxicant)	TWA 100 ppm (375 mg/m^3) ST 150 ppm (560 mg/m^3)	TWA 200 ppm C 300 ppm 500 ppm (10-minute maximum peak)	500 ppm	Inhalation, skin absorption, ingestion, skin and/or eye contact	irritation eyes, nose; lassitude (weakness, exhaustion), confusion, euphoria, dizziness, headache; dilated pupils, lacrimation (discharge of tears); anxiety, muscle fatigue, insomnia; paresthesia; dermatitis; liver, kidney damage	Eyes, skin, respiratory system, central nervous system, liver, kidneys	Colorless liquid with a sweet, pungent, benzene-like odor. BP: 232°F Fl.P: 40°F LEL: 1.1% UEL: 7.1% Class IB Flammable Liquid Fl.P. below 73°F and BP at or above 100°F.
Trichloroethene (TCE)	79-01-6	TWA 10 ppm STEL 25 ppm	Ca	TWA 100 ppm C 200 ppm 300 ppm (5-minute maximum peak in any 2 hours)	Ca [1000 ppm]	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin; headache, visual disturbance, lassitude (weakness, exhaustion), dizziness, tremor, drowsiness, nausea, vomiting; dermatitis; cardiac arrhythmias, paresthesia; liver injury; [potential occupational carcinogen]	Eyes, skin, respiratory system, heart, liver, kidneys, central nervous system	Colorless liquid (unless dyed blue) with a chloroform-like odor. BP: 189°F Fl.Pt. = NA LEL(77°F): 8.0% UEL(77°F): 10.5% Combustible Liquid, but burns with difficulty.
Trichlorofluoromethane	75-69-4	STEL C 1000 ppm	C 1000 ppm (5600 mg/m3)	TWA 1000 ppm (5600 mg/m3)	2000 ppm	Inhalation, ingestion, skin and/or eye contact	Incoordination, tremor; dermatitis; cardiac arrhythmias, cardiac arrest; asphyxia; liquid: frostbite	Skin, respiratory system, cardiovascular system	Colorless to water-white, nearly odorless liquid or gas (above 75°F) BP: 75°F Fl.P: NA LEL: NA UEL: NA Noncombustible Liquid Nonflammable Gas
Vinyl Chloride (chloroethylene)	75-01-4	TWA 1 ppm	Ca	TWA 1 ppm C 5 ppm [15-minute]	Ca (ND)	Inhalation, skin and/or eye contact (liquid)	Lassitude (weakness, exhaustion); abdominal pain, gastrointestinal bleeding; enlarged liver; pallor or cyanosis of extremities; liquid: frostbite; [potential occupational carcinogen]	Liver, central nervous system, blood, respiratory system, lymphatic system	Colorless gas or liquid (below 7°F) with a pleasant odor at high concentrations.[Note: Shipped as a liquefied compressed gas.] BP: 7°F Fl.Pt. = NA (Gas) LEL: 3.6% UEL: 33.0% Flammable Gas
Xylene (m, o & p isomers)	108-38-3, 95-47-6, 106-42-3	TWA 20 ppm	NA	NA	NA	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; corneal vacuolization; anorexia, nausea, vomiting, abdominal pain; dermatitis	Eyes, skin, respiratory system, central nervous system, gastrointestinal tract, blood, liver, kidneys	Colorless liquid with an aromatic odor BP: 282°F, 292°F, 281°F Fl. Pt. 82°F, 90°F, 81°F LEL: 1.1%, 0.9%, 1.1% UEL: 7.0%, 6.7%, 7.0% Class IC Flammable Liquid at or above 73°F and below 100°F.
Zinc Oxide (dust)	7440-66-6	TWA 2 mg/m3 (repsirable) STEL 10 mg/m^3 (respirable)	TWA 5 mg/m^3 C 15 mg/m^3	TWA 15 mg/m^3 (total dust) TWA 5 mg/m^3 (resp dust) TWA 5 mg/m^3 (fume)	500 mg/m^3	Inhalation	Metal fume fever: chills, muscle ache, nausea, fever, dry throat, cough; lassitude (weakness, exhaustion); metallic taste; headache; blurred vision; low back pain; vomiting; malaise (vague feeling of discomfort); chest tightness; dyspnea (breathing difficulty), rales, decreased pulmonary function	Respiratory system	White, odorless solid. BP: NA Fl.Pt. = NA LEL: NA UEL: NA Noncombustible Solid

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at the Site.

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
SEMI-VOLATILE ORGANIC COMPOUNDS (SVOCs)									
2-Chloronaphthalene	91-58-7	https://cameochemicals.noaa.gov/chemical/16185				Inhalation, ingestion, skin and/or eye contact	Chloracne, cysts, headache, fatigue, vertigo, anorexia and jaundice		Monoclinic plates or off-white crystalline powder BP: NA Fl.Pt. = NA LEL: NA UEL: NA
2-Methylnaphthalene	91-57-6	TWA 0.5 ppm TLV-SL 3 mg/100 cm2 [skin]	https://cameochemicals.noaa.gov/chemical/20668			Inhalation, ingestion, skin and/or eye contact	Headaches, nausea, vomiting, diarrhea, anemia, jaundice, euphoria, dermatitis, visual disturbances, convulsions and comatose	Skin, eyes, mucous membranes and upper respiratory tract	White crystalline solid Combustible solid BP: 466-468 ° F Fl.Pt. = 208 ° F LEL: NA UEL: NA
Acenaphthene	83-32-9	https://cameochemicals.noaa.gov/chemical/10358				Inhalation, ingestion, skin and/or eye contact	Irritation of the skin, eyes, mucous membranes and upper respiratory tract, vomiting	Skin, eyes, mucous membranes and upper respiratory tract	White needles BP: 534 ° F Fl.Pt. = NA LEL: 0.6% UEL: NA
Acenaphthylene	208-96-8	https://cameochemicals.noaa.gov/chemical/16157				Inhalation, ingestion, skin and/or eye contact			Colorless crystalline solid BP: 509 to 527 ° F at 760 mm Hg Fl.Pt. = NA LEL: NA UEL: NA
Anthracene (as coal tar pitch volatiles)	120-12-7	TWA 0.2 mg/m3 (as Benzene solubles)	Ca TWA 0.1 mg/m3 (cyclohexane-extractable fraction)	TWA 0.2 mg/m3 (benzene-soluble fraction) [1910.1002]	Ca [80 mg/m3]	Inhalation, skin and/or eye contact	Dermatitis, bronchitis, [potential occupational carcinogen]	Respiratory system, skin, bladder, kidneys	Black or dark-brown amorphous residue BP: NA Fl.Pt. = NA LEL: NA UEL: NA Combustible Solids
Benzo[a]anthracene	56-55-3	https://cameochemicals.noaa.gov/chemical/16171				Inhalation, injestion, skin and/or eye contact			Colorless leaflets or plates or coarse gold powder with a greenish-yellow fluorescence. May reasonably be expected to be a carcinogen. BP: 815° F at 760 mm Hg Fl.Pt. = NA LEL: NA UEL: NA
Benzo[a]pyrene (as coal tar pitch volatiles)	50-32-8	TWA 0.2 mg/m3 (as Benzene solubles)	Ca TWA 0.1 mg/m3 (cyclohexane-extractable fraction)	TWA 0.2 mg/m3 (benzene-soluble fraction) [1910.1002]	Ca [80 mg/m3]	Inhalation, skin and/or eye contact	Dermatitis, bronchitis, [potential occupational carcinogen]	Respiratory system, skin, bladder, kidneys	Black or dark-brown amorphous residue BP: NA Fl.Pt. = NA LEL: NA UEL: NA Combustible Solids
Benzo[b]fluoranthene	205-99-2	None listed	https://cameochemicals.noaa.gov/chemical/16172			Inhalation, injestion, skin and/or eye contact			Needles or yellow fluffy powder BP: NA Fl.Pt. = NA LEL: NA UEL: NA
Benzo[g,h,i]perylene	191-24-2	https://cameochemicals.noaa.gov/chemical/16174				Inhalation, injestion, skin and/or eye contact	Inhalation of material may be harmful. Contact may cause burns to skin and eyes. Inhalation of Asbestos dust may have a damaging effect on the lungs. Fire may produce irritating, corrosive and/or toxic gases. Some liquids produce vapors that may cause dizziness or suffocation. Runoff from fire control may cause pollution.	Lungs, skin, eyes	Colorless to white crystalline solid. Water insoluble. BP: NA Fl.Pt. = NA LEL: NA UEL: NA
Benzo[k]fluoranthene	207-08-9	https://cameochemicals.noaa.gov/chemical/16173				Inhalation, injestion, skin and/or eye contact	When heated to decomposition this compound emits acrid smoke and irritating fumes.		Pale yellow needles or yellow crystalline solid BP: 896° F Fl.Pt. = NA LEL: NA UEL: NA
Chrysene (as coal tar pitch volatiles	218-01-9	TWA 0.2 mg/m3 (as Benzene solubles)	Ca TWA 0.1 mg/m3 (cyclohexane-extractable fraction)	TWA 0.2 mg/m3 (benzene-soluble fraction) [1910.1002]	Ca [80 mg/m3]	Inhalation, skin and/or eye contact	Dermatitis, bronchitis, [potential occupational carcinogen]	Respiratory system, skin, bladder, kidneys	Black or dark-brown amorphous residue BP: NA Fl.Pt. = NA LEL: NA UEL: NA Combustible Solids
Dibenzo(a,h)anthracene	53-70-3	https://cameochemicals.noaa.gov/chemical/16192				Inhalation, injestion, skin and/or eye contact	Symptoms of exposure to this compound may include irritation. This compound is harmful if swallowed or inhaled. It may cause irritation. When heated to decomposition it emits acrid smoke, irritating fumes and toxic fumes of carbon monoxide and carbon dioxide.	Lungs	White crystals or pale yellow solid. Sublimes BP: 975° F Fl.Pt. = NA LEL: NA UEL: NA

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at the Site.

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
Fluoranthene	206-44-0	https://cameochemicals.noaa.gov/chemical/16213				Inhalation, injestion, skin and/or eye contact	When heated to decomposition this compound emits acrid smoke and fumes.		Light yellow fine crystals BP: 482° F Fl.Pt. = NA LEL: NA UEL: NA
Fluorene	86-73-7	https://cameochemicals.noaa.gov/chemical/16214				Inhalation, injestion, skin and/or eye contact			White leaflets. Sublimes easily under a vacuum. Fluorescent when impure. BP: 563° F Fl.Pt. = NA LEL: NA UEL: NA
Indeno[1,2,3-cd]pyrene	193-39-5	https://cameochemicals.noaa.gov/chemical/16218				Inhalation, injestion, skin and/or eye contact			Yellow crystals BP: 997° F Fl.Pt. = NA LEL: NA UEL: NA
Naphthalene	91-20-3	TWA 10 ppm [skin]	TWA 10 ppm (50 mg/m3) ST 15 ppm (75 mg/m3)	TWA 10 ppm (50 mg/m3)	250 ppm	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes; headache, confusion, excitement, malaise (vague feeling of discomfort); nausea, vomiting, abdominal pain; irritation bladder; profuse sweating; jaundice; hematuria (blood in the urine), renal shutdown; dermatitis, optical neuritis, corneal damage	Eyes, skin, blood, liver, kidneys, central nervous system	Colorless to brown solid with an odor of mothballs. [Note: Shipped as a molten solid.] BP: 424°F Fl.P: 174°F LEL: 0.9% UEL: 5.9% Combustible Solid, but will take some effort to ignite
Phenanthrene	85-01-8	https://cameochemicals.noaa.gov/chemical/16236				Inhalation, injestion, skin and/or eye contact	Symptoms following exposure to this compound may include skin sensitization, dermatitis, bronchitis, cough, dyspnea, respiratory neoplasm, kidney neoplasm, skin irritation, and respiratory irritation.	Skin, respiratory tract	Colorless monoclinic crystals with a faint aromatic odor. Solutions exhibit a blue fluorescence. BP: 642° F Fl.Pt. = 340° F LEL: NA UEL: NA
Pyrene (see coal tar pitch volatiles)	129-00-0	TWA 0.2 mg/m3 (as Benzene solubles)	Ca TWA 0.1 mg/m3 (cyclohexane-extractable fraction)	TWA 0.2 mg/m3 (benzene-soluble fraction) [1910.1002]	Ca [80 mg/m3]	Inhalation, skin and/or eye contact	Dermatitis, bronchitis, [potential occupational carcinogen]	Respiratory system, skin, bladder, kidneys	Black or dark-brown amorphous residue BP: NA Fl.Pt. = NA LEL: NA UEL: NA Combustible Solids
METALS									
Aluminum	7429-90-5	TWA 1 mg/m3	TWA 10 mg/m^3 (total) TWA 5 mg/m^3 (resp)	TWA 15 mg/m^3 (total) TWA 5 mg/m^3 (resp)	N.D.	Inhalation, skin and/or eye contact	Irritation eyes, skin, respiratory system	Eyes, skin, respiratory system	Silvery-white, malleable, ductile, odorless metal BP: 4221°F Fl.Pt. = NA LEL: NA UEL: NA Combustible Solid, finely divided dust is easily ignited; may cause explosions.
Antimony	7440-36-0	TWA 0.5 mg/m3 (as Sb)	TWA 0.5 mg/m3 [*Note: The REL also applies to other antimony compounds (as Sb).]	TWA 0.5 mg/m3 [*Note: The PEL also applies to other antimony compounds (as Sb).]	50 mg/m3 (as Sb)	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, throat, mouth; cough; dizziness; headache; nausea, vomiting, diarrhea; stomach cramps; insomnia; anorexia; unable to smell properly	Eyes, skin, respiratory system, cardiovascular system	Silver-white, lustrous, hard, brittle solid; scale-like crystals; or a dark-gray, lustrous powder BP: 2975°F Fl.Pt. = NA LEL: NA UEL: NA Noncombustible Solid in bulk form, but a moderate explosion hazard in the form of dust when exposed to flame.
Arsenic	7440-38-2	TWA 0.01 mg/m3	Ca C 0.002 mg/m3 [15-minute]	[1910.1018] TWA 0.010 mg/m3	Ca [5 mg/m3 (as As)]	Inhalation, skin absorption, skin and/or eye contact, ingestion	Ulceration of nasal septum, dermatitis, gastrointestinal disturbances, peripheral neuropathy, resp irritation, hyperpigmentation of skin, [potential occupational carcinogen]	Liver, kidneys, skin, lungs, lymphatic system	Metal: Silver-gray or tin-white, brittle, odorless solid BP: Sublimes Fl.Pt. = NA LEL: NA UEL: NA Metal: Noncombustible Solid in bulk form, but a slight explosion hazard in the form of dust when exposed to flame
Barium	7440-39-3	TWA 0.5 mg/m3	0.5 mg Ba/m3 TWA	0.5 mg Ba/m3 TWA	50 mg Ba/m3	Inhalation, ingestion, skin and/or eye contact	Inhalation or contact with vapors, substance or decomposition products may cause severe injury or death. Contact may cause burns to skin, eyes, and mucous membranes. May be toxic by ingestion, inhalation and skin absorption. Used to make other chemicals.	Lungs, skin, eyes, and mucous membrane	A silver to white metallic solid BP: 1337°F Fl.Pt. = NA LEL: NA UEL: NA
Beryllium	7440-41-7	TWA 0.00005 mg/m^3	Ca C 0.0005 mg/m^3	TWA 0.002 mg/m^3 C 0.005 mg/m^3 0.025 mg/m3 [30-minute maximum peak]	Ca [4 mg/m^3 (as Be)]	Inhalation, skin and/or eye contact	Berylliosis (chronic exposure): anorexia, weight loss, lassitude (weakness, exhaustion), chest pain, cough, clubbing of fingers, cyanosis, pulmonary insufficiency; irritation eyes; dermatitis; [potential occupational carcinogen]	Eyes, skin, respiratory system	Hard, brittle, gray-white solid BP: 4532°F Fl.Pt. = NA LEL: NA UEL: NA Noncombustible Solid in bulk form, but a slight explosion hazard in the form of a powder or dust.

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at the Site.

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
Cadmium	7440-43-9	TWA 0.01 mg/m^3 total dust TWA 0.002 mg/m^3 (as Cd) respirable fraction	Ca	TWA 0.005 mg/m^3	Ca [9 mg/m3 (as Cd)]	Inhalation, ingestion	Pulmonary edema, dyspnea (breathing difficulty), cough, chest tightness, substernal (occurring beneath the sternum) pain; headache; chills, muscle aches; nausea, vomiting, diarrhea; anosmia (loss of the sense of smell), emphysema, proteinuria, mild anemia; [potential occupational carcinogen]	Respiratory system, kidneys, prostate, blood	Silver-white/blue tinged lustrous, odorless solid. BP: 1409°F Fl.Pt. = NA LEL: NA UEL: NA Noncombustible - will burn in powder form
Calcium	7440-70-2	https://cameochemicals.noaa.gov/chemical/309				Inhalation, ingestion, skin and/or eye contact	Contact with eyes or skin produces caustic burns.	Eyes, skin	A silvery, soft metal that turns grayish white on exposure to air. BP: 2714°F Fl.Pt. = NA LEL: NA UEL: NA
Chromium	7440-47-3	TWA 0.5 mg/m^3 (metal) TWA 0.003 mg/m^3 (water-soluble Cr III compounds) TWA 0.0002 mg/m^3 (water-soluble Cr VI compounds) STEL 0.0005 mg/m3 (water-soluble Cr VI compounds)	TWA 0.5 mg/m^3	TWA 1 mg/m^3	250 mg/m^3 (as Cr)	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin; lung fibrosis (histologic)	Eyes, skin, respiratory system	Blue-white to steel-gray, lustrous, brittle, hard, odorless solid. BP: 4788°F Fl.Pt. = NA LEL: NA UEL: NA Noncombustible - will burn in dust form if heated in a flame
Cobalt	7440-48-4	TWA 0.02 mg/m3 [DSEN] [RSEN]	TWA 0.05 mg/m3	TWA 0.1 mg/m3	20 mg/m3 (as Co)	Inhalation, ingestion, skin and/or eye contact	Cough, dyspnea (breathing difficulty), wheezing, decreased pulmonary function; weight loss; dermatitis; diffuse nodular fibrosis; resp hypersensitivity, asthma	Skin, respiratory system	Odorless, silver-gray to black solid BP: 5612°F Fl.Pt. = NA LEL: NA UEL: NA Noncombustible Solid in bulk form, but finely divided dust will burn at high temperatures.
Copper	7440-50-8	TWA 0.2 mg/m^3 (fume) TWA 1 mg/m3 (dusts and mists)	TWA 1 mg/m^3	TWA 1 mg/m^3	100 mg/m^3 (as Cu)	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, nose, pharynx; nasal septum perforation; metallic taste; dermatitis; In Animals: lung, liver, kidney damage; anemia	Eyes, skin, respiratory system, liver, kidneys (increased risk with Wilson's disease)	Reddish, lustrous, malleable, odorless solid. BP: 4703°F Fl.Pt. = NA LEL: NA UEL: NA Noncombustible - powdered form may ignite
Iron (as iron oxide)	7439-89-6	TWA 5 mg/m3 (respirable particulate mass)	TWA 1 mg/m^3	NA	NA	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, mucous membrane; abdominal pain, diarrhea, vomiting; possible liver damage	Eyes, skin, respiratory system, liver, gastrointestinal tract	Appearance and odor vary depending upon the specific soluble iron salt. BP: NA Fl.Pt. = NA LEL: NA UEL: NA Noncombustible Solids
Lead	7439-92-1	TWA 0.05 mg/m3	TWA (8-hour) 0.050 mg/m3	[1910.1025] TWA 0.050 mg/m3	100 mg/m3 (as Pb)	Inhalation, ingestion, skin and/or eye contact	Lassitude (weakness, exhaustion), insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; paralysis wrist, ankles; encephalopathy; kidney disease; irritation eyes; hypertension	Eyes, gastrointestinal tract, central nervous system, kidneys, blood, gingival tissue	A heavy, ductile, soft, gray solid BP: 3164°F Fl.Pt. = NA LEL: NA UEL: NA Noncombustible Solid in bulk form
Magnesium	7439-95-4	https://cameochemicals.noaa.gov/chemical/6949				Eye and/or skin contact	Dust irritates eyes in same way as any foreign material. Penetration of skin by fragments of metal is likely to produce local irritation, blisters, and ulcers which may become infected.	Eyes	A light silvery metal BP: 1202°F Fl.Pt. = NA LEL: NA UEL: NA
Manganese	7439-96-5	TWA 0.02 mg/m3 [R] TWA 0.1 mg/m3 [I]	TWA 1 mg/m3 ST 3 mg/m3	C 5 mg/m3	500 mg/m3 (as Mn)	inhalation, ingestion	Manganism; asthenia, insomnia, mental confusion; metal fume fever: dry throat, cough, chest tightness, dyspnea (breathing difficulty), rales, flu-like fever; low-back pain; vomiting; malaise (vague feeling of discomfort); lassitude (weakness, exhaustion); kidney damage	respiratory system, central nervous system, blood, kidneys	A lustrous, brittle, silvery solid BP: 3564°F Fl.Pt. = NA LEL: NA UEL: NA Metal: Combustible Solid
Mercury	7439-97-6	TWA 0.1 mg/m3, as Hg Aryl compounds TWA 0.025 mg/m3 as Hg, inorganic forms including metallic mercury	Hg Vapor: TWA 0.05 mg/m3 [skin] Other: C 0.1 mg/m3 [skin]	TWA 0.1 mg/m3	10 mg/m3 (as Hg)	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin; cough, chest pain, dyspnea (breathing difficulty), bronchitis, pneumonitis; tremor, insomnia, irritability, indecision, headache, lassitude (weakness, exhaustion); stomatitis, salivation; gastrointestinal disturbance, anorexia, weight loss; proteinuria	Eyes, skin, respiratory system, central nervous system, kidneys	Metal: Silver-white, heavy, odorless liquid. [Note: "Other" Hg compounds include all inorganic & aryl Hg compounds except (organo) alkyls.] BP: 674°F Fl.Pt. = NA LEL: NA UEL: NA Metal: Noncombustible Liquid

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at the Site.

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
Nickel	7440-02-0	TWA 1.5 mg/m^3 [elemental] TWA 0.1 mg/m^3 [soluble inorganic compound] TWA 0.2 mg/m^3 [insoluble inorganic compound] TWA 0.1 mg/m^3 [Nickel subsulfide]	Ca TWA 0.015 mg/m^3	TWA 1 mg/m^3	Ca [10 mg/m3 (as Ni)]	Inhalation, ingestion, skin and/or eye contact	Sensitization dermatitis, allergic asthma, pneumonitis; [potential occupational carcinogen]	Nasal cavities, lungs, skin	Lustrous, silvery, odorless solid. BP: 5139°F Fl.Pt. = NA LEL: NA UEL: NA Combustible Solid; nickel sponge catalyst may ignite spontaneously in air.
Potassium	9/7/7440	https://cameochemicals.noaa.gov/chemical/4289				Eye and/or skin contact	Will burn skin and eyes	Skin, eyes	Potassium is a soft silvery metal though normally grayish white due to oxidation BP: 1425°F Fl.Pt. = NA LEL: NA UEL: NA
Selenium	7782-49-2	TWA 0.2 mg/m3	TWA 0.2 mg/m3	TWA 0.2 mg/m3	1 mg/m3 (as Se)	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, throat; visual disturbance; headache; chills, fever; dyspnea (breathing difficulty), bronchitis; metallic taste, garlic breath, gastrointestinal disturbance; dermatitis; eye, skin burns; In Animals: anemia; liver necrosis, cirrhosis; kidney, spleen damage	Eyes, skin, respiratory system, liver, kidneys, blood, spleen	Amorphous or crystalline, red to gray solid. [Note: Occurs as an impurity in most sulfide ores.] BP: 1265°F Fl.Pt. = NA LEL: NA UEL: NA Combustible Solid
Silver	7440-22-4	TWA 0.1 mg/m3 [Metal, dust, and fume] TWA 0.01 mg/m3 [Soluble compounds, as Ag]	TWA 0.01 mg/m3	TWA 0.01 mg/m3	10 mg/m3 (as Ag)	Inhalation, ingestion, skin and/or eye contact	Blue-gray eyes, nasal septum, throat, skin; irritation, ulceration skin; gastrointestinal disturbance	Nasal septum, skin, eyes	Metal: White, lustrous solid BP: 3632°F Fl.Pt. = NA LEL: NA UEL: NA Metal: Noncombustible Solid, but flammable in form of dust or powder
Sodium	7440-23-5	https://cameochemicals.noaa.gov/chemical/7794				Skin contact	Severe burns caused by burning metal or by caustic soda formed by reaction with moisture on skin	Skin	A silvery soft metal that becomes grayish white upon exposure to air BP: 1621°F Fl.Pt. = NA LEL: NA UEL: NA
Thallium	7440-28-0	0.02 mg/m3 inhallable particulate matter	TWA 0.1 mg/m3 [skin]	TWA 0.1 mg/m3 [skin]	15 mg/m3 (as Tl)	Inhalation, skin absorption, ingestion, skin and/or eye contact	Nausea, diarrhea, abdominal pain, vomiting; ptosis, strabismus; peri neuritis, tremor; retrosternal (occurring behind the sternum) tightness, chest pain, pulmonary edema; convulsions, chorea, psychosis; liver, kidney damage; alopecia; paresthesia legs	Eyes, respiratory system, central nervous system, liver, kidneys, gastrointestinal tract, body hair	Appearance and odor vary depending upon the specific soluble thallium compound BP: NA Fl.Pt. = NA LEL: NA UEL: NA
Vanadium	7440-62-2	https://cameochemicals.noaa.gov/chemical/16147				Inhalation, skin absorption, ingestion, skin and/or eye contact	Highly toxic, may be fatal if inhaled, swallowed or absorbed through skin. Avoid any skin contact. Effects of contact or inhalation may be delayed. Fire may produce irritating, corrosive and/or toxic gases. Runoff from fire control or dilution water may be corrosive and/or toxic and cause pollution	Skin	Silvery-whitish powder BP: NA Fl.Pt. = NA LEL: NA UEL: NA
Zinc	7440-66-6	https://cameochemicals.noaa.gov/chemical/4814				Inhalation, skin absorption, ingestion, skin and/or eye contact	Inhalation or contact with vapors, substance or decomposition products may cause severe injury or death. May produce corrosive solutions on contact with water. Fire will produce irritating, corrosive and/or toxic gases. Runoff from fire control may cause pollution	Lungs	A grayish powder BP: NA Fl.Pt. = NA LEL: NA UEL: NA
PCBs									
PCBs (total)	11097-69-1, 53469-21-9	TWA 0.5 mg/m3 [skin] TWA 1 mg/m3 [skin]	Ca TWA 0.001 mg/m3 Ca TWA 0.001 mg/m3	TWA 0.5 mg/m3 [skin] TWA 1 mg/m3 [skin]	Ca [5 mg/m3] Ca [5 mg/m3]	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, chloracne; liver damage; reproductive effects; [potential occupational carcinogen]	Skin, eyes, liver, reproductive system	Colorless to pale-yellow, viscous liquid or solid (below 50°F) with a mild, hydrocarbon odor BP: 689-734°F, 617-691°F Fl.Pt. = NA, NA LEL: NA UEL: NA Nonflammable Liquid, but exposure in a fire results in the formation of a black soot containing PCBs, polychlorinated dibenzofurans, and chlorinated dibenzo-p-dioxins.
Petroleum Hydrocarbons									
Gasoline	86290-81-5	TWA 300 ppm STEL 500 ppm	Ca	None	Ca [N.D.]	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, mucous membrane; dermatitis; headache; lassitude (weakness, exhaustion), blurred vision, dizziness, slurred speech, confusion, convulsions; chemical pneumonitis (aspiration liquid); possible liver, kidney damage; [potential occupational carcinogen]	Eyes, skin, respiratory system, central nervous system, liver, kidneys	Clear liquid with a characteristic odor BP: 102°F Fl.Pt. = -45°F LEL: 1.4% UEL: 7.6%

References

Centers for Disease Control and Prevention, 2018. *NIOSH Pocket Guide to Chemical Hazards*. The National Institute for Occupational Safety and Health.

American Conference of Governmental Industrial Hygienists (ACGIH), 2017. *2017 TLVs® and BEIs®*. Cincinnati, OH.

National Oceanic and Atmospheric Administration (NOAA) and Environmental Protection Agency (EPA), 2019. *CAMEO Chemicals Database* . https://cameochemicals.noaa.gov/

U.S. Department of Labor, 1990. *OSHA Regulated Hazardous Substances*. Industrial Exposure and Control Technologies Government Institutes, Inc.

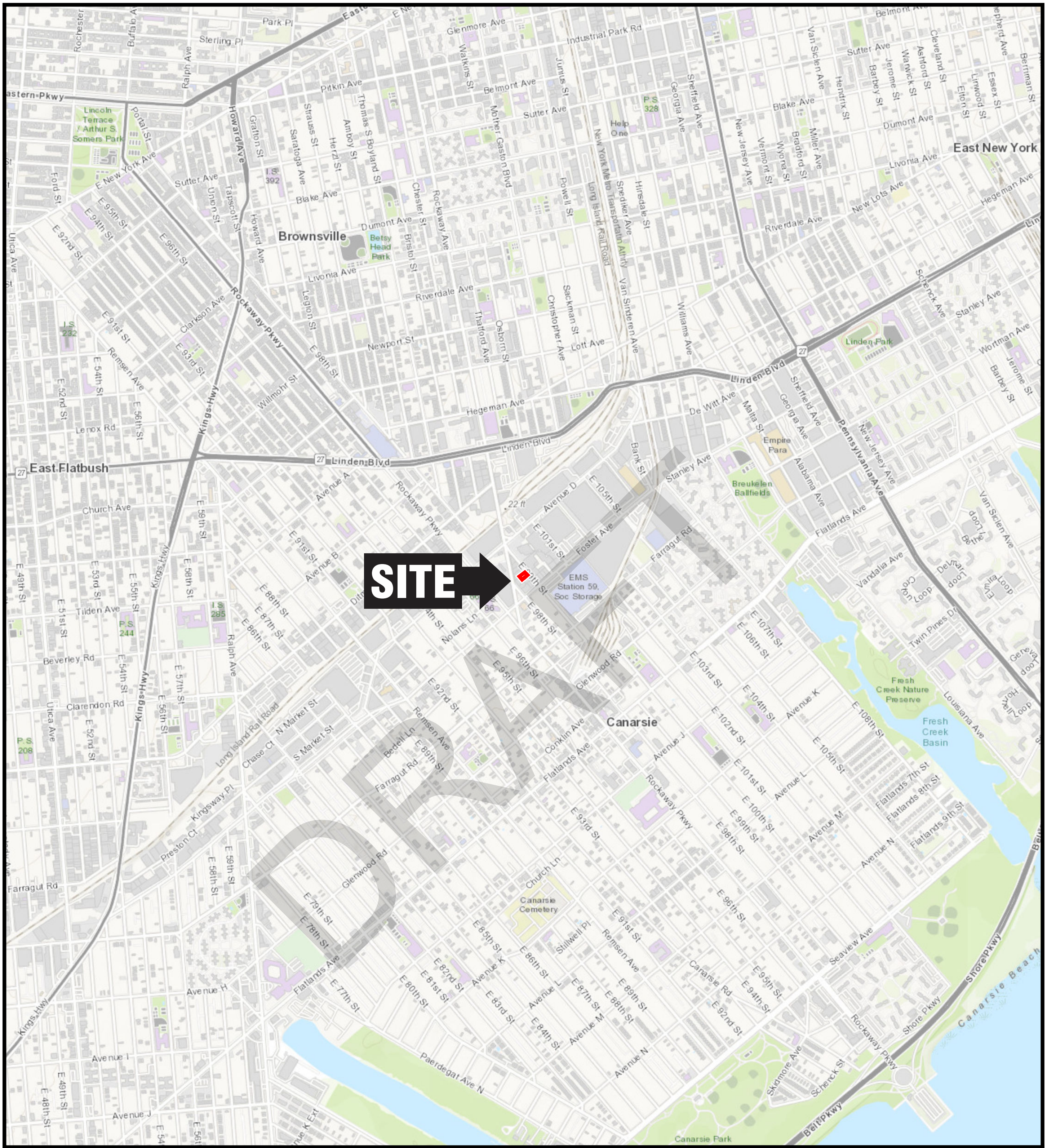
Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at the Site.

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties

Sax, N. Van Nostrand and Reinhold Company, 1987. *Hawley's Condensed Chemical Dictionary, 11th Edition.*
Proctor, N.H., J.P. Hughes and M.L. Fischman, 1989. *Chemical Hazards of the Workplace* . Van Nostrand Reinhold. New York.
Sax, N.I. and R.J. Lewis, 1989. *Dangerous Properties of Industrial Materials, 7th Edition.* Van Nostrand Reinhold. New York.

Abbreviations:
ACGIH – American Conference of Governmental Industrial Hygienists.
BP – boiling point at 1 atmosphere, °F
C – Ceiling, is a concentration that should not be exceeded during and part of the working exposure.
Ca – Carcinogenic.
CAS# - Chemical Abstracts Service registry number which is unique for each chemical.
DSEN - Dermal Sensitization
Ft Pt. – Flash point
IDLH - Immediately Dangerous to Life and Health concentrations represent the maximum concentration from which, in the event of respirator failure, one could escape within 30 minutes without a respirator and without experiencing any escape-impairing or irreversible health effects.
LEL – Lower explosive (flammable) limit in air, % by volume (at room temperature)
mg/m^3 – Milligrams of substance per cubic meter of air
NIOSH - National Institute for Occupational Safety and Health.
OSHA – Occupational Safety and Health Administration
OTO - Ototoxicant
PEL - OSHA Permissible Exposure Limit (usually) a time weighted average concentration that must not be exceeded during any 8 hour work shift of a 40 hr work week.
ppm – parts per million
REL – NIOSH Recommended Limit indicated a time weighted average concentration that must not be exceeded during any 10 hour work shift of a 40 hr work week
RSEN - Respiratory Sensitization
SG - Specific Gravity
STEL – ACGIH Short-term exposure limit (ST)
TLV - ACGIH Threshold Limit Values (usually 8 hour time weighted average concentrations).
TWA – 8-hour, time-weighted average
UEL – Upper explosive (flammable) limit in air, % by volume (at room temperature)
VP - Vapor Pressure

FIGURES



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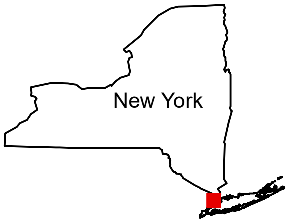
QUADRANGLE LOCATION



N

1,000 0 1,000'

Title:

SITE LOCATION MAP

458 EAST 99TH STREET
BROOKLYN, NY

Prepared for:

458 EAST 99TH STREET LLC

ROUX

Compiled by: L.C.	Date: 06/25/21	FIGURE
Prepared by: M.S.R.	Scale: AS SHOWN	1
Project Mgr: L.C.	Project: X.X.	
File: 1. Site Location.mxd		

LEGEND

🟥 SITE BOUNDARY

🟨 EMERGENCY MUSTER AREA

Title:

SITE PLAN WITH EMERGENCY MUSTER AREA

458 EAST 99TH STREET
BROOKLYN, NY

Prepared for:

458 EAST 99TH STREET LLC

ROUX

Compiled by: L.C.	Date: 06/25/21	FIGURE
Prepared by: M.S.R.	Scale: AS SHOWN	2
Project Mgr: L.C.	Project: X.X.	
File: 2. Site Plan.mxd		

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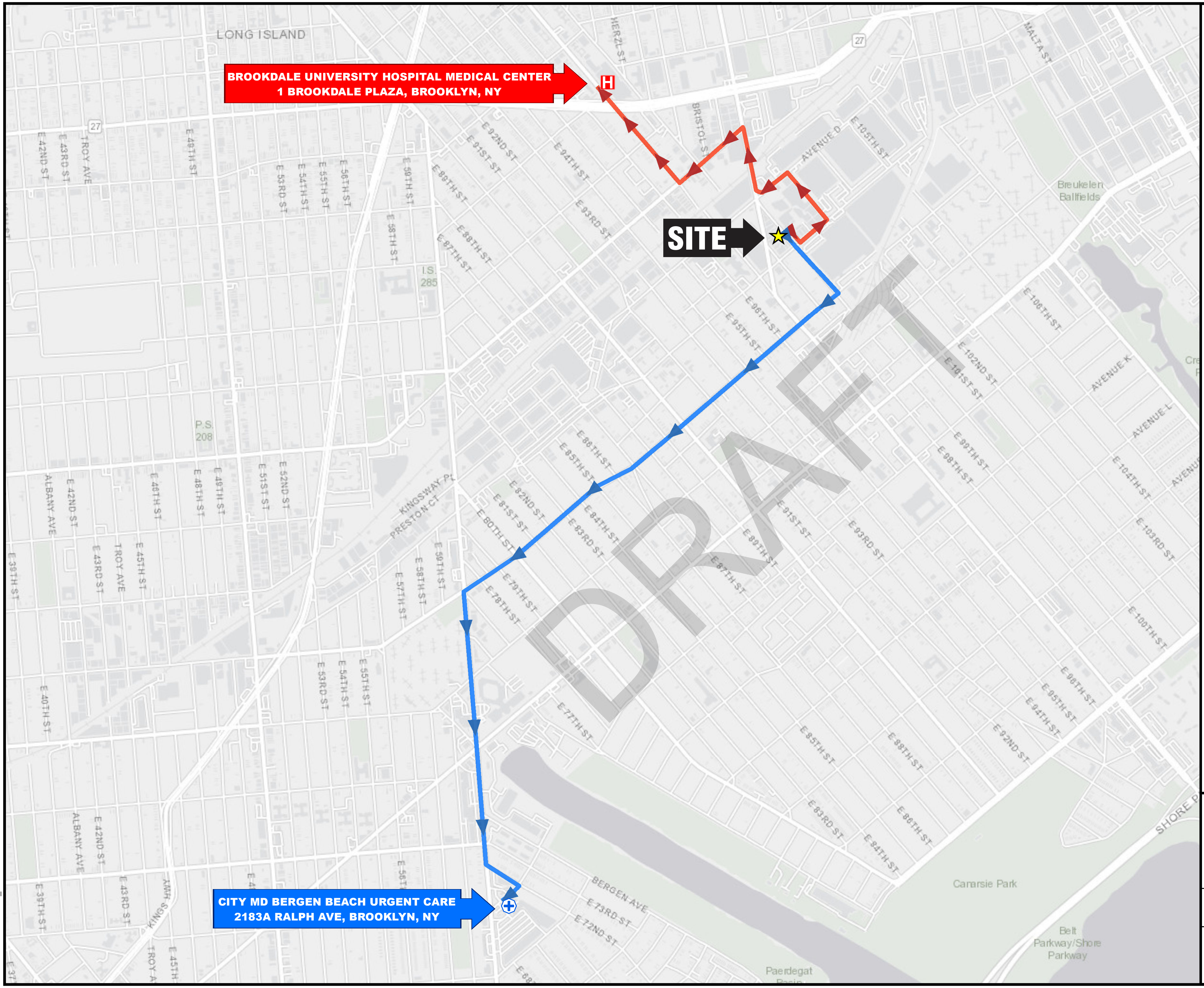

DIRECTIONS TO HOSPITAL

1. HEAD SOUTHEAST ON E 99TH ST
2. TURN LEF ONTO FOSTER AVE
3. TURN LEFT ONTO E 101ST ST
4. TURN LEFT ONTO AVENUE D
5. TURN RIGHT ONTO ROCKAWAY AVE
6. TURN LEFT ONTO DITMAS AVE
7. TURN RIGHT ONTO ROCKAWAY PKWY
8. DESTINATION WILL BE ON THE RIGHT

DIRECTIONS TO URGENT CARE

1. HEAD SOUTHEAST ON E 99TH ST
2. TURN RIGHT ONTO FARRAGUT RD
3. TURN LEFT ONTO RALPH AVE
4. TURN LEFT ONTO E 72ND ST
5. TURN RIGHT ONTO AVENUE K
6. TURN LEFT
7. DESTINATION WILL BE ON THE LEFT

1,200 0 1,200'

Title:

ROUTES TO URGENT CARE AND HOPSITAL

458 EAST 99TH STREET
BROOKLYN, NY

Prepared for:

458 EAST 99TH STREET LLC

ROUX

Compiled by: L.C.	Date: 06/25/21	FIGURE
Prepared by: M.S.R.	Scale: AS SHOWN	3
Project Mgr: L.C.	Project: X.X.	
File: 3. Urgent Route.mxd		

V:\GIS\PROJECTS\NON_INITIALIZED\EAST 99TH STREET\HASP\3. URGENT ROUTE.MXD

APPENDICES

A. Job Safety Analysis (JSA) Management Program and JSA Forms
B. Safety Data Sheets (SDSs) for Chemicals Used
C. Personal Protective Equipment (PPE) Management Program
D. Subsurface Utility Clearance Management Program
E. Heavy Equipment Exclusion Zone (HEEZ) Management Program
F. Incident Investigation and Reporting Management Program
G. Generic Community Air Monitoring Plan (CAMP)
H. Tailgate Form
I. Roux COVID-19 Interim Health and Safety Guidance

APPENDIX A

Job Safety Analysis (JSA) Management Program and JSA Forms

JOB SAFETY ANALYSIS **Cntrl. No.**	DATE:	☒ NEW ☐ REVISED	PAGE 1 of 2

JSA TYPE CATEGORY **GENERIC**	WORK TYPE	WORK ACTIVITY (Description)

DEVELOPMENT TEAM	**POSITION / TITLE**	**REVIEWED BY:**	**POSITION / TITLE**

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST
☐ HARD HAT
☐ LIFELINE / BODY HARNESS
☐ SAFETY GLASSES
☐ GOGGLES
☐ FACE SHIELD
☐ HEARING PROTECTION
☐ SAFETY SHOES
☐ AIR PURIFYING RESPIRATOR
☐ SUPPLIED RESPIRATOR
☐ PPE CLOTHING:
☐ GLOVES:
☐ OTHER

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Required Equipment:

Commitment to LPS – All personnel onsite will actively participate in SPSA performance by verbalizing SPSAs throughout the day.

EXCLUSION ZONE: A _ foot exclusion zone will be maintained around (indicate equipment).

Assess **[1]JOB STEPS**	**Analyze** **[2]POTENTIAL HAZARDS**	**Act** **[3]CRITICAL ACTIONS**
1. [INSERT JOB STEP]	**1a. CONTACT:** [INSERT HAZARD] **1b. CAUGHT:** [INSERT HAZARD] **1c. FALL:** [INSERT HAZARD] **1d. EXPOSURE:** [INSERT HAZARD] **1e. EXERTION:** [INSERT HAZARD] **1f. ENERGY SOURCE:** [INSERT HAZARD]	1a. 1b. 1c. 1d. 1e. 1f.
2. [INSERT JOB STEP]	**2a. CONTACT:** [INSERT HAZARD] **2b. CAUGHT:** [INSERT HAZARD]	2a. 2b.

[1] Each Job or Operation consists of a set of tasks / steps. Be sure to list all the steps needed to perform job.

[2] A hazard is a potential danger. Break hazards into five types: Contact - victim is struck by or strikes an object; Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards.

[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift." Avoid general statements such as, "be careful."

	2c. FALL: [INSERT HAZARD]	2c.
	2d. EXPOSURE: [INSERT HAZARD]	2d.
	2e. EXERTION: [INSERT HAZARD]	2e.
	2f. ENERGY SOURCE: [INSERT HAZARD]	2f.

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Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards.

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JOB SAFETY ANALYSIS **Ctrl. No. GEN-003**	DATE 8/6/2018	☐ NEW ☒ REVISED	PAGE 1 of 2

JSA TYPE CATEGORY **GENERIC**	WORK TYPE **Construction - Excavation**	WORK ACTIVITY (Description) **Backfilling Excavation & Compaction**

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
David Kaiser	Project Engineer	Brian Hobbs	Corporate Health & Safety Manager
Edward Lacina	Senior Construction Manager		

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST	☐ GOGGLES	☐ AIR PURIFYING RESPIRATOR	☒ GLOVES: Leather/ cut-resistant level 2
☒ HARD HAT	☐ FACE SHIELD	☐ SUPPLIED RESPIRATOR	☐ OTHER _____
☐ LIFELINE / BODY HARNESS	☒ HEARING PROTECTION	☒ PPE CLOTHING: reflective DOT approved safety	
☒ SAFETY GLASSES	☒ SAFETY TOE BOOTS		

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Payloader, Backhoe, Dump Trucks, Mechanical gas powered tampers, Excavator with hydraulic tamper. APR when tamping if dust present. Two-way radios.

COMMITMENT TO SAFETY- All personnel onsite will actively participate in hazard recognition and mitigation throughout the day by verbalizing SPSAs.

EXCLUSION ZONE: A 10’ minimum exclusion zone will be maintained around excavator, backhoe, tampers, and dump trucks.

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Pre-construction meeting: Review proposed excavation locations	**1a. CONTACT:** Potential for contact with subsurface utilities and above ground utilities	1a. Call state 811 for mark out service and one call ticket. 1a. Obtain private utility mark out service as necessary. 1a. Review and mark proposed excavations w/white paint. 1a. Identify all “Critical” zones. A Critical zone is any area within 10 feet of any operating utility. 1a. **Complete subsurface clearance checklist.** 1a. Soft dig must be conducted within 2 lateral feet of any suspected underground utility. 1a. Protection of aboveground utilities identified as being located within the work zone must be coordinated w/ client and utility owner.
2. Secure Work Area	**2a. CONTACT:** Potential for personnel to enter the work area. Potential for equipment to contact, or crush personnel. **2b. EXERTION:** Potential for muscle strain or tear while installing traffic cones and barrel	2a. Ensure work area is secure and inform others of work activity. Establish a heavy equipment exclusion zone (HEEZ) using 42” traffic cones, barrels & snow fencing or telescoping poles. Use of flag persons to maintain clear traffic and to minimize motorist confusion during set-up of new traffic pattern. HEEZ to include tip/swing radius of equipment. 2a. Dump Truck/Excavator/Payloader/Backhoe equipment to be set-up by personnel who are familiar with machinery. Spotters shall be in place for all equipment. and to control access to the HEEZ 2a. Truck wheels are chocked when driver is not in truck and engine shut off. 2a. Personnel shall stay out of the exclusion zone (10’ minimum or greater than the equipment boom) while equipment is maneuvering. 2b. Keep back straight, keep load close to the body and bend knees while lifting and working. If over 50 lbs., use 2 or more laborers for lifting or use of equipment.

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[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".

3. Backfilling excavation, and compaction	**3a. CONTACT:** Traffic and live equipment. .	3a. Equipment and trucks shall be isolated from other workers, subcontractors and third party traffic with 42" traffic cones, barricades, snow fencing or telescoping poles, and/or Jersey barriers. Spotters shall direct dump truck for placement of fill near excavation. Pay loader/ Excavator, as directed by spotter, shall move fill into trench where it shall be placed in layers and compacted by mechanical means. 3a. Spotters will wear florescent vests at all times. 3a. Spotters will remain out of the exclusion zone, line of fire from equipment and third-party vehicles. 3a. Spotters and operators will have radios for communication, when other visual and/or hand signals are insufficient. 3a. Locate all overhead utilities. All personnel and machinery should maintain a 10' distance from overhead electric lines. Refer to OSHA chart for distances and voltage. 3a. For excavations engineered (shored, sloped, benched} all personnel, equipment, and materials must remain a minimum of 2 feet from edge of excavation.
	3b. EXPOSURE: Fumes from gas powered tamper	3b. Fueling of all equipment will be done outside of work area in a well-ventilated area. Refueling will be done only after a 2-5-minute cool down.
	3c. FALL: Slips, trips, fall hazards.	3c. Work area will be clean and free of any debris to remove slip, trip and fall hazards. All tools will be kept in designated areas. Insure work area is well illuminated. 3c. Workers should only be working in areas that have been leveled with a machine. 3c. All persons working at elevations over 6' shall use a guardrail system or personal fall arrest system while around excavation.
	3d. OVEREXERTION: Muscle strain, or tear.	3d. Keep knees bent and back straight while transferring/ lifting/lowering tamper from elevated areas. Utilize a co-worker to avoid staining muscles. 3d. Keep knees bent and back straight while maneuvering tamper. Utilize a co-worker to avoid staining muscles.
	3e. EXPOSURE: Noise from tamper.	3e. Workers will wear hearing protection during compaction tamper activities.
	Dust inhalation.	3e. Wear NIOSH approved dust mask for personal comfort. If dust is visible for extended time, limit by wetting down area. 3e. If dust continues stop work and evaluate if APR is needed with approval and clearance.
4. Secure/leave site.	**4a. FALL:** Slip, trip, fall	4a. Clear work area of all debris and store all equipment in designated areas/containers before opening to traffic. 4a. Replace fencing and barricades as needed to secure path before opening roadway or area up to traffic(vehicle, pedestrian and/or bicycle).

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JOB SAFETY ANALYSIS **Ctrl. No. GEN-006**	DATE 7/10/2020	☐ NEW ☒ REVISED	PAGE 1 of 2

JSA TYPE CATEGORY: **Generic**	WORK TYPE: **Drilling**	WORK ACTIVITY (Description): **Direct Push Soil Borings / Well Installation**

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
Timothy Zei	Project Hydrogeologist	Raymond Olson	Office Health & Safety Manager
		Brian Hobbs	Corporate Health & Safety Manager

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST ☒ HARD HAT ☐ LIFELINE / BODY HARNESS ☒ SAFETY GLASSES	☐ GOGGLES ☐ FACE SHIELD ☒ HEARING PROTECTION: (as needed) ☒ SAFETY SHOES: <u>Composite-toe or steel toe boots</u>	☐ AIR PURIFYING RESPIRATOR ☐ SUPPLIED RESPIRATOR ☒ PPE CLOTHING: <u>Fluorescent reflective vest or high visibility clothing, Long Sleeve Shirt</u>	☒ GLOVES: <u>Leather, Nitrile and cut resistant</u> ☒ OTHER: <u>Insect Repellant, sunscreen (as needed)</u>

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Geoprobe or Truck-Mounted Direct Push Drill Rig, Hand Tools, Photoionization Detector, Multi-Gas Meter (or equivalent), Macrocore liners, Liner Opening Tool, 20 lb. Type ABC Fire Extinguisher, 42” Cones & Flags, “Work Area” Signs, Water

COMMITMENT TO SAFETY- All personnel onsite will actively participate in hazard recognition and mitigation throughout the day by verbalizing SPSAs

EXCLUSION ZONE (EZ): Maintain Minimum Heavy Equipment Exclusion Zone around equipment and loads while it is in motion. The HEEZ must be greater than the swing zone of any moving part of the equipment, tip zone of the equipment, fall zone of the equipment and contents, distance that debris may travel during demolition activities and/or foot print of a structure to be demolished.

“SHOW ME YOUR HANDS”
Driller and helper should show that hands are clear from controls and moving parts

Assess ¹JOB STEPS	Analyze ²POTENTIAL HAZARDS	Act ³CRITICAL ACTIONS
1. Mobilization of drilling rig (ensure the Subsurface Clearance Protocol and Drill Rig Checklist are completed)	**1a. CONTACT:** Equipment/property damage.	1a. The drill rig's tower/derrick will be lowered and secured prior to mobilization. 1a. A spotter should be utilized while moving the drill rig. If personnel move into the path of the drill rig, the drill rig will be stopped until the path is again clear. Use a spotter for all required backing operations. 1a. Set-up the work area and position equipment in a manner that eliminates or reduces the need for backing of support trucks and trailers. 1a. When backing up truck rig with an attached trailer use a second spotter if there is tight clearance simultaneously on multiple sides of the equipment or if turning angles limit driver visibility. 1a. Inspect the driving path for uneven terrain. Level or avoid if needed. 1a. Drill rig should have a minimum **exclusion zone which encompasses its tip radius** for non-essential personnel (i.e., driller helper, geologist) when the rig is moving/ in operation.
	1b. FALL: Slip/trip/fall hazards.	1b. Inspect walking path for uneven terrain, weather-related hazards (i.e., ice, puddles, snow, etc.), and obstructions prior to mobilizing equipment. 1b. Do not climb over stored materials/equipment; walk around. Practice good housekeeping. 1b. Use established pathways and walk on stable, secure ground.
	1c. CONTACT: Crushing from roll-over.	1c Geoprobe should cross all hills/obstructions head on with the mast down to reduce risk of roll-over.
2. Raising tower/derrick of drill rig	**2a. CONTACT:** Overhead hazards.	2a. Prior to raising the tower/derrick, the area above the drilling rig will be inspected for wires, tree limbs, piping, or other structures, that could come in contact with the rig's tower and/or drilling rods or tools. 2a. Maintain a safe distance of 10’ from overhead structures.
	2b. CONTACT: Pinch Points/Amputation Points when raising the rig and instability of rig	2b. Inspect the equipment prior to use and avoid pinch/amputation points. 2b. Lower outriggers to ensure stability prior to raising rig tower/derrick. 2b. If the rig needs to be mounted, be sure to use three points of contact.
3. Advancement of drilling equipment and well installation	**3a. CONTACT:** Flying debris	3a. Be aware of and avoid potential lines of fire and wear required PPE such as eye, ear, and hand protection.
	3b. EXPOSURE: Noise and dust.	3b. Wet borehole area with sprayer to minimize dust. 3b. Stand upwind and keep body away from rig. 3b. Dust mask should be worn if conditions warrant. 3b. Wear hearing protection when the drill rig is in operation.

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[2] A hazard is a potential danger. Break hazards into six types: Contact - victim is struck by or strikes an object; Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards; Energy Source – electricity, pressure, compression/tension.

[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
3. Advancement of drilling equipment and well installation (Continued)	**3a. CONTACT:** Flying debris **3b. EXPOSURE:** Noise and dust. **3c. FALL:** Slip/trip/fall hazards. **3d. CAUGHT:** Limb/extremity pinching; abrasion/crushing. **3e. CONTACT:** Equipment imbalance during advancement of drill equipment. **3f. EXPOSURE:** Inhalation of contamination/vapors. **3g. EXERTION:** Potential for muscle strain/injury while lifting and installing well casings, lifting sand bags, and/or lifting rods.	3c. Contain drill cuttings and drilling water to prevent fall hazards from developing in work area. 3c. See 1b. 3d. Ensure all Emergency Safety Stop buttons function properly. 3d. Always wear leather gloves when making connections and using hand tools; wear cut-resistant (i.e., Kevlar) gloves when handling cutting tools. 3d. Inspect the equipment prior to use for potential pinch/amputation points. Keep hands away from pinch/amputation points and use of tools is preferable compared to fingers and hands. 3d. Inspect drill head for worn surface or missing teeth; replace if damaged or blunt. 3d. Ensure all jewelry is removed, loose clothing is secured, and PPE is secured close to the body. 3d. All non-essential personnel should stay away from the immediate work area; position body out of the line-of-fire of equipment. 3d. Drillers and helpers will understand and use the “Show Me Your Hands” Policy. 3d. Spinning rods/casing have an **exclusion zone of tip radius** while in operation. 3e. Drillers will advance the borehole with caution to avoid causing the rig to become imbalanced and/or tip. 3e. The blocking and leveling devices used to secure the rig will be inspected by drillers and Roux personnel regularly to see if shifting has occurred. 3e. In addition, personnel and equipment that are non-essential to the advancement of the borehole will be positioned away from the rig at a distance that is at least as far as the boom is high (**minimum exclusion zone**). 3f. Monitor ambient air for dangerous conditions using a calibrated photoionization detector (PID) to periodically monitor the breathing zone of the work area. 3f. If a reading of >5ppm is recorded, the Roux field personnel must temporarily cease work, instruct all Site personnel to step away from the area of elevated readings and inform the Roux PM of the condition. The Roux PM will then recommend additional precautions in accordance with the site specific health and safety plan. 3f. Use a multi-gas meter to monitor ambient air for dangerous conditions (i.e. unsafe levels of carbon monoxide when drilling indoors or the presence of explosive vapors). 3g. Keep back straight and bend at the knees. 3g. Utilize team lifting for objects over 50lbs. 3g. Use mechanical lifting device for odd shaped objects.
4. Remove sample liner.	**4a. EXERTION:** Potential for muscle strain/injury while removing liner from probe rod. **4b. CONTACT:** Pinch points and cuts **4c. EXPOSURE:** Inhalation and/or dermal contact with contaminants.	4a Utilize team lifting for objects over 50lbs. 4a. Use hydraulic liner extruder if available. 4b. Place liner on sturdy surface when opening. 4b. Don cut-resistant gloves and use appropriate liner cutter when opening liners. 4b. Always cut away from the body. 4c. Wear chemical-resistant disposable gloves when handling liners. 4c. See 3e.
5. Decontaminate equipment.	**5a. EXPOSURE/CONTACT**: To contamination (e.g., Separate Phase Hydrocarbons (SPH), contaminated groundwater, vapors). **5b. EXPOSURE:** To chemicals in cleaning solution including ammonia.	5a. Wear chemical-resistant disposable gloves and safety glasses. 5a. Contain decontamination water so that it does not spill. 5a. Use an absorbent pad to clean spills, if necessary. 5a. Spray equipment from side angle, not straight on, to avoid backsplash. 5a. See 3b. 5b. See 4a. Review SDS to ensure appropriate precautions are taken and understood.

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JOB SAFETY ANALYSIS **Ctrl. No. GEN-007**	DATE 8/6/2018	☐ NEW ☒ REVISED	PAGE 1 of 2

JSA TYPE CATEGORY **GENERIC**	WORK TYPE **General Site Activity**	WORK ACTIVITY (Description) **Driving**

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
Valerie Sabatasso	Staff Scientist	Brian Hobbs	Corporate Health & Safety Manager

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST	☐ GOGGLES	☐ AIR PURIFYING RESPIRATOR	☒ GLOVES: Leather/ cut-resistant level 2
☒ HARD HAT: when outside vehicle	☐ FACE SHIELD	☐ SUPPLIED RESPIRATOR	☐ OTHER _____
☐ LIFELINE / BODY HARNESS	☒ HEARING PROTECTION	☒ PPE CLOTHING: high visibility vest, when outside vehicle	
☒ SAFETY GLASSES: when outside vehicle	☒ SAFETY TOE BOOTS: when outside vehicle		

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Motor Vehicle (i.e. car, truck, SUV)

COMMITMENT TO SAFETY- All personnel onsite will actively participate in hazard recognition and mitigation throughout the day by verbalizing SPSAs

EXCLUSION ZONE: A 10' minimum exclusion zone will be maintained around motor vehicles when operating.

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Driving to/leaving Site	**1a. CONTACT:** Severe injury/disability, property damage, monetary loss (insurance premiums, deductibles, loss of license/job) caused by collision with or struck by other vehicles, obstructions, pedestrians, animals, etc. *Common factors that may lead to CONTACT incident, but not limited to: • distracted driving (cell phone, GPS, radio, billboards, "rubber necking") • lack of situational awareness • unfamiliarity with traffic patterns/road layout • weather conditions (wet/icy roads, hydroplaning, black ice) • weariness • high speeds • obstructed vision (solar glare, debris on windshield, blind spots) • changes in travel pathway (construction, snow banks, non-operational signals, potholes, detours, special events) • improper vehicle maintenance (non-operational signal light, worn tires, cracked windshield, ineffective wipers) • loose or unsecure objects	1a. PLAN AHEAD – review/make yourself familiar with maps and driving directions before beginning the drive to the Site. Do not attempt to drive and review maps/directions at the same time. Pull over and stop your vehicle before looking at maps/directions. 1a. Complete a basic vehicle inspection before driving. Verify Inspection and Registration are current, tires and wipers are in good condition, all lights are functional, all glass/mirrors are undamaged, the horn is functional, roof/hood/trunk are free from accumulated snow and visibility is not impaired due to snow/ice/frost/fog on windows. 1a. Do not hang items in car that can obstruct your view or become projectiles in a collision. 1a. Do not get distracted using touch screen radios or GPS units built into newer models. Keep your eyes on the road and stay alert. 1a. Follow posted speed limits and obey traffic signals and roadway signs. 1a. Always wear your seat belt and shoulder harness when driving. 1a. When driving around large vehicles and trucks, maintain extra space as these vehicles may not be able to see a smaller car too close. 1a. Follow the "Rules of the Road" including: using your turn signals, coming to a complete stop, and allowing vehicles the right of way (yield) when they are when traffic laws require. 1a. Apply the Smith Five Keys® of safe driving • Aim High in Steering® - Expand eye lead time to a minimum of 15 seconds • Get the Big Picture® - Maintain proper a 4 second minimum following distance at all times - Scan mirrors every 5-8 seconds to achieve a circle of awareness - Position your vehicle so you can see relevant/non-relevant objects • Keep Your Eyes Moving® - Try to maintain about 180 degrees of visibility - Avoid blank and fixed stares. Avoid focusing on one object for more than 2 seconds • Leave Yourself an Out® - Avoid traveling in traffic clusters - Surround yourself with space - Anticipate the actions of others

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[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Driving to/leaving Site (cont'd)	**1a. CONTACT:** Severe injury/disability, property damage, monetary loss (insurance premiums, deductibles, loss of license/job) caused by collision with or struck by other vehicles, obstructions, pedestrians, animals, etc.	• Make Sure They See You® - Maintain eye contact with on-coming vehicles/pedestrians - Use warning devices (e.g., hand signals, high-lights, horns etc.) - Proper timing is essential 1a. Do not perform reconnaissance or inspections while driving. Your vehicle should be parked in a safe location when viewing or surveying the Site and vicinity 1a. Avoid sudden turns and stops. Don't drive recklessly – be in control of vehicle at all times. 1a. In inclement weather, first determine if work can be POSTPONED. Otherwise, plan according to weather conditions including checking forecast along entirety of travel route (especially, for long distances). Reduce speed as road conditions warrant. Travelling with winter car equipment, in the winter, is strongly recommended (i.e., shovel, scraper, brush, blanket, extra clothing, flashlight, bag of sand). If your vehicle has 4-wheel drive, review to operators manual and understand operating procedure prior to engaging 4-wheel drive. If at any point on your drive weather becomes too severe to proceed safely pull over if safe to do so or seek nearest cover (e.g., overpass) 1a. If feeling drowsy or sleepy, do not drive. Pull over in a safe place to rest if you experience any signs of drowsiness. Make sure to get adequate sleep the night before an early drive. 1a. Never operate a vehicle under the influence of alcohol or illegal substances or medications affecting your performance. 1a. Keep your eyes on the road. Do not call or talk on cellular phones. Pull over to a safe location if you must answer or make a call. (Legal requirement in: CA, CT, DE, D.C., HI, IL, LA*, MD, NV, NH*, NJ, NM, NY, OK*, OR, TX*, VT, WA, WV as of 01/20/15; per www.IIHS.org) * = Applicable to some drivers, situations or to be implemented in 2015 1a. When parking, pull-through when possible. If backing is required visually inspect area to ensure it is free from obstructions prior to backing in and relying solely on mirrors; use spotters when available.
2. Entering/Exiting Vehicle.	**2a. CAUGHT:** Personal injury (broken fingers/hand) while entering or exiting vehicles	2a. Open and close doors slowly. Never put hands or feet in between door and vehicle to avoid pinch points.
	2b. FALL: Personal injury (twisted ankle, deep contusion, concussion, broken wrist/arm, etc.) from slip/fall on uneven or unstable or slippery surface while exiting/entering vehicle	2b. When exiting the vehicle make sure your feet are on firm footing and weight is evenly distributed before exiting/standing. In inclement weather use hands to support yourself, by holding the car door and/or steering wheel, when exiting the vehicle.
	2c. CONTACT: Severe injury/disability, property damage, monetary loss (insurance premiums, deductibles, loss of license/job) caused by collision with or struck by other vehicles, obstructions, pedestrians, animals, etc.	2c. Check both directions for traffic before opening door. Do not exit vehicle if traffic does not permit you to exit safely 2c. Check anticipated path of door prior to opening, do not open door into any obstructions (e.g., bollards, high curbing)

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JOB SAFETY ANALYSIS	**Ctrl. No. GEN-009**	DATE: 7/10/2020	☐ NEW ☒ REVISED	PAGE 1 of 1

JSA TYPE CATEGORY **Generic**	WORK TYPE **O&M**	WORK ACTIVITY (Description) **Movement of 55-Gallon Drums/Drum Handling with Mobile Carrier**

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
Michael Sarni	Technician	Brian Hobbs	Corporate Health & Safety Manager

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST ☒ HARD HAT ☐ LIFELINE / BODY HARNESS ☒ SAFETY GLASSES	☐ GOGGLES ☐ FACE SHIELD ☐ HEARING PROTECTION ☒ SAFETY SHOES: Steel or composite toe	☐ AIR PURIFYING RESPIRATOR ☐ SUPPLIED RESPIRATOR ☒ PPE CLOTHING: Fluorescent long sleeve shirt or long sleeve shirt and reflective safety vest.	☒ GLOVES: Cut-resistant gloves ☐ OTHER:

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Mobile Drum Carrier, safety cones, and caution tape

COMMITMENT TO SAFETY- All personnel onsite will actively participate in hazard recognition and mitigation throughout the day by verbalizing SPSAs

EXCLUSION ZONE (EZ): Maintain Minimum Heavy Equipment Exclusion Zone around equipment (i.e. forklift) and loads while it is in motion. The HEEZ must be greater than the swing zone of any moving part of the equipment, tip zone of the equipment, fall zone of the equipment and contents, distance that debris may travel during demolition activities and/or foot print of a structure to be demolished.

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Preparing for and Inspection of Drum	**1a. FALL:** Tripping/falling due to uneven surface. Loose debris/garbage in work area.	1a. Clear area of loose garbage and debris. Inspect 55-gal drums for proper condition, labeling, check drum ring and bolts for tightness, inspect mobile drum carrier. 1a. Do a Test Lift to get a general sense of the weight of the drum. 1a. Inspect and use established pathways to avoid uneven terrain, weather-related hazards (i.e., debris, puddles, ice, etc.), and other obstructions. 1a. Secure work area and coordinate and communicate the planned work activities with other personnel working in the area. 1a. Delineate work area with 42" safety cones.
	1b. CONTACT/EXPOSURE: Drums could potentially be damaged or contain hazardous material. Mobile drum carrier could potentially be in poor working condition causing malfunctioning during operation.	1b. Prior to inspecting drums don cut-resistant gloves. If drum is not properly labeled, do not open and cease all drum transport activities. Immediately contact project manager and inform him/her of drum situation. 1b. Do not continue drum transport activities until further actions are determined by the project manager. 1b. If the drum is properly labeled, but leaking, improperly sealed or in poor condition, place drum in an over-pack drum. 1b. Inspect mobile drum carrier to ensure its overall integrity. Look for rust marks or potential weak points where the drum carrier could malfunction. Inspect the wheels to ensure that they easily turn and nothing is impeding their movement.
	1c. EXERTION/CAUGHT: Potential pinching/exertion hazards while securing ring/ tightening bolts	1c. Keep back straight and knees slightly bent while securing drum ring/tightening bolt. Wear cut-resistant gloves.

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2. Position drum clamp tightly in between drum ribs, securing drum clamp to drum with chain	**2a. CAUGHT:** Pinching fingers between drum clamp and handle/chain.	2a. Attach drum clamp with chain and tighten until snug. Do not place hands between drum clamp and drum as the chain is tightened; wear cut resistant gloves. Keep face away from drum when handling in case of escaping vapors.
Assess **[1]JOB STEPS**	**Analyze** **[2]POTENTIAL HAZARDS**	**Act** **[3]CRITICAL ACTIONS**
3. Disengage safety latches on handle, pull handle down until drum is lifted off ground and safety latches are reengaged; slightly suspending drum off the ground	**3a. EXERTION/ CONTACT:** Potential muscle strain associated with lifting/engaging drum/handle. Drum could shift/slip downward and crush toes. **3b. CAUGHT:** Fingers could be pinched while engaging/disengaging safety latches on handle	3a. Ascertain whether the drum is overweight; if it is, then two people are needed to lower handle while drum is secured with clamp so that safety latches can be engaged. Keep body out of the line of fire of the handle (do not position head above handle) as it is being pushed down. Do not allow feet/toes to be positioned under the drum as it is being lifted; wear steel/composite toe boots. 3b. Wear cut-resistant gloves while disengaging/reengaging safety latches. 3b. Avoid placing hands in pinch points.
4. Transport drums to designated location and disengage drum clamp (repeat Step 3 in reverse order)	**4a. FALL:** Tripping/ falling due to obstructions and uneven terrain. Potential for drum to fall during transport.	4a. Ensure transport path is free of potential obstructions that may cause the drum/carrier to become unstable. Position drum clamp between the ribs on the drum to prevent possible slipping.

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JOB SAFETY ANALYSIS Ctrl. No. GEN-013	DATE 7/10/2020	☐ NEW ☒ REVISED	PAGE 1 of 2

JSA TYPE CATEGORY **Generic**	WORK TYPE: **Gauging and Sampling**	WORK ACTIVITY (Description): **Gauging and Sampling**

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
Brandon Tufano	Staff Geologist	Brian Hobbs	Corporate Health & Safety Manager

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☒ LIFE VEST
☒ HARD HAT
☐ LIFELINE / BODY HARNESS
☒ SAFETY GLASSES

☐ GOGGLES
☐ FACE SHIELD
☐ HEARING PROTECTION
☒ SAFETY SHOES: Composite-toe or steel toe boots

☐ AIR PURIFYING RESPIRATOR
☐ SUPPLIED RESPIRATOR
☒ PPE CLOTHING: Fluorescent reflective vest or high visibility clothing

☒ GLOVES: Leather, Nitrile and cut resistant
☒ OTHER: Knee pads, Insect Repellant, sunscreen (as needed)

REQUIRED AND / OR RECOMMENDED EQUIPMENT

42-inch Safety Cones, Caution Tape, Interface Probe and/or Water Level Meter, 20-lb., Type ABC Fire Extinguisher, Buckets. Tools as needed: Socket Wrench, Screw Driver, Crow Bar, Mallet, and Wire Brush.

COMMITMENT TO SAFETY- All personnel onsite will actively participate in hazard recognition and mitigation throughout the day by verbalizing SPSAs

Assess ¹JOB STEPS	Analyze ²POTENTIAL HAZARDS	Act ³CRITICAL ACTIONS
1. Mobilization to monitoring well(s).	**1a. FALL:** Personal injury from slip/trip/fall due to uneven terrain and/or obstructions.	1a. Inspect pathway and plan for most suitable designated pathway prior to mobilization. 1a. Use established pathways, walk and/or drive on stable, secure ground and avoid steep hills or uneven terrain. 1a. If working near open water with an unguarded edge, wear life vest.
	1b. CONTACT: With traffic/third parties.	1b. Identify potential traffic sources and delineate work area with 42-inch traffic safety cones. Position vehicle to protect against oncoming traffic. Use caution tape to provide a more visible delineation of the work area if necessary. 1b. Wear appropriate PPE including high visibility clothing or reflective vest. 1b. Face traffic, maintain eye contact with oncoming vehicles, and establish a safe exit route.
	1c. EXERTION: Muscle strain from lifting equipment	1c. Use proper lifting techniques when handling/moving equipment; bend knees and keep back straight. 4c. Use mechanical assistance or team lifting techniques when equipment is 50 lbs. or heavier. 4c. Make multiple trips to carry equipment.
	1d. EXPOSURE: To biological hazards.	1d. Inspect work area for bees and insects. 1d. Use insect/tick repellent as necessary.
2. Open/close well.	**2a. EXERTION:** Muscle strain.	2a. Use proper lifting techniques; keep back straight, lift with legs and bend knees when reaching to open/close well.
	2b. CAUGHT: Pinch/crush points associated with removing/replacing manholes and working with hand tools.	2b. Wear leather gloves or cut resistant gloves when working with well cover and hand tools. 2b. Use proper tools (ratchet and pry bar for well cover) and inspect before use. 2b. Do not put fingers under well cover.
	2c. CAUGHT: Pinch points associated with placing J-plug back onto PVC pipe.	2c. See 2b. 2c. Keep fingers out of line-of-fire when securing cap.
	2d. EXPOSURE: To potential hazardous vapors.	2d. No open flames/heat sources. 2d. To minimize exposure to vapors, allow well to vent after opening it and before sampling activities begin. 2d. Stand up-wind, if possible, to avoid inhaling vapors.
3. Gauge well.	**3a. CONTACT:** With contamination (e.g. contaminated groundwater).	3a. Wear chemical-resistant disposable gloves (over cut-resistant gloves) and safety glasses when gauging well. 3a. Insert and remove probe slowly to avoid splashing. 3a. Use an absorbent pad to clean probe.
	3b. CONTACT: With traffic.	3b. See 1b.

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Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
4. Purge and sample well	**4a. EXPOSURE/CONTACT:** To contamination (e.g., SPH, contaminated groundwater, vapors) and/or sample preservatives.	4a. Open and fill sample jars slowly to avoid splashing and contact with preservatives. 4a. Wear cut-resistant gloves and chemical-resistant disposable gloves when sampling. 4a. Fill sample containers over purge container to avoid spilling water onto the ground. 4a. Use an absorbent pad to clean spills. 4a. When using a bailer to purge a well, pull the bailer slowly from the well to avoid splash hazards. 4a. When sampling or purging the water using a bailer, pour out water slowly to reduce the potential for splash hazards with groundwater. 4a. When using a tubing valve always remove the valve slowly after sample collection to release any pressure and avoid pressurized splash hazards. 4a. When collecting a groundwater sample always point sampling apparatus (tubing, bailer, etc.) away from face and body.
	4b. CONTACT: Personal injury from cuts, abrasions, or punctures by glassware or sharp objects.	4b. To avoid spills or breakage, place sample ware on even surface. 4b. Do not over tighten caps on glass sample ware. 4b. Wear chemical-resistant nitrile disposable gloves over cut-resistant (i.e., Kevlar) gloves when sampling and handling glassware (i.e., VOA vials) or when using cutting tools.
	4c. EXERTION: Muscle strain while carrying equipment.	4c. Use proper lifting techniques when handling/moving equipment, bend knees and keep back straight. 4c. Use mechanical assistance or team lifting techniques when equipment is 50 lbs. or heavier. 4c. Make multiple trips to carry equipment.
	4d. CONTACT: With traffic.	4d. See 1b.
	4e. CONTACT: Pinch points with groundwater pump components (i.e., wheel, line, clamps).	4e. Wear leather gloves when working with groundwater pumps. 4e. Never place hands on or near pinch points such as the wheel, clamps or other moving parts during pump operations. 4e. Use the correct mechanisms, such as a pump reel, to lower pump into well. 4e. Never attempt to manually stop any moving part of equipment including hose reels and/or tubing.
	4f. EXERTION: Muscle strain from repetitive motion of bailing and sampling a well.	4f. See 4c. 4f. Include a stretch break when repetitive motions are part of the task.
5. Management of purge water.	**5a. EXPOSURE/CONTACT:** To contamination (e.g., SPH, contaminated groundwater, vapors).	5a. Do not overfill container and pour liquids slowly so that they do not splash. 5a. Properly dispose of used materials/PPE in appropriate container in designated storage area.
	5b. EXERTION: Muscle strain from lifting/carrying and moving containers.	5b. Use proper lifting techniques when lifting / carrying or moving container(s) (see 4c.). 5b. Do not overfill container(s).
6. Decontaminate equipment.	**6a. EXPOSURE/CONTACT:** To contamination (e.g., SPH, contaminated groundwater, vapors).	6a. Work on the upwind side, where possible, of decon area. 6a. Wear chemical-resistant disposable gloves and safety glasses. 6a. Use an absorbent pad to clean spills.
	6b. CAUGHT: Pinch points associated with handling hand tools	6b. See 2b. 6b. Inspect hand tools for sharp edges before decontaminating.

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JOB SAFETY ANALYSIS **Ctrl. No. GEN-014**	DATE: 7/10/2020	☐ NEW ☒ REVISED	PAGE 1 of 2

JSA TYPE CATEGORY: **Generic**	WORK TYPE: **Drilling**	WORK ACTIVITY (Description): **Hollow Stem Auger Soil Borings / Well Installation**

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
Douglas Ferraiolo	Staff Geologist	Brian Hobbs	Corporate Health & Safety Manager

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST ☒ HARD HAT ☐ LIFELINE / BODY HARNESS ☒ SAFETY GLASSES	☒ GOGGLES: Spoggles required if winds exceed 15 mph. ☐ FACE SHIELD ☒ HEARING PROTECTION: (as needed). ☒ SAFETY SHOES: Steel or Composite Toe.	☐ AIR PURIFYING RESPIRATOR ☐ SUPPLIED RESPIRATOR ☒ PPE CLOTHING: Fluorescent long-sleeve shirt or long-sleeve shirt and reflective safety vest.	☒ GLOVES: Leather, Cut-Resistant, and Nitrile. ☒ OTHER: Insect Repellant, Sunscreen (as needed).

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Truck-Mounted Drilling Rig or Track Rig, Saw, Hand Tools, Photoionization Detector, Multi-Gas Meter (or equivalent), Interface Probe, 20 lb. Type ABC Fire Extinguisher, 42" Cones & Flags, "Work Area" Signs.

COMMITMENT TO SAFETY- All personnel onsite will actively participate in hazard recognition and mitigation throughout the day by verbalizing SPSAs

EXCLUSION ZONE (EZ): Maintain Minimum Heavy Equipment Exclusion Zone around equipment and loads while it is in motion. The HEEZ must be greater than the swing zone of any moving part of the equipment, tip zone of the equipment, fall zone of the equipment and contents, distance that debris may travel during demolition activities and/or foot print of a structure to be demolished.

"SHOW ME YOUR HANDS"
Driller and helper should show that hands are clear from controls and moving parts

Assess **¹JOB STEPS**	**Analyze** **²POTENTIAL HAZARDS**	**Act** **³CRITICAL ACTIONS**
1. Mobilization / demobilization and establish a work area.	**1a. See Mobilization/ Demobilization JSA GEN-015.**	1a. See Mobilization / Demobilization JSA GEN-015.
2. Raising tower / derrick of drilling rig.	**2a. CONTACT:** Overhead hazards. **2b. CONTACT:** Amputation / crush points when raising the rig and instability of rig.	2a. Prior to raising the tower / derrick, the area above the drilling rig will be inspected for overhead hazards (wires, tree limbs, piping or other structures) that may be contacted by the rig's tower or drilling rods. 2a. The tower / derrick must not be raised beneath overhead power lines unless approved by the Roux PM. 2a. Maintain a minimum of 10' from all overhead structures. 2a. Do not move the rig while the tower / derrick is raised. 2b. Inspect the equipment prior to use and avoid any potential amputation points. 2b. Lower outriggers to ensure stability prior to raising rig tower derrick. Keep feet and body out of the line of fire when lowering out-riggers. 2b. Inspect the set-up location for uneven terrain. Level or avoid area if needed. 2b. If the rig needs to be mounted, be sure to use three points of contact.
3. Advancement of augers for soil boring installation.	**3a. CONTACT:** Equipment imbalance during advancement of drill equipment. **3b. CONTACT:** Flying / spraying debris. **3c. CAUGHT:** Limb/extremity amputation, abrasion, and crushing.	3a. Drillers will advance the borehole with caution to avoid causing the rig to become imbalanced and / or tip. 3a. The blocking and leveling devices used to secure the rig will be inspected by drillers and Roux personnel regularly to see if shifting has occurred. **3a. Drillers will maintain the "Purple Zone" policy surrounding augers to ensure no personnel come into contact with augers while in use. Workers will spray paint a 3' semi-circle surrounding the augers to visually show that no personnel should enter the "Purple Zone" while drilling activities are being conducted.** 3a. In addition, personnel and equipment that are non-essential to the advancement of the borehole will be positioned away from the rig at a distance that is at least as far as the boom is high (minimum exclusion zone of 20 feet). 3b. Wear all required PPE (especially hand, eye, and ear protection). 3b. Maintain minimum EZ distance (i.e. swing/tip radius of rig) when rig is in operation to avoid potential line of fire hazards from flying materials or debris. 3c. Inspect the equipment prior to use for potential pinch points. 3c. Test all emergency shutdown devices prior to drilling. 3c. Inspect drill head for worn surface or missing teeth; replace if damaged or blunt. 3c. Inspect augers, do not use if auger flight is damaged or bent.

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Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
3. Advancement of augers for soil boring installation (Continued).		3c. Ensure all jewelry is removed, loose clothing is secured, and PPE is secured close to the body. 3c. All non-essential personnel should stay away from the immediate work area; position body out of the line-of-fire of equipment particularly when installing auger flights and steel override casings. 3c. Drillers and helpers will understand and use the “Show Me Your Hands” Policy. 3c. Spinning augers should have an exclusion zone of 20 feet when in operation.
	3d. **FALL:** Slip/trip/fall hazards.	3d. Inspect walking path for uneven terrain, weather-related hazards (i.e., ice, puddles, snow, etc.), and obstructions prior to mobilizing equipment. 3d. Do not climb over stored materials/equipment; walk around. Practice good housekeeping. 3d. Use established pathways and walk on stable, secure ground. 3d. Use three points of contact when mounting or dismounting the rig. 3d. Remove soil cuttings to avoid a tripping hazard from developing near augers.
	3e. **EXPOSURE:** Inhalation of contamination / vapors.	3e. Air monitoring using a calibrated photoionization detector (PID) to periodically monitor the breathing zone of the work area. 3e. The Action Level for breathing zone air is five parts per million (sustained) as detected by the PID. 3e. If a reading of >5ppm is recorded, the Roux field personnel must temporarily cease work, instruct all Site personnel to step away from the area of elevated readings and inform the Roux PM of the condition. The Roux PM will then recommend additional appropriate precautions in accordance with the site specific health and safety plan.
	3f. **EXPOSURE:** Noise and dust.	3f. Wet borehole area with sprayer to minimize dust. Stand upwind and keep body positioned away from rig. 3f. Wear hearing protection while drill rig is operating and / or the noise levels exceed 85 dBA.
	3g. **EXERTION:** Installing well casings and lifting augers.	3g. Keep back straight and bend at the knees. 3g. Utilize team lifting for objects over 50lbs. 3g. Use mechanical lifting device for odd shaped objects.
4. Installation of well materials.	**4a. CONTACT:** Installing well materials while also pulling up augers.	4a. Potential contact with augers during installation of well materials. 4a. Keep distance from augers and do not place any materials while augers are in motion.
	4b. CAUGHT: Possible pinch or crush hazard assembling PVC and sending down the borehole.	4b. Keep all body parts out of potential pinch points while placing PVC together and sending down borehole.
	4c. FALL: Slip/trip/fall hazards with hand tools and materials.	4c. See 3d.
	4d. EXPOSURE: Potential contamination, harmful vapors, dust, and / or noise.	4d. See 3e and 3f. 4d. Stand upwind to avoid exposure to dust generated from packing materials.
	4e. EXERTION: Lifting heavy bags of materials to backfill borehole.	4e. Ergonomic hazard lifting bags of sand and bentonite while packing the well.
5. Cleaning the auger flights	**5a. CONTACT:** Cuts/scrapes or puncture wound from contacting auger.	5a. Follow “Show Me Your Hands” Procedure and make sure auger is out of gear before contacting auger with tool or hand. 5a. Pull cleaning tool across your body with handle away from body; do not push toward the auger. 5a. Do not clean more than ¾ turn around the auger at a time. 5a. Wear cut resistant and leather gloves. 5a. Always use two hands to operate cleaning tool. 5a. Inspect tool before use and remove from service if handle or metal are cracked/fatigued. 5a. Stand out of the line of fire.
6. Decontaminate equipment.	**6a. EXPOSURE / CONTACT:** To contamination (e.g., contaminated groundwater, vapors).	6a. Wear chemical-resistant disposable gloves and safety glasses. 6a. Contain decontamination water so that it does not spill. 6a. Use an absorbent pad to clean spills, if necessary.
	6b. EXPOSURE: To chemicals in cleaning solution (including ammonia).	6b. See 3e. Wear all appropriate PPE and stand upwind of any exposed cleaning solutions.

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JOB SAFETY ANALYSIS	**Ctrl. No. GEN-015**	DATE: 8/6/2018	☐NEW ☒REVISED	PAGE 1 of 2

JSA TYPE CATEGORY **GENERIC**	WORK TYPE **Site Recon**	WORK ACTIVITY (Description) **Mobilization/Demobilization**

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
Rebecca Lowy	Staff Assistant Geologist	Brian Hobbs	Corporate Health & Safety Manager
Tally Sodre	OHSM		

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

- ☐ LIFE VEST
- ☒ HARD HAT
- ☐ LIFELINE / BODY HARNESS
- ☒ SAFETY GLASSES

- ☐ GOGGLES
- ☐ FACE SHIELD
- ☒ HEARING PROTECTION (as needed)
- ☒ SAFETY SHOES: Steel Toe or composite toe

- ☐ AIR PURIFYING RESPIRATOR
- ☐ SUPPLIED RESPIRATOR
- ☒ PPE CLOTHING: Fluorescent reflective vest of high-visibility clothing; long sleeve shirt; long pants

- ☒ GLOVES: Leather, nitrile, and cut resistant (as needed)
- ☐ OTHER

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Required Equipment: Varies

COMMITMENT TO SAFETY- All personnel onsite will actively participate in hazard recognition and mitigation throughout the day by verbalizing SPSAs

EXCLUSION ZONE (EZ): A 10-foot exclusion zone will be maintained around equipment in use..

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Mobilize/demobilize and establish work area	**1a. FALL:** Slip/trips/falls from obstructions, uneven terrain, weather conditions, heavy loads, and/or poor housekeeping.	1a. Use 3 points-of-contact/ensure secure footing when entering and exiting vehicle. 1a. Inspect walking path for uneven terrain, steep hills, obstructions, and/or weather-related hazards (i.e., ice, snow, and puddles) prior to mobilizing equipment. Use established pathways. Walk on stable/secure ground. 1a. Do not climb over stored materials/equipment; walk around. Practice good housekeeping; organize and store equipment neatly in one area at its lowest potential energy. 1a. Wear boots with adequate treads. 1a. Delineate unsafe areas with 42” cones, caution tape and/or flagging.
	1b. CONTACT: Personal injury and/or property damage caused by being struck by Site traffic or equipment used in Site activities.	1b. Observe and maintain the posted speed limits. 1b. When first arriving onsite, park vehicles in designated parking space and/or out of the way locations. Use parking brake on all vehicles and tire chocks on work trucks and trailers. 1b. Check in with Site Manager/Supervisor to ensure coordination with other Site activities and to discuss any special hazards. Ensure that short-service employees (SSE) are identified. 1b. Identify potential traffic sources. 1b. Wear PPE including high visibility clothing or reflective vest. 1b. Use a spotter while moving work vehicles; plan ahead to avoid backing whenever possible. 1b. Maintain a minimum 10’ exclusion zone when vehicles are in motion. When backing up truck rig with an attached trailer use a second spotter if there is tight clearance simultaneously on multiple sides of the equipment or if turning angles limit driver-to-spotter visibility. 1b. Delineate work area with 42” cones, flags, caution tape, and/or other barriers. 1b. Position “Work Area” signs at Site entrances, if possible, or at either side of work area.

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Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
		1b. Position largest vehicle to protect against oncoming traffic. 1b. Face traffic, maintain eye contact with oncoming vehicles, use a spotter, and establish a safe exit route. 1b. Observe potential overhead and ground surface features that may interfere with moving equipment. Clear the path of physical hazards prior to initiating mobilization.
	1c. CAUGHT: Personal injury from pinch points and being in line-of-fire of vehicle and/or equipment.	1c. Make sure driver has engaged parking brake and placed wheel chocks in a position to prevent movement. Be sure that vehicle is parked in front/down gradient (positioned to best block oncoming traffic) of work area. 1c. Wear leather gloves when handling any tools or equipment. Wear cut-resistant gloves (Kevlar or similar) when handling sharp objects/cutting tools/glass. 1c. Keep body parts away from line-of-fire of equipment. 1c. Always carry tools by the handles and/or designated carrier. Ensure sharp-edged tools are sheathed/secure. 1c. Remove any loose jewelry. Avoid wearing loose clothing and/or ensure loose clothing is secure. 1c. Secure all items on the equipment, tighten up any items or features that have potential to shift or break during mobilization.
	1d. OVEREXERTION: Muscle strains while lifting/carrying equipment.	1d. Use body positioning and lifting techniques that avoid muscle strain; keep back straight, lift with legs, turn with whole body, keep load close to body, and never reach with a load. 1d. Ensure that loads are balanced. Use assistance (mechanical or additional person) to carry equipment that is either unwieldy or over 50 lbs.
	1e. EXPOSURE: Personal injury from exposure to biological and environmental hazards.	1e. Inspect area to avoid contact with biological hazards (i.e. poisonous plants, stinging insects, ticks, etc.). 1e. Wear long sleeved clothes treated with Permethrin, apply insect repellant containing DEET to exposed skin, and inspect clothes and skin for ticks during and after work. 1e. Apply sunscreen (SPF 15+) if exposure to sun for 30 minutes or more is expected.
	1f. EXPOSURE: Weather related injuries.	1f. Watch for heat stress symptoms (muscle cramping, exhaustion, dizziness, nausea, rapid and shallow breathing). Take breaks in cool places and hydrate as needed. 1f. Watch for cold stress symptoms (severe shivering, slowing of body movement, weakness, stumbling or inability to walk, collapse). Take breaks in warm areas as needed. 1f. Wear clothing appropriate for weather and temperature conditions (e.g., rain jackets, snow pants, multiple layers). 1f. If lightning is observed, wait 30 minutes in a sheltered location (car is acceptable) before resuming work.
	1g. EXPOSURE: Personal injury from noise hazards.	1g. Wear hearing protection if sound levels exceed 85 dBA (if you must raise your voice for normal conversation).

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JOB SAFETY ANALYSIS	**Ctrl. No. GEN-019**	DATE: 8/6/2018	☐NEW ☒REVISED	PAGE 1 of 2

JSA TYPE CATEGORY **GENERIC**	WORK TYPE **Site Recon**	WORK ACTIVITY (Description) **Site Walk and Inspection**

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
Sara Barrientos	Staff Geologist	Brian Hobbs	Corporate Health and Safety Manager
		Joe Duminuco	Vice President

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST ☒ HARD HAT ☐ LIFELINE / BODY HARNESS ☒ SAFETY GLASSES	☐ GOGGLES ☐ FACE SHIELD ☒ HEARING PROTECTION: ear plugs as necessary ☒ SAFETY SHOES: Steel or composite toed	☐ AIR PURIFYING RESPIRATOR ☐ SUPPLIED RESPIRATOR ☒ PPE CLOTHING: High-visibility vest or high-vis outerwear	☒ GLOVES: Leather/cut-resistant/chemical resistant ☒ OTHER: Tyvek and rubber boots as necessary, dust mask as necessary

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Required Equipment: Site map, emergency contact list, documentation of urgent care/hospital routes and / or guide familiar with Site, operating cell phone or walkie-talkie if Site allows.

Commitment to Safety – All personnel onsite will actively participate in SPSA performance by verbalizing SPSAs throughout the day.

EXCLUSION ZONE (EZ): A minimum 10’ exclusion zone will be maintained around equipment.

SITE SECURITY: Prior to site inspection verify appropriate method to address Site Security concerns as it relates to potential criminal activity, homeless population, and/or isolation concerns. Work with the Project Principal and/or Project Manager to address appropriately.

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Check in with Site contact.	1a. **CONTACT/EXPOSURE/FALL:** Personal injury caused by lack of site specific hazards.	1a. Inquire about hazards and other activities taking place at the Site. 1a. Inform Site contact of work scope, timeline and location(s). 1a. Discuss emergency evacuation procedures and muster points with Site contact.
2. Traversing the Site	2a. **CONTACT:** Property damage and personal injury caused by obstructions/vehicles or unauthorized personnel at remote Sites.	2a. All equipment must be stowed and secured prior to moving. 2a. Maintain speed limit as posted on-site. 2a. When possible drive on established roadways. 2a. Yield to all pedestrians. 2a. Use pull-through spots or back into parking spots. 2a. Don high visibility clothing/safety vest. If working at remote Site, add orange accessories during hunting season.
	2b. **FALL:** Uneven terrain and weather conditions. Overgrown shrubs and vines. Equipment in the work zone.	2b. Inspect walking path for uneven terrain, weather-related hazards (i.e., ice, puddles, snow, etc.), and obstructions prior to mobilizing equipment. 2b. When possible, use established pathways and walk on stable, secure ground. 2b. Communicate traversing hazards with others.
	2c. **OVEREXERTION:** Muscle strain while carrying equipment.	2c. When carrying equipment to/from work area, use proper lifting techniques; keep back straight, lift with legs, keep load close to body, never reach with a load. Ensure that loads are balanced to reduce the potential for muscle strain. Use mechanical assistance or make multiple trips to carry equipment.
	2d. **EXPOSURE:** Biological hazards – ticks; bees/wasps; poison ivy; insects; (Ticks are most active any time the temperature is above freezing, typically from March to November.)	2d. Inspect area to avoid contact with biological hazards. 2d. Ticks: • Treat outer clothing including pants, shirts, socks, boots and hats the evening before with Permethrin (allowing at least two hours before use). • Apply DEET to exposed skin before travelling to the Site and reapply after two hours. • Check for ticks during and after work. 2d. Bees: • Use bee spray as appropriate to deter/eliminate bees. • Protect exposed skin with insect repellent. 2d. Poison Ivy: • Identify areas of poison ivy and spray with weed killer. Don Tyvek and rubber boots while traversing poison ivy areas.

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	2e. EXPOSURE: Heat Stress & Cold Stress. Personal injury from working in inclement weather conditions.	• If skin contacts poison ivy, wash skin thoroughly with soap and water. 2e. Wear sunscreen with SPF 15 or greater on exposed skin whenever 30 minutes or more of sun exposure is expected. 2e. Watch for heat stress symptoms (muscle cramping, exhaustion, dizziness, rapid and shallow breathing). Take breaks as needed. 2e. Watch for cold stress symptoms (severe shivering, slowing of body movement, weakness, stumbling or inability to walk, collapse). Take breaks as needed. 2e. Wear appropriate rain gear as needed. 2e. Take frequent breaks if tired, wet, or cold/hot. Drink water. 2e. If lightning is observed, wait 30 minutes after last thunder boom/lightning bolt in a sheltered location (car acceptable) before starting work again.
3. Walking near heavy equipment and machinery.	**3a. CONTACT:** Personal injury from Site and roadway traffic. Personal injury from flying debris **3b. OVEREXERTION:** Personal injury from lifting/moving/rotating equipment. **3c. EXPOSURE:** Hearing damage from noise generating equipment/processes. Inhalation/exposure to hazardous vapors and or dust. **3d. EXPOSURE:** Working in a remote area.	3a. See 2a. 3a. Maintain an exclusion zone of at least 10'-25' feet from all engaged equipment. 3a. Keep body parts out of the line of fire of pinch points. 3a. Wear appropriate PPE always. 3b. See 2c. 3c. Wear hearing protection if >85 dBA. (i.e. noise levels which require you to raise your voice to communicate) 3c. Always wear leather gloves when handling any tools or equipment. 3c. Always wear appropriate PPE based off chemicals present. 3d. Use the "buddy system" whenever possible. If working alone, contact PM upon arrival/departure, as well as during work activities prior to commencing work if applicable. 3d. Always carry a communication (i.e., cell phone, walkie-talkie) or directional (i.e., map, compass, etc.) device when traversing remote areas.
4. Working in adverse weather conditions.	**4a. EXPOSURE:** Heat Stress & Cold Stress. Personal injury from working in inclement weather conditions.	4a. Watch for heat stress symptoms (muscle cramping, exhaustion, dizziness, rapid and shallow breathing). Take breaks as needed. 4a. Watch for cold stress symptoms (severe shivering, slowing of body movement, weakness, stumbling or inability to walk, collapse). Take breaks as needed. 4a. Wear appropriate rain gear as needed. 4a. Take frequent breaks if tired, wet, or cold/hot. Drink water. 4a. If lightning is observed, wait 30 minutes after last thunder boom/lightning bolt in a sheltered location (car acceptable) before starting work again.
5. Departing Site.	**5a. EXPOSURE:** Exposure to unnecessary hazards should personnel believe Roux is on-Site during an emergency and conduct a search.	5a. Sign out or notify Site contact and Roux Project Manager of your departure.

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JOB SAFETYANALYSIS **Ctrl. No. GEN-020**	DATE: 8/6/2018	☐NEW ☒REVISED	PAGE 1 of 2

JSA TYPE CATEGORY: **GENERIC**	WORK TYPE: **Gauging & Sampling**	WORK ACTIVITY (Description): **Soil Sampling**

DEVELOPMENT TEAM	**POSITION / TITLE**	**REVIEWED BY:**	**POSITION / TITLE**
MaryBeth Lyons	Project Scientist	Brian Hobbs	Corporate Health and Safety Manager

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST
☒ HARD HAT
☐ LIFELINE / BODY HARNESS
☒ SAFETY GLASSES
☒ FLAME RESISTANT CLOTHING (as needed)

☐ GOGGLES
☐ FACE SHIELD:
☒ HEARING PROTECTION: (as needed)
☒ SAFETY SHOES: Composite-toe or steel toe boots

☐ AIR PURIFYING RESPIRATOR
☐ SUPPLIED RESPIRATOR
☒ PPE CLOTHING: Fluorescent reflective vest or high visibility clothing

☒ GLOVES: Leather, Nitrile and cut resistant
☒ OTHER: Insect repellant, sunscreen (as needed)

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Recommended Equipment: 42” traffic cones, caution tape, trowel

COMMITMENT TO SAFETY- All personnel onsite will actively participate in hazard recognition and mitigation throughout the day by verbalizing SPSAs.

EXCLUSION ZONE (EZ): A 10-foot exclusion zone will be maintained around moving equipment, if present.

Assess **¹JOB STEPS**	**Analyze** **²POTENTIAL HAZARDS**	**Act** **³CRITICAL ACTIONS**
1. Secure location	**1a. CONTACT:** Personnel and vehicular traffic may enter the work area.	1a. If in an area with foot or vehicle traffic, delineate the work area with 42” traffic cones and/or caution tape to prevent exposure to traffic and inform others of work activity. 1a. Wear reflective vest and/or high visibility clothing. 1a. Face the direction of any vehicular traffic. Position vehicle to protect worker from traffic. 1a. Communicate work activity with adjacent work areas.
	1b. FALL: Tripping/falling due to uneven terrain or entry/exit from excavations.	1b. Inspect pathways and work area for uneven terrain, weather-related hazards (i.e., ice, puddles, snow, etc.), and obstructions. 1b. Use established pathways and walk on stable, secure ground. 1b. Stage equipment and tools in a convenient, stable, and orderly manner. Store equipment at lowest potential energy. 1b. Roux employees should stay 5 feet from in-progress excavations and trenches. Should entry to an excavation be required (when stabilization is complete), ladders must be employed for steep embankments, excavations, pits, and trenches.
	1c. EXPOSURE: Exposure to sun and excessive heat, possibly causing sunburn, heat exhaustion or heat stroke. Exposure to cold temperatures possibly causing cold stress. Skin burn as a result of fire, if applicable. Exposure to explosive vapors due to tank farm operations. Exposure to airborne dust due to high wind speeds. Biological hazards - ticks, bees/wasps, poison ivy, thorns, insects, etc.	1c. Wear sunscreen with an SPF 15 or greater whenever 30 minutes or more of exposure is expected. 1c. Use a tent to shade the work area from direct sunlight particularly when warm temperatures are expected. 1c. Be aware of the location of all Site personnel. 1c. Watch for heat stress symptoms (muscle cramping, exhaustion, dizziness, rapid and shallow breathing). 1c. Watch for cold stress symptoms (severe shivering, slowing of body movement, weakness, stumbling or inability to walk, collapse). 1c. Take breaks for rest and water as necessary. Move to an area that is well shaded or a climate controlled area (i.e., car, site trailer, etc.). 1c. No open flames/heat sources. 1c. Flame retardant clothing must be worn when specified by Site policy. 1c. Cell phones should be disabled when specified by Site policy. 1c. Pre-treat field clothing with Permethrin prior to site visit to kill ticks and insects. 1c. Wear long sleeved shirts and tuck in (or tape) pant legs into socks or boots to prevent ticks from reaching skin. 1c. Spray insect repellant containing DEET on exposed skin when working in overgrown areas of the Site. 1c. Inspect area to avoid contact with biological hazards. 1c. Wear cut-resistant gloves when handling branches, shrubs, etc. that may lie within the walking path. 1c. Wear spoggles if the average wind speeds are above 15 mph. 1c. Personnel shall examine themselves and co-worker’s outer clothing for ticks periodically when onsite. 1c. If skin comes in contact with poison ivy, wash skin thoroughly with soap and water. If rash persists after washing, immediately notify your supervisor, the OM and OHSM for possible consultation with a physician at an approved Occupational Health Clinic.

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[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
2. Collect Soil Sample	**2a. CONTACT:** Personal injury from pinch points, cuts, and abrasions from sampling equipment tools, and material within soil sample. Personal injury from contact with moving equipment while sampling. Personal injury from contact with glass sample jars.	2a. Wear cut-resistant (i.e., Kevlar) gloves under chemical-resistant (nitrile) disposable gloves when handling soil samples and sampling jars. 2a. Where possible, use trowel or equivalent tool to avoid contact with soil. 2a. If sampling from bucket of heavy equipment, ensure all equipment is off and operator utilizes the “show me your hands” policy. 2a. See 1a.
	2b. EXPOSURE: Exposure to contamination (impacted soil) and/or lab preservatives.	2b. Wear chemical-resistant (nitrile) disposable gloves over cut resistant gloves to protect hands when handling samples; use containment material or plastic sheeting to protect surrounding areas. 2b. Wear safety glasses to protect eyes from dust or air-borne contaminants that may results from disturbing the soil. 2b. Where possible, remain upgradient from sample location if collecting soil sample from stockpile, drill rig, etc. to avoid breathing contaminant vapors, if they are present. 2b. When collecting soil sample from hand auger, put large zip lock bag over entire auger to prevent spillage of soil on to the ground. 2b. Open sample jars slowly and fill carefully to avoid contact with preservatives.
	2c. EXERTION: Exertion due to repetitive motion and ergonomics.	2c. Utilize a table or raised surface for soil sampling if multiple soil samples are going to be taken to minimize repetitive bending motion.
3. Decontaminate equipment	**3a. EXPOSURE/CONTACT:** Contamination (e.g., Separate Phase Hydrocarbons (SPH), contaminated vapors and/or soil).	3a. Wear chemical-resistant (nitrile) disposable gloves and safety glasses. 3a. Use an absorbent pad to clean spills. 3a. Properly dispose of used materials/PPE in provided drums in designated drum storage area. 3a. Remain upwind of sample and avoid breathing contaminant vapors, if they are present.
	3b. EXPOSURE: Chemicals in cleaning solution including ammonia.	3b. Wear chemical-resistant (nitrile) disposable gloves and safety glasses. 3b. Work on the upwind side of decontamination area. 3b. Use an absorbent pad to clean spills. 3b. Properly dispose of used materials/PPE in provided drums in designated drum storage area. Ensure that all drums are properly labeled and secured.

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JOB SAFETY ANALYSIS **Ctrl. No. GEN-021**	DATE: 7/10/2020	☐ NEW ☒ REVISED	PAGE 1 of 2

JSA TYPE CATEGORY: **GENERIC**	WORK TYPE **Gauging and Sampling**	WORK ACTIVITY (Description) **Soil Vapor Sampling (Permanent Monitoring Points)**

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
Jeff Wills	Senior Hydrogeologist	Brian Hobbs	Corporate Health and Safety Manager

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST ☒ HARD HAT ☐ LIFELINE / BODY HARNESS ☒ SAFETY GLASSES	☐ GOGGLES ☐ FACE SHIELD ☐ HEARING PROTECTION ☒ SAFETY SHOES: Steel-toe boots	☐ AIR PURIFYING RESPIRATOR ☐ SUPPLIED RESPIRATOR ☒ PPE CLOTHING: Fluorescent reflective vest or high visibility clothing	☒ GLOVES: Cut-resistant & Nitriles ☒ OTHER: Bug Spray, Sun Screen, Knee Pads or kneeling pad

REQUIRED AND / OR RECOMMENDED EQUIPMENT

9/16” Socket and Wrench, Non-Toxic Clay, Teflon-Lined Tubing, Masterflex Tubing, Air Pump with Low Flow, Dry Cal, Enclosure (Bucket with 2 holes), Helium Gas Canister, Summa Canisters and Flow Controllers, MultiRae Photo Ionization Detector (PID), Helium Detector, Tubing Cutter, 42-inch Safety Cones, Caution Tape or Retractable Cone Bars

COMMITMENT TO SAFETY- All personnel onsite will actively participate in hazard recognition and mitigation throughout the day by verbalizing SPSAs.

Work Zone (WZ): A 5-foot exclusion zone will be maintained for non-essential personnel.

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Define and secure work area.	**1a. FALL:** Potential tripping hazards. **1b. CONTACT:** Potential contact with moving vehicles or pedestrians. **1c. EXERTION:** Muscle strain while lifting and carrying equipment.	1a. Ensure work area is secure and inform others (third party) of work activity. 1a. Remove tripping hazards and inspect walking path for uneven terrain, weather-related hazards (i.e., ice, puddles, snow, etc.), and obstructions prior to mobilizing equipment. 1b. If working alongside roads, look both ways before entering roadways, face traffic, and utilize work vehicle to protect employees. 1b. Delineate work area (including vehicles) with traffic safety cones and caution tape or retractable cone bars. 1b. Maintain a 5-foot work zone. 1b. Wear high visibility clothing or reflective safety vest. 1c. When carrying equipment to/from work area, keep back straight, lift with legs, keep load close to body, never reach with a load. Ensure that loads are balanced. Use mechanical assistance/make multiple trips to carry equipment.
2. Remove well cover / close well cover.	**2a. CONTACT/CAUGHT:** Pinch points and scrapes associated with hand tools and well covers. **2b. FALL:** Potential tripping hazards associated with installing bolts. **2c. EXERTION:** Physical exertion to remove bolts that were over torqued or stripped.	2a. Keep hands away from pinch points. 2a. Use hand tools with extensions to remove and replace well covers. 2a. Wear cut-resistant gloves. 2a. Use knee pads or kneeling pad when repetitive kneeling on rough ground is anticipated. 2b. Place security bolts in secure location so not to create tripping hazards. Replace security bolts so that they fit flush with monitoring well covers. 2c. Replace any security bolts that show signs of stripping. Do not over tighten. 2c. Use body positioning and bending techniques that minimize muscle strain; keep back straight, bend at the knees. 2c. See 2a.

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Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
3. Screen vapor point with PID.	**3a. FALL:** Potential tripping hazards associated with equipment. **3b. EXPOSURE:** Inhalation of soil vapor	3a. Place equipment in one area close to the sampling location. 3b. Identify area where equipment is to be stored within the work area (away from main walking path). 3a. Don't leave equipment on the ground. Return equipment to storage area between uses. 3b. Replace brass caps immediately upon completion to avoid soil vapors migrating to the surface through sample tubing. 3b. Stand upwind of sample point during screening activities.
4. Remove / replace brass caps at the end of the sam`ple tubing.	**4a. CONTACT:** Pinch points associated with hand tools and brass caps. **4b. EXPOSURE:** Potential pathway for vapors to migrate to land surface.	4a. Use wrench to remove and replace brass caps. 4a. Wear cut-resistant gloves to protect against pinch points and scrapes. 4b. See 3b. 4b. Stand up wind of sample point location.
5. Set up soil vapor sampling equipment and calibration of meters.	**5a. FALL:** Potential tripping hazards associated with equipment and tubing.5b. **5b. CONTACT:** Pinch points associated with handling equipment. **5c. EXPOSURE:** Inhalation of calibration gas and helium.	5a. See 3a. 5a. Keep tubing slack to a minimum and locate the summa canister as close to the sampling location as possible. 5a. Avoid stepping over equipment and tubing. 5b. Do not place fingers/hands under sampling equipment. 5b. Make multiple trips when unloading equipment in work area. 5b. Wear cut-resistant gloves to protect against pinch points while handling sampling equipment. 5c. Review SDS for each type of calibration gas used before calibrating. 5c. Calibrate meters in a well-ventilated area and keep air flow regulator away from face. 5c. Close valve on canisters after use to avoid inhalation of excess helium or calibration gas. 5c. Stand up wind of bucket during helium tracer gas test.
6. Cleaning Work Area.	**6a. FALL:** Potential tripping hazards associated with equipment and tubing. **6b. CONTACT:** Storing and transport of equipment in car.	6a. See 3a. 6a. See 3b. 6b. Ensure that equipment is placed securely in the vehicle. Do not stack equipment on top of each other. Secure equipment so that it will not slide while being transported. 6b. Wear cut-resistant gloves while handling/loading equipment.

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JOB SAFETY ANALYSIS	**Cntrl. No. GEN-027**	**DATE: 11/3/2020**	☒ NEW ☐ REVISED	PAGE 1 of 2

JSA TYPE CATEGORY **GENERIC**	WORK TYPE **Drilling**	WORK ACTIVITY (Description) **Pre-Drilling Clearance, Vactron and Air Knife**

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
Courtney Rempfer	Staff Scientist	Joseph Midwig	Office Health & Safety Manager
Sara Redding	Senior Hydrogeologist	Brian Hobbs	Corporate Health & Safety Manager

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST
☒ HARD HAT
☐ LIFELINE / BODY HARNESS
☒ SAFETY GLASSES

☐ GOGGLES
☒ FACE SHIELD (While Air Knifing)
☒ HEARING PROTECTION (As needed)
☒ SAFETY SHOES: Composite toe or steel toe boots

☐ AIR PURIFYING RESPIRATOR
☐ SUPPLIED RESPIRATOR
☒ PPE CLOTHING: Fluorescent reflective vest or high visibility clothing; long-sleeve shirt

☒ GLOVES: Leather, Nitrile, cut-resistant
☒ OTHER: Dusk mask, insect repellant, sunscreen (as needed)

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Vac-Truck or Vac Drum, Compressor, Jack Hammer, Air Knife. Circular Saw, Hand Tools, Dust Mask, Photoionization Detector, Multi Gas Meter, 42 inch safety cones and flags, Retractable Cone Bars, Caution Tape, 20 lb. Fire Extinguisher, “Work Area” Signs, Pressurized Water Sprayer

Commitment to Safety – All personnel onsite will actively participate in hazard recognition and mitigation throughout the day by verbalizing SPSAs

EXCLUSION ZONE: All non-essential personnel will maintain a distance of 10 feet from drilling equipment while equipment is moving/engaged

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Verify pre-clearance protocol	**1a. CONTACT:** Underground utility damage; property damage; personal injury	1a. Confirm that (if applicable) “Call Before You Dig” and local utility companies were contacted prior to starting work in order to confirm utility mark outs. Must have a case # before digging. 1a Walk the Site to evaluate utility markings and review maps (see Site Walk Inspection JSA). Utilities are not always properly marked out ensure use of observational skills through the pre-clearing checklist. 1a. Review pre-clearing checklist fromm and sub-surface clearance form. Pre-clearing protocol indicates that clearance must be conducted to a minimum of 5 vertical feet below ground surface or 10 vertical feet below ground surface in the critical zone using hand tools.
	1b. ENERGY SOURCE/CONTACT: Property damage; Pressurized water mains may cause lacerations or broken bones. Pressurized gas mains may explode causing serious injury, or death. Underground electric may cause severe burns, shock, or death.	1b. Pre-clearing of each soil boring/monitoring well location must be conducted to a minimum of 5 vertical feet below the ground surface (10 feet minimum for Critical Zone) using hand tools (shovel and non-metallic dig bar and hand auger) prior to drilling. Supervisor should be contacted to discuss appropriate pre-clearing depth. 1b. MUST Complete subsurface clearance checklist prior to pre-clearance.
	1c. FALL: Slip, Trip or Fall may cause muscle strains or tears, abrasions, lacerations, or broken bones.	1c. Be aware of the conditions when walking or loading equipment and working. Walk within established pathway avoiding uneven surfaces. Remove potential slip/trip/fall hazards.
2. Mobilize/demobilize and establish work area	**2a. SEE MOBILIZATION / DEMOBILIZATION JSA**	2a. See Mobilization / Demobilization JSA
3. Concrete saw cutting, jack hammer and hand clearance with hand tools, air knife	**3a. CONTACT:** Flying debris striking face or body	3a Maintain 10’ minimum exclusion zone. Use the required PPE (i.e., leather/cut proof gloves, safety glasses/face shield). 3a. Use anti-whip devices on compressor hoses. 3a Wear a face shield to protect face from flying debris when using air knife. 3a. Utilize a traffic cone or physical barriers over the hole during air knife activities to keep flying debris close to ground.
	3b. EXPOSURE: Inhalation/exposure to hazardous vapors and/or concrete dust, noise exposure	3b. Monitor breathing zone with a calibrated PID and/or multi-gas meter. If meters sustain readings greater than recommeneded in the HASP for the specific contaminant of concerns (COCs) the Roux field personnel must temporarily cease work, instruct all Site personnel to step away from the area of elevated readings. Contact PM. 3b. Wet concrete while using saw to minimize dust and wear dust mask to prevent inhalation. 3b. Stand upwind and keep body behind saw. Observers and helpers should avoid line of fire for saw blade. Always cut away from body. 3b. No open flames/heat sources. 3b. Wear hearing protection when saw, jackhammer or air compressor are in operation. Otherwise, if sound levels exceed 85 dbA, put on hearing protection.
	3c. ENERGY SOURCE/CONTACT: Property damage; Pressurized water	

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[1] Each Job or Operation consists of a set of tasks / steps. Be sure to list all the steps needed to perform job.

[2] A hazard is a potential danger. Break hazards into five types: Contact - victim is struck by or strikes an object; Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards.

[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift." Avoid general statements such as, "be careful."

	mains may cause lacerations or broken bones. Pressurized gas mains may explode causing serious injury, or death. Underground electric may cause severe burns, shock, or death. **3d.ERGONOMICS/EXERTION:** Muscle strain due to poor body positioning when handling equipment and materials **3e. FALL:** Tripping/falling due to uneven terrain, weather conditions, and materials/equipment stored at the Site **3f. CAUGHT:** Amputation points associated with the equipment and vacuum hose	3c. For air knifing, ensure extention/lance tip reaches the full 5 feet bgs. Air knife should be advanced **AT A MINIMUM** in all four corners of the expected boring location to find any possible arrangement of utilities. 3c. Ensure diameter of soil preclearance hole is at a **MINIMUM 2x** the diameter of any drilling or hard dig equipment that will be entering the hole. 3c. See Complete subsurface clearance protocol for information provided above. 3d. Use body positioning and lifting techniques that minimizes muscle strain; keep back straight, lift with legs, keep load close to body, and never reach with a load. 3d. Ensure that loads are balanced to reduce the potential for muscle strain. 3d. Two people or a mechanical lifting aid are required when lifting objects over 50 lbs. or when the shape makes the object difficult to lift. 3e. Inspect walking path for uneven terrain, weather-related hazards (i.e., ice, puddles, snow, etc.), and obstructions prior to mobilizing equipment. Mob/Demob JSA. 3e. Do not climb over stored materials/equipment; walk around. Practice good housekeeping. 3e. Use established pathways and walk on stable, secure ground. 3e. Equipment and tools will be stored at the lowest point of potential energy and out of the walkway and immediate work area (i.e. tools should not be propped against walls or nearby equipment or vehicles). 3e. Equipment and tools that are not anticipated to be used will be returned to a storage area that is out of the immediate work area. 3e. Ensure power cords and compressed air lines are grouped when used within the work area. 3e. Pre-cleared location will be finished flush to grade as to prevent a slip/trip hazard or coned and taped off. 3f. Always wear leather gloves when making connections and using hand tools; wear cut-resistant (i.e., Kevlar) gloves when handling cutting tools. 3f. Inspect the equipment prior to use for potential pinch points. 3f. Test all emergency shutdown devices prior to using equipment. 3f. Inspect saw blade for worn surface or missing teeth; switch blade if damaged or blunt. 3f. Ensure all jewelry is removed, loose clothing is secured, and PPE is secured close to the body. 3f. All non-essential personnel shall maintain a 10 foot exclusion zone; position body out of the line-of-fire of equipment. 3f. Drillers and helpers will understand and use the “Show Me Your Hands Policy”.
4. Move drum to staging area using drum cart	**4a. EXPOSURE/CONTACT:** Contamination (e.g., Separate Phase Hydrocarbons (SPH), contaminated groundwater, soil) **4b. EXERTION:** Muscle strain while maneuvering drums with drum cart/lift gate **4c. CAUGHT: Pinch points associated with handling drum lid**	4a. Wear Nitrile chemical-resistant gloves under leather or cut proof gloves. 4a. Do not overfill drums. Ensure that the drum lids are attached securely. 4a. All drums will be staged in the designated storage area. 4b. See 3d. Do not overfill drums. Use lift gate on back of truck to load and unload drums. Use drum dolly to move drum. 4c. Ensure that fingers are not placed under the lid of the drum. Wear leather gloves or cut proof gloves. Use appropriate ratchet while sealing drum lid.
5. Decontaminate equipment.	**5a. EXPOSURE/CONTACT**: To contamination (e.g., Separate Phase Hydrocarbons (SPH), contaminated groundwater, vapors). **5b. EXPOSURE:** To chemicals in cleaning solution.	5a. Wear chemical-resistant disposable gloves and safety glasses. 5a. Contain decontamination water so that it does not spill. 5a. Use an absorbent pad to clean spills, if necessary. 5a. Spray equipment from side angle, not straight on, to avoid backsplash. 5a. See 3b. 5b. See 4a. Review SDS to ensure appropriate precautions are taken and understood.

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APPENDIX B

Safety Data Sheets (SDSs) for Chemicals Used

PRAXAIR
Making our planet more productive™

Isobutylene

Safety Data Sheet P-4614

This SDS conforms to U.S. Code of Federal Regulations 29 CFR 1910.1200, Hazard Communication.

Date of issue: 01/01/1979 Revision date: 10/17/2016 Supersedes: 02/27/2015

SECTION: 1. Product and company identification

1.1. Product identifier

Product form : Substance
Name : Isobutylene
CAS No : 115-11-7
Formula : C4H8 / CH2=C(CH3)2
Other means of identification : Isobutene, 2-methylpropene

1.2. Relevant identified uses of the substance or mixture and uses advised against

Use of the substance/mixture : Industrial use. Use as directed.

1.3. Details of the supplier of the safety data sheet

Praxair, Inc.
10 Riverview Drive
Danbury, CT 06810-6268 - USA
T 1-800-772-9247 (1-800-PRAXAIR) - F 1-716-879-2146
www.praxair.com

1.4. Emergency telephone number

Emergency number : Onsite Emergency: 1-800-645-4633

CHEMTREC, 24hr/day 7days/week
— Within USA: 1-800-424-9300, Outside USA: 001-703-527-3887
(collect calls accepted, Contract 17729)

SECTION 2: Hazard identification

2.1. Classification of the substance or mixture

GHS-US classification

Flam. Gas 1 H220
Liquefied gas H280

2.2. Label elements

GHS-US labeling

Hazard pictograms (GHS-US) :


GHS02


GHS04

Signal word (GHS-US) : DANGER

Hazard statements (GHS-US) :
H220 - **EXTREMELY FLAMMABLE GAS**
H280 - CONTAINS GAS UNDER PRESSURE; MAY EXPLODE IF HEATED
OSHA-H01 - MAY DISPLACE OXYGEN AND CAUSE RAPID SUFFOCATION
CGA-HG04 - MAY FORM EXPLOSIVE MIXTURES WITH AIR
CGA-HG01 - MAY CAUSE FROSTBITE

Precautionary statements (GHS-US) :
P202 - Do not handle until all safety precautions have been read and understood
P210 - Keep away from Heat, Open flames, Sparks, Hot surfaces. - No smoking
P271+P403 - Use and store only outdoors or in a well-ventilated place
P377 - Leaking gas fire: Do not extinguish, unless leak can be stopped safely
P381 - Eliminate all ignition sources if safe to do so
CGA-PG05 - Use a back flow preventive device in the piping
CGA-PG12 - Do not open valve until connected to equipment prepared for use
CGA-PG06 - Close valve after each use and when empty
CGA-PG11 - Never put cylinders into unventilated areas of passenger vehicles
CGA-PG02 - Protect from sunlight when ambient temperature exceeds 52°C (125°F)

2.3. Other hazards

Other hazards not contributing to the classification : None.

2.4. Unknown acute toxicity (GHS US)

No data available

SECTION 3: Composition/Information on ingredients

3.1. Substance

Name	Product identifier	%
Isobutylene (Main constituent)	(CAS No) 115-11-7	100

3.2. Mixture

Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures

First-aid measures after inhalation : Remove to fresh air and keep at rest in a position comfortable for breathing. If not breathing, give artificial respiration. If breathing is difficult, trained personnel should give oxygen. Call a physician.

First-aid measures after skin contact : The liquid may cause frostbite. For exposure to liquid, immediately warm frostbite area with warm water not to exceed 105°F (41°C). Water temperature should be tolerable to normal skin. Maintain skin warming for at least 15 minutes or until normal coloring and sensation have returned to the affected area. In case of massive exposure, remove clothing while showering with warm water. Seek medical evaluation and treatment as soon as possible.

First-aid measures after eye contact : Immediately flush eyes thoroughly with water for at least 15 minutes. Hold the eyelids open and away from the eyeballs to ensure that all surfaces are flushed thoroughly. Contact an ophthalmologist immediately.

First-aid measures after ingestion : Ingestion is not considered a potential route of exposure.

4.2. Most important symptoms and effects, both acute and delayed

No additional information available

4.3. Indication of any immediate medical attention and special treatment needed

None.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media : Carbon dioxide, Dry chemical, Water spray or fog.

5.2. Special hazards arising from the substance or mixture

Fire hazard : **EXTREMELY FLAMMABLE GAS**. If venting or leaking gas catches fire, do not extinguish flames. Flammable vapors may spread from leak, creating an explosive reignition hazard. Vapors can be ignited by pilot lights, other flames, smoking, sparks, heaters, electrical equipment, static discharge, or other ignition sources at locations distant from product handling point. Explosive atmospheres may linger. Before entering an area, especially a confined area, check the atmosphere with an appropriate device.

Explosion hazard : **EXTREMELY FLAMMABLE GAS**. Forms explosive mixtures with air and oxidizing agents.

Reactivity : No reactivity hazard other than the effects described in sub-sections below.

5.3. Advice for firefighters

Firefighting instructions : **DANGER: FLAMMABLE LIQUID AND VAPOR.** Evacuate all personnel from danger area. Use self-contained breathing apparatus. Immediately cool surrounding containers with water spray from maximum distance, taking care not to extinguish flames. Avoid spreading burning liquid with water. Remove ignition sources if safe to do so. If flames are accidentally extinguished, explosive reignition may occur. Reduce vapors with water spray or fog. Stop flow of liquid if safe to do so, while continuing cooling water spray. Remove all containers from area of fire if safe to do so. Allow fire to burn out. On-site fire brigades must comply with OSHA 29 CFR 1910.156 and applicable standards under 29 CFR 1919 Subpart L - Fire Protection.

Special protective equipment for fire fighters : Standard protective clothing and equipment (Self Contained Breathing Apparatus) for fire fighters.

Other information : Containers are equipped with a pressure relief device. (Exceptions may exist where authorized by DOT.).

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

General measures : **DANGER: Flammable, liquefied gas.** FORMS EXPLOSIVE MIXTURES WITH AIR. Immediately evacuate all personnel from danger area. Use self-contained breathing apparatus where needed. Remove all sources of ignition if safe to do so. Reduce vapors with fog or fine water spray, taking care not to spread liquid with water. Shut off flow if safe to do so. Ventilate area or move container to a well-ventilated area. Flammable vapors may spread from leak and could explode if reignited by sparks or flames. Explosive atmospheres may linger. Before entering area, especially confined areas, check atmosphere with an appropriate device.

6.1.1. For non-emergency personnel

No additional information available

6.1.2. For emergency responders

No additional information available

6.2. Environmental precautions

Try to stop release. Prevent waste from contaminating the surrounding environment. Prevent soil and water pollution. Dispose of contents/container in accordance with local/regional/national/international regulations. Contact supplier for any special requirements.

6.3. Methods and material for containment and cleaning up

No additional information available

6.4. Reference to other sections

See also sections 8 and 13.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling : Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Use only non-sparking tools. Use only explosion-proof equipment

Wear leather safety gloves and safety shoes when handling cylinders. Protect cylinders from physical damage; do not drag, roll, slide or drop. While moving cylinder, always keep in place removable valve cover. Never attempt to lift a cylinder by its cap; the cap is intended solely to protect the valve. When moving cylinders, even for short distances, use a cart (trolley, hand truck, etc.) designed to transport cylinders. Never insert an object (e.g, wrench, screwdriver, pry bar) into cap openings; doing so may damage the valve and cause a leak. Use an adjustable strap wrench to remove over-tight or rusted caps. Slowly open the valve. If the valve is hard to open, discontinue use and contact your supplier. Close the container valve after each use; keep closed even when empty. Never apply flame or localized heat directly to any part of the container. High temperatures may damage the container and could cause the pressure relief device to fail prematurely, venting the container contents. For other precautions in using this product, see section 16.

7.2. Conditions for safe storage, including any incompatibilities

Storage conditions	: Store only where temperature will not exceed 125°F (52°C). Post “No Smoking/No Open Flames” signs in storage and use areas. There must be no sources of ignition. Separate packages and protect against potential fire and/or explosion damage following appropriate codes and requirements (e.g, NFPA 30, NFPA 55, NFPA 70, and/or NFPA 221 in the U.S.) or according to requirements determined by the Authority Having Jurisdiction (AHJ). Always secure containers upright to keep them from falling or being knocked over. Install valve protection cap, if provided, firmly in place by hand when the container is not in use. Store full and empty containers separately. Use a first-in, first-out inventory system to prevent storing full containers for long periods. For other precautions in using this product, see section 16 **OTHER PRECAUTIONS FOR HANDLING, STORAGE, AND USE:** When handling product under pressure, use piping and equipment adequately designed to withstand the pressures to be encountered. Never work on a pressurized system. Use a back flow preventive device in the piping. Gases can cause rapid suffocation because of oxygen deficiency; store and use with adequate ventilation. If a leak occurs, close the container valve and blow down the system in a safe and environmentally correct manner in compliance with all international, federal/national, state/provincial, and local laws; then repair the leak. Never place a container where it may become part of an electrical circuit.

7.3. Specific end use(s)

None.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Isobutylene (115-11-7)		
ACGIH	ACGIH TLV-TWA (ppm)	250 ppm

8.2. Exposure controls

Appropriate engineering controls	: Use an explosion-proof local exhaust system. Local exhaust and general ventilation must be adequate to meet exposure standards. MECHANICAL (GENERAL): **Inadequate - Use only in a closed system.** Use explosion proof equipment and lighting.
Eye protection	: Wear safety glasses when handling cylinders; vapor-proof goggles and a face shield during cylinder changeout or whenever contact with product is possible. Select eye protection in accordance with OSHA 29 CFR 1910.133.
Skin and body protection	: Wear metatarsal shoes and work gloves for cylinder handling, and protective clothing where needed. Wear appropriate chemical gloves during cylinder changeout or wherever contact with product is possible. Select per OSHA 29 CFR 1910.132, 1910.136, and 1910.138.
Respiratory protection	: When workplace conditions warrant respirator use, follow a respiratory protection program that meets OSHA 29 CFR 1910.134, ANSI Z88.2, or MSHA 30 CFR 72.710 (where applicable). Use an air-supplied or air-purifying cartridge if the action level is exceeded. Ensure that the respirator has the appropriate protection factor for the exposure level. If cartridge type respirators are used, the cartridge must be appropriate for the chemical exposure. For emergencies or instances with unknown exposure levels, use a self-contained breathing apparatus (SCBA).
Thermal hazard protection	: Wear cold insulating gloves when transfilling or breaking transfer connections.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state	: Gas
Molecular mass	: 56 g/mol
Color	: Colorless.
Odor	: Poor warning properties at low concentrations. Sweetish.
Odor threshold	: Odor threshold is subjective and inadequate to warn for overexposure.
pH	: Not applicable.
Relative evaporation rate (butyl acetate=1)	: No data available
Relative evaporation rate (ether=1)	: Not applicable.
Melting point	: -140.3 °C
Freezing point	: No data available

Boiling point	: -6.9 °C
Flash point	: -80 °C (closed cup)
Critical temperature	: 144.7 °C
Auto-ignition temperature	: 465 °C
Decomposition temperature	: No data available
Flammability (solid, gas)	: 1.8 - 8.8 vol %
Vapor pressure	: 260 kPa
Critical pressure	: 4000 kPa
Relative vapor density at 20 °C	: No data available
Relative density	: 0.63
Density	: 0.599 g/cm³ (at 20 °C)
Relative gas density	: 2
Solubility	: Water: 388 mg/l
Log Pow	: 2.35
Log Kow	: Not applicable.
Viscosity, kinematic	: Not applicable.
Viscosity, dynamic	: Not applicable.
Explosive properties	: Not applicable.
Oxidizing properties	: None.
Explosion limits	: No data available

9.2. Other information

Gas group	: Liquefied gas
Additional information	: Gas/vapor heavier than air. May accumulate in confined spaces, particularly at or below ground level

SECTION 10: Stability and reactivity

10.1. Reactivity

No reactivity hazard other than the effects described in sub-sections below.

10.2. Chemical stability

Stable under normal conditions.

10.3. Possibility of hazardous reactions

May occur.

10.4. Conditions to avoid

High temperature. Catalyst.

10.5. Incompatible materials

Halogens. Oxidizing agents. Acids.

10.6. Hazardous decomposition products

Thermal decomposition may produce : Carbon monoxide. Carbon dioxide.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity : Not classified

Isobutylene (\f)115-11-7	
LC50 inhalation rat (mg/l)	620 mg/l/4h
LC50 inhalation rat (ppm)	541657 ppm/1h
ATE US (gases)	270828.500 ppmV/4h
ATE US (vapors)	620.000 mg/l/4h
ATE US (dust, mist)	620.000 mg/l/4h

Skin corrosion/irritation : Not classified

pH: Not applicable.

Serious eye damage/irritation : Not classified

pH: Not applicable.

Respiratory or skin sensitization : Not classified

Germ cell mutagenicity : Not classified

Carcinogenicity : Not classified

Isobutylene (115-11-7)	
National Toxicology Program (NTP) Status	1 - Evidence of Carcinogenicity

Reproductive toxicity : Not classified

Specific target organ toxicity (single exposure) : Not classified

Specific target organ toxicity (repeated exposure) : Not classified

Aspiration hazard : Not classified

SECTION 12: Ecological information

12.1. Toxicity

Ecology - general : No known ecological damage caused by this product.

12.2. Persistence and degradability

Isobutylene (115-11-7)	
Persistence and degradability	The substance is biodegradable. Unlikely to persist.

12.3. Bioaccumulative potential

Isobutylene (115-11-7)	
Log Pow	2.35
Log Kow	Not applicable.
Bioaccumulative potential	Not expected to bioaccumulate due to the low log Kow (log Kow < 4). Refer to section 9.

12.4. Mobility in soil

Isobutylene (115-11-7)	
Mobility in soil	No data available.
Ecology - soil	Because of its high volatility, the product is unlikely to cause ground or water pollution.

12.5. Other adverse effects

Effect on ozone layer : None

Effect on the global warming : No known effects from this product

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Waste disposal recommendations : Do not attempt to dispose of residual or unused quantities. Return container to supplier.

SECTION 14: Transport information

In accordance with DOT

Transport document description : UN1055 Isobutylene, 2.1

UN-No.(DOT) : UN1055

Proper Shipping Name (DOT) : Isobutylene

Class (DOT) : 2.1 - Class 2.1 - Flammable gas 49 CFR 173.115

Hazard labels (DOT) : 2.1 - Flammable gas

DOT Special Provisions (49 CFR 172.102) : 19 - For domestic transportation only, the identification number UN1075 may be used in place of the identification number specified in column (4) of the 172.101 table. The identification number used must be consistent on package markings, shipping papers and emergency response information
T50 - When portable tank instruction T50 is referenced in Column (7) of the 172.101 Table, the applicable liquefied compressed gases are authorized to be transported in portable tanks in accordance with the requirements of 173.313 of this subchapter

Additional information

Emergency Response Guide (ERG) Number : 115 (UN1055)

Other information : No supplementary information available.

Special transport precautions : Avoid transport on vehicles where the load space is not separated from the driver's compartment. Ensure vehicle driver is aware of the potential hazards of the load and knows what to do in the event of an accident or an emergency. Before transporting product containers: - Ensure there is adequate ventilation. - Ensure that containers are firmly secured. - Ensure cylinder valve is closed and not leaking. - Ensure valve outlet cap nut or plug (where provided) is correctly fitted. - Ensure valve protection device (where provided) is correctly fitted.

Transport by sea

UN-No. (IMDG) : 1055
Proper Shipping Name (IMDG) : ISOBUTYLENE
Class (IMDG) : 2 - Gases
MFAG-No : 115

Air transport

UN-No. (IATA) : 1055
Proper Shipping Name (IATA) : Isobutylene
Class (IATA) : 2
Civil Aeronautics Law : Gases under pressure/Gases flammable under pressure

SECTION 15: Regulatory information

15.1. US Federal regulations

Isobutylene (115-11-7)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory	
SARA Section 311/312 Hazard Classes	Immediate (acute) health hazard Delayed (chronic) health hazard Sudden release of pressure hazard Fire hazard

15.2. International regulations

CANADA

Isobutylene (115-11-7)
Listed on the Canadian DSL (Domestic Substances List)

EU-Regulations

Isobutylene (115-11-7)
Listed on the EEC inventory EINECS (European Inventory of Existing Commercial Chemical Substances)

15.2.2. National regulations

Isobutylene (115-11-7)
Listed on the AICS (Australian Inventory of Chemical Substances) Listed on IECSC (Inventory of Existing Chemical Substances Produced or Imported in China) Listed on the Japanese ENCS (Existing & New Chemical Substances) inventory Listed on the Korean ECL (Existing Chemicals List) Listed on NZIoC (New Zealand Inventory of Chemicals) Listed on PICCS (Philippines Inventory of Chemicals and Chemical Substances) Listed on INSQ (Mexican National Inventory of Chemical Substances)

15.3. US State regulations

Isobutylene(115-11-7)	
U.S. - California - Proposition 65 - Carcinogens List	No
U.S. - California - Proposition 65 - Developmental Toxicity	No
U.S. - California - Proposition 65 - Reproductive Toxicity - Female	No
U.S. - California - Proposition 65 - Reproductive Toxicity - Male	No
State or local regulations	U.S. - Massachusetts - Right To Know List U.S. - New Jersey - Right to Know Hazardous Substance List U.S. - Pennsylvania - RTK (Right to Know) List

SECTION 16: Other information

Other information : When you mix two or more chemicals, you can create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an industrial hygienist or other trained person when you evaluate the end product. Before using any plastics, confirm their compatibility with this product

Praxair asks users of this product to study this SDS and become aware of the product hazards and safety information. To promote safe use of this product, a user should (1) notify employees, agents, and contractors of the information in this SDS and of any other known product hazards and safety information, (2) furnish this information to each purchaser of the product, and (3) ask each purchaser to notify its employees and customers of the product hazards and safety information

The opinions expressed herein are those of qualified experts within Praxair, Inc. We believe that the information contained herein is current as of the date of this Safety Data Sheet. Since the use of this information and the conditions of use are not within the control of Praxair, Inc, it is the user's obligation to determine the conditions of safe use of the product

Praxair SDSs are furnished on sale or delivery by Praxair or the independent distributors and suppliers who package and sell our products. To obtain current SDSs for these products, contact your Praxair sales representative, local distributor, or supplier, or download from www.praxair.com. If you have questions regarding Praxair SDSs, would like the document number and date of the latest SDS, or would like the names of the Praxair suppliers in your area, phone or write the Praxair Call Center (Phone: 1-800-PRAXAIR/1-800-772-9247; Address: Praxair Call Center, Praxair, Inc, P.O. Box 44, Tonawanda, NY 14151-0044)

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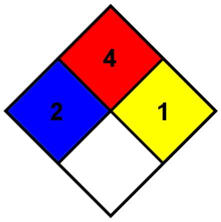
NFPA health hazard : 2 - Intense or continued exposure could cause temporary incapacitation or possible residual injury unless prompt medical attention is given.

NFPA fire hazard : 4 - Will rapidly or completely vaporize at normal pressure and temperature, or is readily dispersed in air and will burn readily.

NFPA reactivity : 1 - Normally stable, but can become unstable at elevated temperatures and pressures or may react with water with some release of energy, but not violently.



HMIS III Rating

Health : 1 Slight Hazard - Irritation or minor reversible injury possible

Flammability : 4 Severe Hazard

Physical : 2 Moderate Hazard

SDS US (GHS HazCom 2012) - Praxair

This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product.

1 Identification of the substance/mixture and of the supplier

1.1 Product identifier

Trade Name: Alconox
Synonyms:
Product number: 1104-1, 1104, 1125, 1150, 1101, 1103, 1112-1, 1112

1.2 Application of the substance / the mixture : Cleaning material/Detergent

1.3 Details of the supplier of the Safety Data Sheet

Manufacturer	**Supplier**
Alconox, Inc. 30 Glenn Street White Plains, NY 10603 1-914-948-4040	

Emergency telephone number:
ChemTel Inc
North America: 1-800-255-3924
International: 01-813-248-0585

2 Hazards identification

2.1 Classification of the substance or mixture:

In compliance with EC regulation No. 1272/2008, 29CFR1910/1200 and GHS Rev. 3 and amendments.

Hazard-determining components of labeling:

Tetrasodium Pyrophosphate
Sodium tripolyphosphate
Sodium Alkylbenzene Sulfonate

2.2 Label elements:

Skin irritation, category 2.
Eye irritation, category 2A.

Hazard pictograms:

Signal word: Warning

Hazard statements:

H315 Causes skin irritation.
H319 Causes serious eye irritation.

Precautionary statements:

P264 Wash skin thoroughly after handling.
P280 Wear protective gloves/protective clothing/eye protection/face protection.
P302+P352 If on skin: Wash with soap and water.
P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing.
P321 Specific treatment (see supplemental first aid instructions on this label).
P332+P313 If skin irritation occurs: Get medical advice/attention.
P362 Take off contaminated clothing and wash before reuse.
P501 Dispose of contents and container as instructed in Section 13.

Additional information: None.

Hazard description
Hazards Not Otherwise Classified (HNOC): None

Information concerning particular hazards for humans and environment:

The product has to be labelled due to the calculation procedure of the "General Classification guideline for preparations of the EU" in the latest valid version.

Classification system:

The classification is according to EC regulation No. 1272/2008, 29CFR1910/1200 and GHS Rev. 3 and amendments, and extended by company and literature data. The classification is in accordance with the latest editions of international substances lists, and is supplemented by information from technical literature and by information provided by the company.

3 Composition/information on ingredients

3.1 Chemical characterization : None

3.2 Description : None

3.3 Hazardous components (percentages by weight)

Identification	Chemical Name	Classification	Wt. %
CAS number: 7758-29-4	Sodium tripolyphosphate	Skin Irrit. 2 ; H315 Eye Irrit. 2; H319	12-28
CAS number: 68081-81-2	Sodium Alkylbenzene Sulfonate	Acute Tox. 4; H303 Skin Irrit. 2 ; H315 Eye Irrit. 2; H319	8-22
CAS number: 7722-88-5	Tetrasodium Pyrophosphate	Skin Irrit. 2 ; H315 Eye Irrit. 2; H319	2-16

3.4 Additional Information : None.

4 First aid measures

4.1 Description of first aid measures

General information: None.

After inhalation:

Maintain an unobstructed airway.
Loosen clothing as necessary and position individual in a comfortable position.

After skin contact:

Wash affected area with soap and water.
Seek medical attention if symptoms develop or persist.

After eye contact:

Rinse/flush exposed eye(s) gently using water for 15-20 minutes.
Remove contact lens(es) if able to do so during rinsing.
Seek medical attention if irritation persists or if concerned.

After swallowing:

Rinse mouth thoroughly.
Seek medical attention if irritation, discomfort, or vomiting persists.

4.2 Most important symptoms and effects, both acute and delayed

None

4.3 Indication of any immediate medical attention and special treatment needed:

No additional information.

5 Firefighting measures

5.1 Extinguishing media

Suitable extinguishing agents:

Use appropriate fire suppression agents for adjacent combustible materials or sources of ignition.

For safety reasons unsuitable extinguishing agents : None

5.2 Special hazards arising from the substance or mixture :

Thermal decomposition can lead to release of irritating gases and vapors.

5.3 Advice for firefighters

Protective equipment:

Wear protective eye wear, gloves and clothing.
Refer to Section 8.

5.4 Additional information :

Avoid inhaling gases, fumes, dust, mist, vapor and aerosols.
Avoid contact with skin, eyes and clothing.

6 Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures :

Ensure adequate ventilation.
Ensure air handling systems are operational.

6.2 Environmental precautions :

Should not be released into the environment.
Prevent from reaching drains, sewer or waterway.

6.3 Methods and material for containment and cleaning up :

Wear protective eye wear, gloves and clothing.

6.4 Reference to other sections : None

7 Handling and storage

7.1 Precautions for safe handling :

Avoid breathing mist or vapor.
Do not eat, drink, smoke or use personal products when handling chemical substances.

7.2 Conditions for safe storage, including any incompatibilities :

Store in a cool, well-ventilated area.

7.3 Specific end use(s):

No additional information.

8 Exposure controls/personal protection

8.1 Control parameters :

a) 7722-88-5, Tetrasodium Pyrophosphate, OSHA TWA 5 mg/m3
b) Dusts, non-specific OEL, Irish Code of Practice
  (i) Total inhalable 10 mg/m3 (8hr)
  (ii) Respirible 4mg/m3 (8hr)
  (iii) Tetrasodium Pyrophosphate, OSHA TWA 5 mg/m3, (8hr)

8.2 Exposure controls

Appropriate engineering controls:

Emergency eye wash fountains and safety showers should be available in the immediate vicinity of use or handling.

Respiratory protection:

Not needed under normal use conditions.

Protection of skin:

Select glove material impermeable and resistant to the substance or preparation. Protective gloves recommended to comply with EN 374. Take note of break through times, permeability, and special workplace conditions, such as mechanical strain, duration of contact, etc. Protective gloves should be replaced at the first sign of wear.

Eye protection:

Safety goggles or glasses, or appropriate eye protection. Recommended to comply with ANSI Z87.1 and/or EN 166.

General hygienic measures:

Wash hands before breaks and at the end of work.
Avoid contact with skin, eyes and clothing.

9 Physical and chemical properties

Appearance (physical state, color):	White and cream colored flakes - powder	**Explosion limit lower:** **Explosion limit upper:**	Not determined or not available. Not determined or not available.
Odor:	Not determined or not available.	**Vapor pressure at 20°C:**	Not determined or not available.
Odor threshold:	Not determined or not available.	**Vapor density:**	Not determined or not available.
pH-value:	9.5 (aqueous solution)	**Relative density:**	Not determined or not available.
Melting/Freezing point:	Not determined or not available.	**Solubilities:**	Not determined or not available.
Boiling point/Boiling range:	Not determined or not available.	**Partition coefficient (n-octanol/water):**	Not determined or not available.
Flash point (closed cup):	Not determined or not available.	**Auto/Self-ignition temperature:**	Not determined or not available.
Evaporation rate:	Not determined or not available.	**Decomposition**	Not determined or not available.

Flammability (solid, gaseous):	Not determined or not available.	**Viscosity:**	a. Kinematic: Not determined or not available. b. Dynamic: Not determined or not available.
Density at 20°C:	Not determined or not available.		

10 Stability and reactivity

10.1 Reactivity : None

10.2 Chemical stability : None

10.3 Possibility hazardous reactions : None

10.4 Conditions to avoid : None

10.5 Incompatible materials : None

10.6 Hazardous decomposition products : None

11 Toxicological information

11.1 Information on toxicological effects :

Acute Toxicity:

Oral:

: LD50 > 5000 mg/kg oral rat - Product .

Chronic Toxicity: No additional information.

Skin corrosion/irritation:

Sodium Alkylbenzene Sulfonate: Causes skin irritation. .

Serious eye damage/irritation:

Sodium Alkylbenzene Sulfonate: Causes serious eye irritation .

Tetrasodium Pyrophosphate: Rabbit - Risk of serious damage to eyes .

Respiratory or skin sensitization: No additional information.

Carcinogenicity: No additional information.

IARC (International Agency for Research on Cancer): None of the ingredients are listed.

NTP (National Toxicology Program): None of the ingredients are listed.

Germ cell mutagenicity: No additional information.

Reproductive toxicity: No additional information.

STOT-single and repeated exposure: No additional information.

Additional toxicological information: No additional information.

12 Ecological information

12.1 Toxicity:

Sodium Alkylbenzene Sulfonate: Fish, LC50 1.67 mg/l, 96 hours.
Sodium Alkylbenzene Sulfonate: Aquatic invertebrates, EC50 Daphnia 2.4 mg/l, 48 hours. Sodium Alkylbenzene Sulfonate: Aquatic Plants, EC50 Algae 29 mg/l, 96 hours.
Tetrasodium Pyrophosphate: Fish, LC50 - other fish - 1,380 mg/l - 96 h.
Tetrasodium Pyrophosphate: Aquatic invertebrates, EC50 - Daphnia magna (Water flea) - 391 mg/l - 48 h.

12.2 Persistence and degradability: No additional information.

12.3 Bioaccumulative potential: No additional information.

12.4 Mobility in soil: No additional information.

General notes: No additional information.

12.5 Results of PBT and vPvB assessment:

PBT: No additional information.

vPvB: No additional information.

12.6 Other adverse effects: No additional information.

13 Disposal considerations

13.1 Waste treatment methods (consult local, regional and national authorities for proper disposal)

Relevant Information:

It is the responsibility of the waste generator to properly characterize all waste materials according to applicable regulatory entities. (US 40CFR262.11).

14 Transport information

14.1 UN Number: ADR, ADN, DOT, IMDG, IATA	None
14.2 UN Proper shipping name: ADR, ADN, DOT, IMDG, IATA	None
14.3 Transport hazard classes: ADR, ADN, DOT, IMDG, IATA	**Class:** None **Label:** None **LTD. QTY:** None

US DOT
Limited Quantity Exception: None

Bulk:	**Non Bulk:**
RQ (if applicable): None	**RQ (if applicable):** None
Proper shipping Name: None	**Proper shipping Name:** None
Hazard Class: None	**Hazard Class:** None
Packing Group: None	**Packing Group:** None
Marine Pollutant (if applicable): No additional information.	**Marine Pollutant (if applicable):** No additional information.

	Comments: None	**Comments:** None
14.4	**Packing group:** ADR, ADN, DOT, IMDG, IATA	None
14.5	**Environmental hazards :**	None
14.6	**Special precautions for user:**	None
	Danger code (Kemler):	None
	EMS number:	None
	Segregation groups:	None
14.7	**Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code:** Not applicable.	
14.8	**Transport/Additional information:**	
	Transport category:	None
	Tunnel restriction code:	None
	UN "Model Regulation":	None

15 Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture.

North American

SARA

Section 313 (specific toxic chemical listings): None of the ingredients are listed.
Section 302 (extremely hazardous substances): None of the ingredients are listed.

CERCLA (Comprehensive Environmental Response, Clean up and Liability Act) Reportable Spill Quantity: None of the ingredients are listed.

TSCA (Toxic Substances Control Act):

Inventory: All ingredients are listed.
Rules and Orders: Not applicable.

Proposition 65 (California):

Chemicals known to cause cancer: None of the ingredients are listed.

Chemicals known to cause reproductive toxicity for females: None of the ingredients are listed.

Chemicals known to cause reproductive toxicity for males: None of the ingredients are listed.

Chemicals known to cause developmental toxicity: None of the ingredients are listed.

Canadian

Canadian Domestic Substances List (DSL):
All ingredients are listed.

EU

REACH Article 57 (SVHC): None of the ingredients are listed.

Germany MAK: Not classified.
EC 648/2004 – This is an industrial detergent. Contains >30% phosphate, 15-30% anionic surfactant, <5% EDTA salts
EC 551/2009 – This is not a laundry or dishwasher detergent
EC 907/2006 – Contains no enzymes, optical brighteners, perfumes, allergenic fragrances, or preservative agents

Asia Pacific

Australia

Australian Inventory of Chemical Substances (AICS): All ingredients are listed.

China

Inventory of Existing Chemical Substances in China (IECSC): All ingredients are listed.

Japan

Inventory of Existing and New Chemical Substances (ENCS): All ingredients are listed.

Korea

Existing Chemicals List (ECL): All ingredients are listed.

New Zealand

New Zealand Inventory of Chemicals (NZOIC): All ingredients are listed.

Philippines

Philippine Inventory of Chemicals and Chemical Substances (PICCS): All ingredients are listed.

Taiwan

Taiwan Chemical Substance Inventory (TSCI): All ingredients are listed.

16 Other information

Abbreviations and Acronyms: None

Summary of Phrases

Hazard statements:
H315 Causes skin irritation.
H319 Causes serious eye irritation.

NFPA: 1-0-0
HMIS: 1-0-0

Precautionary statements:
P264 Wash skin thoroughly after handling.
P280 Wear protective gloves/protective clothing/eye protection/face protection.
P302+P352 If on skin: Wash with soap and water.
P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing.
P321 Specific treatment (see supplemental first aid instructions on this label).
P332+P313 If skin irritation occurs: Get medical advice/attention.
P362 Take off contaminated clothing and wash before reuse.
P501 Dispose of contents and container as instructed in Section 13.

Manufacturer Statement:

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

Safety Data Sheet: **Simple Green® All-Purpose Cleaner** ★

Version No. 13000-18C Issue Date: August 8, 2018 Supersedes Date: May 31, 2018 *OSHA HCS-2012 / GHS*

Section 1: IDENTIFICATION

Product Name: Simple Green® All-Purpose Cleaner
Additional Names:

Manufacturer's Part Number: **Please refer to Section 16*

Recommended Use: Cleaner & Degreaser for water tolerant surfaces.
Restrictions on Use: Do not use on non-rinsable surfaces.

Company: Sunshine Makers, Inc.
15922 Pacific Coast Highway
Huntington Beach, CA 92649 USA

Telephone: 800-228-0709 ● 562-795-6000 *Mon – Fri, 8am – 5pm PST*
Fax: 562-592-3830
Email: info@simplegreen.com

Emergency Phone: Chem-Tel 24-Hour Emergency Service: 800-255-3924

Section 2: HAZARDS IDENTIFICATION

This product has been assessed in accordance to 2012 OSHA Hazard Communication Standards (29 CFR 1910.1200) and has been determined to not be classifiable as hazardous.

OSHA HCS 2012
Label Elements
Signal Word: None **Hazard Symbol(s)/Pictogram(s):** None required

Hazard Statements: None
Precautionary Statements: None
Hazards Not Otherwise Classified (HNOC): None
Other Information: None Known

Section 3: COMPOSITION/INFORMATION ON INGREDIENTS

Ingredient	CAS Number	Percent Range
Water	7732-18-5	> 84.8%*
C9-11 Alcohols Ethoxylated	68439-46-3	< 5%*
Sodium Citrate	68-04-2	< 5%*
Sodium Carbonate	497-19-8	< 1%*
Tetrasodium Glutamate Diacetate	51981-21-6	< 1%*
Citric Acid	77-92-9	< 1%*
Methylchloroisothiazolinone	26172-55-4	< 0.002%*
Methylisothiazolinone	2682-20-4	< 0.001%*
Fragrance	Proprietary Mixture	< 1%*
Liquitint Colorant	Proprietary Mixture	< 1%*

**specific percentages of composition are being withheld as a trade secret*

Section 4: FIRST-AID MEASURES

Inhalation: Not expected to cause respiratory irritation. If adverse effect occurs, move to fresh air.
Skin Contact: Not expected to cause skin irritation. If adverse effect occurs, rinse skin with water.
Eye Contact: Not expected to cause eye irritation. If adverse effect occurs, flush eyes with water.
Ingestion: May cause upset stomach. Drink plenty of water to dilute. See section 11.

Most Important Symptoms/Effects, Acute and Delayed: None known.

Indication of Immediate Medical Attention and Special Treatment Needed, if necessary: Treat symptomatically

Section 5: FIRE-FIGHTING MEASURES

Suitable & Unsuitable Extinguishing Media: Use Dry chemical, CO2, water spray or "alcohol" foam. Avoid high volume jet water.
Specific Hazards Arising from Chemical: In event of fire, fire created carbon oxides may be formed.
Special Protective Actions for Fire-Fighters: Wear positive pressure self-contained breathing apparatus; Wear full protective clothing.

This product is non-flammable. See Section 9 for Physical Properties.

Section 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures: *For non-emergency and emergency personnel:* See section 8 – personal protection. Avoid eye contact. Safety goggles suggested.

Environmental Precautions: Do not allow into open waterways and ground water systems.

Methods and Materials for Containment and Clean Up: Dike or soak up with inert absorbent material. See section 13 for disposal considerations.

Section 7: HANDLING AND STORAGE

Precautions for Safe Handling: Ensure adequate ventilation. Keep out of reach of children. Keep away from heat, sparks, open flame and direct sunlight. Do not pierce any part of the container. Do not mix or contaminate with any other chemical. Do not eat, drink or smoke while using this product.

Conditions for Safe Storage including Incompatibilities: Keep container tightly closed. Keep in cool dry area. Avoid prolonged exposure to sunlight. Do not store at temperatures above 109°F (42.7°C). If separation occurs, mix the product for reconstitution.

Section 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Limit Values: No components listed with TWA or STEL values under OSHA or ACGIH.

Appropriate Engineering Controls: Showers, eyewash stations, ventilation systems

Individual Protection Measures / Personal Protective Equipment (PPE)
Eye Contact: Use protective glasses or safety goggles if splashing or spray-back is likely.
Respiratory: Use in well ventilated areas or local exhaust ventilations when cleaning small spaces.
Skin Contact: Use protective gloves (any material) when used for prolonged periods or dermally sensitive.
General Hygiene Considerations: Wash thoroughly after handling and before eating or drinking.

Section 9: PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Green Liquid	**Partition Coefficient: n-octanol/water:**	Not determined		
Odor:	Added sassafras odor	**Autoignition Temperature:**	Non-flammable		
Odor Threshold:	Not determined	**Decomposition Temperature:**	42.7°C (109°F)		
pH ASTM D-1293:	8.5 – 9.2	**Viscosity:**	Like water		
Freezing Point ASTM D-1177:	0-3.33°C (32-38°F)	**Specific Gravity** ASTM D-891:	1.01 – 1.03		
Boiling Point & Range ASTM D-1120:	101°C (213.8°F)	**VOCs:**	***Water & fragrance exemption in calculation*		
Flash Point ASTM D-93:	> 212°F	SCAQMD 304-91 / EPA 24:	0 g/L	0 lb/gal	0%
Evaporation Rate ASTM D-1901:	½ Butyl Acetate @ 25°C	CARB Method 310**:	2.5 g/L	0.021 lb/gal	0.25%
Flammability (solid, gas):	Not applicable	SCAQMD Method 313:	Not tested		
Upper/Lower Flammability or Explosive Limits:	Not applicable	**VOC Composite Partial Pressure:**	Not determined		
Vapor Pressure ASTM D-323:	0.60 PSI @77°F, 2.05 PSI @100°F	**Relative Density** ASTM D-4017:	8.42 – 8.59 lb/gal		
Vapor Density:	Not determined	**Solubility:**	100% in water		

Section 10: STABILITY AND REACTIVITY

Reactivity: Non-reactive.
Chemical Stability: Stable under normal conditions 70°F (21°C) and 14.7 psig (760 mmHg).
Possibility of Hazardous Reactions: None known.
Conditions to Avoid: Excessive heat or cold.
Incompatible Materials: Do not mix with oxidizers, acids, bathroom cleaners, or disinfecting agents.
Hazardous Decomposition Products: Normal products of combustion - CO, CO2.

Section 11: TOXICOLOGICAL INFORMATION

Likely Routes of Exposure:

	Inhalation -	Overexposure may cause headache.
	Skin Contact -	Not expected to cause irritation, repeated contact may cause dry skin.
	Eye Contact -	Not expected to cause irritation.
	Ingestion -	May cause upset stomach.

Symptoms related to the physical, chemical and toxicological characteristics: no symptoms expected under typical use conditions.
Delayed and immediate effects and or chronic effects from short term exposure: no symptoms expected under typical use conditions.
Delayed and immediate effects and or chronic effects from long term exposure: headache, dry skin, or skin irritation may occur.
Interactive effects: Not known.

Numerical Measures of Toxicity

Acute Toxicity:	Oral LD_{50} (rat)	> 5 g/kg body weight
	Dermal LD_{50} (rabbit)	> 5 g/kg body weight

Calculated via OSHA HCS 2012 / Globally Harmonized System of Classification and Labelling of Chemicals

Skin Corrosion/Irritation: Non-irritant per Dermal Irritection® assay modeling. No animal testing performed.
Eye Damage/Irritation: Non/Minimal irritant per Ocular Irritection® assay modeling. No animal testing performed.
Germ Cell Mutagenicity: Mixture does not classify under this category.
Carcinogenicity: Mixture does not classify under this category.
Reproductive Toxicity: Mixture does not classify under this category.
STOT-Single Exposure: Mixture does not classify under this category.
STOT-Repeated Exposure: Mixture does not classify under this category.
Aspiration Hazard: Mixture does not classify under this category.

Section 12: ECOLOGICAL INFORMATION

Ecotoxicity: Volume of ingredients used does not trigger toxicity classifications under the Globally Harmonized System of Classification and Labelling of Chemicals.
Aquatic: Aquatic Toxicity - Low, based on OECD 201, 202, 203 + Microtox: EC_{50} & IC_{50} ≥100 mg/L. Volume of ingredients used does not trigger toxicity classifications under the Globally Harmonized System of Classification and Labelling of Chemicals.
Terrestrial: Not tested on finished formulation.

Persistence and Degradability: Readily Biodegradable per OCED 301D, Closed Bottle Test. Reaches 100% biodegradability within 1 year or less.
Bioaccumulative Potential: No data available.
Mobility in Soil: No data available.
Other Adverse Effects: No data available.

Section 13: DISPOSAL CONSIDERATIONS

Unused or Used Liquid: May be considered hazardous in your area depending on usage and tonnage of disposal – check with local, regional, and or national regulations for appropriate methods of disposal.

Empty Containers: May be offered for recycling.

Never dispose of used degreasing rinsates into lakes, streams, and open bodies of water or storm drains.

Section 14: TRANSPORT INFORMATION

U.N. Number: Not applicable
U.N. Proper Shipping Name: Cleaning Compound, Liquid NOI
Transport Hazard Class(es): Not applicable
Packing Group: Not applicable
Environmental Hazards: Marine Pollutant - NO
Transport in Bulk (according to Annex II of MARPOL 73/78 and IBC Code): Unknown.
Special precautions which user needs to be aware of/comply with, in connection with transport or conveyance either within or outside their premises: None known.

U.S. (DOT) / Canadian TDG: Not Regulated for shipping.
ICAO/ IATA: Not classified as Hazardous
IMO / IDMG: Not classified as Hazardous
ADR/RID: Not classified as Hazardous

Section 15: REGULATORY INFORMATION

All components are listed on: TSCA and DSL Inventory.

SARA Title III: Sections 311/312 Hazard Categories – Not applicable.
Sections 313 Superfunds Amendments and Reauthorizations Act of 1986 – Not applicable.
Sections 302 – Not applicable.

Clean Air Act (CAA): Not applicable
Clean Water Act (CWA): Not applicable

State Right To Know Lists: No ingredients listed
California Proposition 65: No ingredients listed
Texas ESL:

Ethoxylated Alcohol	68439-46-3	60 µg/m³ long term	600 µg/m³ short term
Sodium Citrate	68-04-2	5 µg/m³ long term	50 µg/m³ short term
Sodium Carbonate	497-19-8	5 µg/m³ long term	50 µg/m³ short term
Citric Acid	77-92-9	10 µg/m³ long term	100 µg/m³ short term

This product has been classified as "not classifiable as hazardous" in accordance with Consumer Product Safety Commission (16 CFR Chapter 2), and labelled and packaged accordingly.

Section 16: OTHER INFORMATION

Size	UPC	Size	UPC
2 fl. oz.	043318131035	67.6 fl. oz.	043318130144
4 fl. oz.	043318130014	67.6 fl. oz.	043318000393
16 fl. oz.	043318130021	1 gallon	043318000799
22 fl. oz.	043318130229	1 gallon	043318130052
24 fl. oz.	043318130137	1 gallon	043318004957
32 fl. oz.	043318002557	1 gallon w/ dilution bottle	043318480492
32 fl. oz.	043318130335	140 fl. oz. w/ dilution bottle	043318001468
32 fl. oz.	043318000652	2.5 gallon	043318004889

USA items listed only. Not all items listed. USA items may not be valid for international sale.

Section 16: OTHER INFORMATION - continued

NFPA:

Health – None
Flammability – Non-flammable

Stability – Stable
Special - None

Acronyms

NTP	National Toxicology Program	IARC	International Agency for Research on Cancer
OSHA	Occupational Safety and Health Administration	CPSC	Consumer Product Safety Commission
TSCA	Toxic Substances Control Act	DSL	Domestic Substances List

Prepared / Revised By: Sunshine Makers, Inc., Regulatory Department.
This SDS has been revised in the following sections: Clarification on hazards in section 2, expanded transparency in section 3, revised layout in section 9, 14 & 16, added statement in section 15.

APPENDIX C

Personal Protective Equipment (PPE) Management Program

PERSONAL PROTECTIVE EQUIPMENT
MANAGEMENT PROGRAM

CORPORATE HEALTH AND SAFETY DIRECTOR	**:**	**Brian Hobbs, CIH, CSP**
EFFECTIVE DATE	**:**	**01/2019**
REVIEW DATE	**:**	**03/2024**
REVISION NUMBER	**:**	**5**

TABLE OF CONTENTS

1. PURPOSE

Roux Associates, Inc. and its affiliated companies, Roux Environmental Engineering and Geology, D.P.C., and Remedial Engineering (collectively, “Roux”) has instituted the following program to establish guidelines for the selection of personal protective equipment (PPE) for use by Roux personnel performing field activities in hazardous environments. PPE is not meant to be a substitute for engineering, work practice, and/or administrative controls, but PPE should be used in conjunction with these controls to protect employees in the workplace. Clothing, body coverings, and other accessories designed to prevent worker exposure to workplace hazards are all types of PPE. To ensure adequate PPE employee-owned PPE is evaluated on a case-by-case basis to insure its adequacy, maintenance and sanitation.

2. SCOPE AND APPLICABILITY

These guidelines apply to all PPE selection decisions to be made in implementing the Roux program. The foundations for this program are the numerous Occupational Health and Safety Administration (OSHA) standards related to PPE cited in 29 CFR 1910 Subpart I, 29 CFR 1926 Subpart E, and the hazardous environment work employee protection requirements under the OSHA Hazardous Waste Operations and Emergency Response (HAZWOPER) standard at 29 CFR 1910.120 and 1926.65. To ensure hazard assessments are documented, the levels of protection, types of protection, and tasks requiring protection are covered in site-specific Health and Safety Plans (HASPs) and Job Safety Analyses (JSAs).

3. PROCEDURES

Due to the varied nature of site activities and the different potential hazards associated with different sites, several aspects must be considered when selecting PPE. The following text describes PPE selection logic and provides guidelines and requirements for the appropriate selection and use of PPE.

3.1 Introduction

To harm the body, chemicals must first gain entrance. The intact skin and respiratory tract are usually the first body tissues that are exposed to chemical contaminants. These tissues provide barriers to some chemicals but, in many cases, are damaged themselves or are highly permeable by certain chemical compounds. PPE, therefore, is used to minimize or eliminate chemical compounds from coming into contact with these first barrier tissues.

Proper PPE selection is essential in preventing exposures. The Project Manager (PM) or health and safety personnel making the selection will have to consider several factors. The level of protection, type, and kind of equipment selected depends on the hazardous conditions. In some cases, additional selection factors include cost, availability, compatibility with other equipment, and performance. All these factors must be accurately assessed before work can be safely carried out.

3.1.1 Training

Training shall be provided to all field-based employees in properly using and caring for PPE. Training shall include, but not be limited to, the initial 40-hour HAZWOPER training, annual 8-hour HAZWOPER refresher training, and site-specific PPE training. The training program includes when PPE is necessary, what types of PPE are required; how to don, doff, adjust, and wear PPE; the limitations of PPE; the proper care, maintenance, useful life, signs of PPE failure and emergency procedures to follow in the event of PPE failure and disposal of PPE. In addition, retraining shall be conducted when workplace changes require a change in PPE when an employee demonstrates a lack of knowledge or improper use of PPE is identified.

3.2 Types of PPE

The type and selection of PPE must meet certain general criteria and requirements as required under OSHA 29 CFR 1910.132 (General Industry) and 1926.95 (Construction). In addition to these general requirements, specific requirements and specifications exist for some types of PPE that form the basis of the protective clothing scheme. All manufacturer's recommendations for PPE care and use shall be followed. All PPE shall be maintained in a sanitary and reliable condition. Additionally, proper fit and size shall be evaluated to ensure adequate employee protection. Should PPE become defective, it shall be immediately removed from service and discarded.

The following is a list of the common types of specific PPE and the specific requirements for the PPE type, where applicable:

1. Hard Hats - Regulated by 29 CFR 1910.135 and 1926.100; and specified in ANSI Z89.1.
2. Face Shields and Safety Glasses - Regulated by 29 CFR 1910.133 and 1926.102; and specified in ANSI Z87.1.
3. Respiratory Protection - Regulated by 29 CFR 1910.134 and 1926.103.
4. Hand Protection - Regulated by 29 CFR 1910.138
5. Foot Protection - Regulated by 29 CFR 1910.136 and 1926.96; and specified in ANSI Z41.1.
6. Protective Clothing (e.g., fully encapsulated suits, aprons) - Specified in NFPA 1991/1992/1994.

3.2.1 PPE Inspection, Cleaning Maintenance, and Storage

The Office Health and Safety Manager (OHSM) or their designee is responsible for procuring PPE, in accordance with this management program. Single-use/disposable PPE should be purchased and used whenever practicable.

3.2.1.1 PPE Inspection

Roux employees must inspect PPE regularly, before and after each use, to check for defects and damage. Garments and other PPE in central storage must be inspected at least annually or as recommended by the manufacturer by the OHSM, Equipment Manager and/or their designee. Defective or damaged equipment must be tagged as out-of-service, immediately removed from the work site and discarded.

3.2.1.2 PPE Cleaning and Maintenance

All Roux employees are responsible for routine cleaning of their assigned PPE. Decontamination of PPE is addressed within Roux's Site Control and Decontamination Program as well as specified within site-specific health and safety plans. As appropriate, Roux employees should be issued single-use PPE when practicable to minimize the requirement for decontamination. When performing routine cleaning of reusable PPE:

- Always follow the manufacturer's recommendations to avoid damaging the PPE. For example, some cleaning solutions compromise the integrity of protective helmets' shells.
- Clean and maintain PPE according to the manufacturer's recommendations. Before being re-issued, PPE should be thoroughly sanitized.
- Disassemble, wash, and sanitize reusable respirators after each use, refer to Roux's Respiratory Protection Management Program.

Employees are not authorized to repair PPE without prior approval from the Health and Safety Department. Reusable PPE may require maintenance by the manufacturer to maintain integrity and certification. Many manufacturers specify which repairs, if performed by the end-user, will void product warranty, therefore Roux employees are not typically authorized to perform such maintenance or repairs.

3.2.1.3 PPE Storage

Certain equipment failures can be directly attributed to improper storage. The OHSM or Equipment Manager (or another designated person) is responsible for implementing procedures for appropriate PPE storage, for equipment that is centrally stored. Both central storage and dedicated PPE provided to employees should be stored using the following:

- Store goggles and safety glasses in protective cases.
- Store PPE (such as helmets, boots, etc.) in clean, dust-proof containers or bags out of direct sunlight.
- PPE should ideally be stored under climate-controlled conditions. PPE, stocked gear bags, and/or go-kits should not be stored in hot, cold, or other extreme environmental conditions, and they should not be stored in vehicles (government-owned or rentals) for even short periods of time. Do not store helmets on the rear window shelf of a vehicle.
- Store different kinds of clothing and gloves separately to prevent errors in selection.
- Hang or fold protective clothing in accordance with manufacturers' recommendations.
- Never store contaminated PPE near new protective clothing or street clothing. Potentially contaminated, reusable clothing must be stored (usually bagged) away from new PPE, in a well-ventilated area, with good air flow around each item, until the garment is decontaminated or disposed.
- See Roux’s Respiratory Protection Management Program for detailed procedures on storing respirators.

3.3 Fitting, Donning and Doffing PPE

Roux shall provide appropriately sized PPE for Roux employees. Improper fitting such as tight-fitting garments, can tear, especially at the knees, crotch, shoulders, back, and elbows due to movement. Protective clothing that is too large can easily snag and/or limit a user’s dexterity. The Roux PM shall ensure site/project-specific PPE is kept in a sufficient stock of appropriately sized PPE (e.g., Level C ensembles). The OHSM, Equipment Manager and/or their designee shall ensure a sufficient stock of appropriately sized PPE is maintained in central storage locations.

The Site Supervisor (SS)/Site Health and Safety Officer (SHSO) is responsible for ensuring that site-specific procedures for donning and doffing PPE are incorporated into site-specific HASPs. Donning and doffing procedures may differ depending on the type of PPE and clothing (e.g., Level D, Modified Level D, Level C) utilized. Figures 1-4, provide examples of procedures that can be used to don and doff Levels A through D and are provided as a reference. Site-specific conditions may warrant adjustments to such procedures. Consult the CHSD for additional information.

Site-specific donning and doffing procedures should include the use of an assistant where necessary. Donning and doffing certain types of PPE without assistance could risk PPE failure or damage. Care must be taken to prevent the spread of contaminants on the PPE. Decontamination procedures should limit the potential for cross contamination and may include gross decontamination of outer boots, gloves, and suits as necessary to prevent tracking of contaminants into the contamination reduction zone (CRZ) and clean zone(s).

3.4 Controlling Hazards Associated with PPE Use

PPE use can pose potential health and safety hazards, which range from minor discomfort to life-threatening height stroke. The magnitude of the potential hazard can vary and will depend on various factors, including an individual's fitness level, the type of PPE worn, the work demands, individual work practices, duration of work and environmental conditions. The use of PPE can also lead to reduced efficiency and work performance.

Among hazards associated with PPE use, heat stress emerges as a prevalent and significant hazard. Particularly, the use of substantial and/or impermeable attire, such as heavy coveralls, Tyvek suits, splash suits, or Level A or B suits, alongside strenuous work, amplifies the risk of heat stress. Regular monitoring for indications of heat stress is imperative for workers operating in such conditions. Roux's Heat Illness Prevention Program lays out requirements for signs and symptoms as well as preventative measures to mitigate the potential for heat illness. In addition, cold environments can pose adverse risk, such examples include use of non-insulated steel-toe safety shoes in frigid conditions which has the potential to increase the risk of frostbite, while safety gloves worn for chemical protection may inadequately insulate hands from the cold.

It is the responsibility of Project Teams to integrate site-specific protocols to manage PPE hazards into such site-specific HASPs. These protocols can encompass considerations like work/rest ratios, crew rotations, and other accommodations for exceptionally demanding conditions.

The following measures are recommended for controlling hazards posed by PPE use:

- Prioritize through the hierarchy of controls with a focus on elimination, substitution, engineering, work practice and administrative control implementation rather than sole reliance on PPE. PPE shall be considered the last line of worker protection.
- Workers should maintain physical fitness to be able to withstand the potential physical strain of PPE use. A physically fit individual will endure less physiological strain, manifesting in a lower heart rate, reduced body temperature (indicating diminished retained body heat), more effective sweating, slightly lower oxygen consumption, and carbon dioxide production. Furthermore, acclimatization to extreme environmental conditions, such as high temperatures, can influence work performance and physical capacity.
- Understand the symptoms of PPE failure. Workers encountering any of these symptoms while donning PPE should promptly notify their onsite SHSO and/or SS:
    - Perception of odors when wearing a respirator
    - Skin irritation
    - Acute discomfort
    - Difficulty breathing
    - Unusual fatigue
    - Dizziness
    - Inability to see, hear, or speak clearly
    - Uncomfortable restriction of movement
    - Rapid pulse, nausea, or chest pain
- Implement a buddy system. Especially in situations where there is a need for increased level of protection (e.g. Level A-C) workers should work in pairs or teams, and are instructed to monitor the integrity of their team/partners gear and remain alert for symptoms of PPE failure.

3.5 PPE Selection

For site-specific work, the Project Manager in consultation with the Health and Safety Department has overall responsibility for coordinating the selection and distribution of PPE to field staff and for ensuring that the selected PPE is appropriate for the site-specific hazards. Generally speaking Roux employees are not engaged in emergency response or perform work at uncontrolled hazardous waste sites, if the case the CHSD shall be made aware of the work and consult with the Project Team on appropriate PPE selection. Most work falls under environmental sampling of low concentration water/soil/perimeter air. Therefore work is carried out in Level D PPE. Upgrades would be based on more information as it becomes available. The United States Environmental Protection Agency (EPA) has created Guidelines for PPE Ensemble Selection to assist workers in selecting PPE ensembles for specific activities and tasks and determining which ensembles and air monitoring equipment should be used to address specific chemicals. Guidelines to Ensembles for Specific Activities/Tasks Where Chemical Exposure is Possible is provided as a reference as Appendix A.

3.6 Protective Clothing Selection Criteria

3.6.1 Chemicals Present

The most important factor in selecting PPE is the determination of what chemicals the employee may be exposed to. The number of chemicals on field investigations may range from a few to several hundred. The exact chemicals or group of chemicals present at the site (certain groups tend to require similar protection) can be determined by collecting and analyzing air, soil, water, or other site media samples. When data are lacking, research into the hazardous materials used or stored at the site can be used to infer potential chemical exposures on the site.

The most appropriate clothing shall be selected once the known or suspected chemicals have been identified and considered based on the type of work to be performed.

Protective garments are made of several different substances for protection against specific chemicals. There is no universal protective material. All will decompose, permeate, or otherwise fail to protect under given circumstances. Fortunately, most manufacturers make guides to using their products (i.e., Dupont’s Tyvek™ Permeation Guide). These guides are usually for gloves and coveralls and typically provide information regarding chemical degradation rates (failure of the material to maintain structural integrity when in contact with the chemical) and may provide information on the permeation rate (whether or not the material allows the chemical to pass through). When permeation tables are available, they shall be used with degradation tables to determine the most appropriate protective material for the specific chemical hazard(s).

During most site work, chemicals are usually in mixed combinations, and the protective materials are not in continuous contact with pure chemicals for long periods; therefore, the selected material may be adequate for the particular chemical of most concern and type of work being performed, yet not the "best" protecting material for all site chemicals and activities. Selection shall depend upon the most hazardous chemicals based on their hazards and concentrations. Sometimes, layering (i.e., using several layers of protective materials) affords the best protection.

3.6.2 Concentration of the Chemical(s)

One of the major criteria for selecting protective material is the concentration of the chemical(s) in air, liquid, and solid state. Airborne and liquid chemical concentrations should be compared to the OSHA standards and American Conference of Governmental Industrial Hygienists (ACGIH) and National Institute for Occupational Safety and Health (NIOSH) guidelines to determine the level of skin or other absorptive surface (e.g., eyes) protection needed. While these standards are not designed specifically for skin exposed directly to the liquid, they may provide skin designations indicative of chemicals known to have significant skin or dermal absorption effects. For example, airborne levels of PCBs on-site may be low because they are not very volatile, so the inhalation hazard may be minimal; however, PCB-containing liquid coming in direct contact with the skin may cause overexposure. Thus, PCBs have been assigned a skin designation in the OSHA and ACGIH exposure limit tables.

3.6.3 Physical State

The characteristics of a chemical may range from nontoxic to highly toxic, depending on its physical state. Inorganic lead in soil would not be considered toxic to site personnel unless it became airborne since it is generally not absorbed through the intact skin. However, organic lead in a liquid could be readily absorbed through the skin. Soil is frequently contaminated with hazardous materials. Concentrations will vary from a few parts per million to nearly one hundred percent by volume. The degree of hazard depends on the type of soil and concentration of the chemical. Generally speaking, "dry" soils that have not become airborne do not pose a hazard to site personnel if they take minimal precautions, such as wearing lightweight gloves.

3.6.4 Length of Exposure

The length of time a material is exposed to a chemical increases the probability of a breakthrough. Determinations of actual breakthrough times for short-term exposures indicate that several materials that would be considered inadequate under long-term exposures can be used. Different materials that would be considered inadequate under long-term exposures can be used. It should be kept in mind that during the manufacturer's permeation testing, a pure (100% composition) liquid is usually placed in direct contact with the material, producing a worst-case situation.

3.6.5 Abrasion

When selecting protective clothing, the job the employee is engaged in must be taken into consideration. Persons moving drums or performing other manual tasks may require added protection for their hands, lower chest, and thighs. Using leather gloves and a heavy apron over other normal protective clothing will help prevent damage to the normal PPE and thus reduce worker exposures.

3.6.6 Dexterity

Although protection from skin and inhalation hazards is the primary concern when selecting PPE, the ability to perform the assigned task must be maintained. For example, personnel cannot be expected to perform work that requires fine dexterity if they must wear thick gloves. Therefore, the PPE selection process must consider the task being performed and provide PPE alternatives or techniques that maintain dexterity while still protecting the worker (e.g., wearing tight latex gloves over more bulky hand protection to increase dexterity).

3.6.7 Ability to Decontaminate

If disposable clothing cannot be used, the ability to decontaminate the materials selected must be taken into consideration. Once a chemical makes contact with the material, the PPE must be cleaned before reusing it. If the chemical has completely permeated the material, the clothing cannot be adequately decontaminated, and the material should be discarded.

3.6.8 Climactic Conditions

The human body works best with few restraints from clothing. Protective clothing adds a body burden by increasing weight, restricting movement, and preventing the body's natural cooling process. In severe situations, a modified work program must be used.

Some materials act differently when they are very hot and very cold. For example, PVC becomes almost brittle in frigid temperatures. If there are any questions about the stability of the protective materials under different conditions, the manufacturer should be contacted before using PPE in the field.

3.6.9 Work Load

Like climactic conditions, the type of work activity may affect work duration and personnel's ability to perform certain tasks. Similarly, the amount of protective materials a person wears will affect their ability to perform certain tasks. For example, a person in a total encapsulating suit, even at 72˚F, cannot work for more than a short period of time without requiring a break.

The work schedule should be adjusted to maintain the health of the employees. Modified work practices may include allowing more time for individual job tasks and implementing work/rest cycles per NIOSH and ACGIH thermal stress recommendations. Special consideration should be given to the selection of clothing that protects the worker and adds the least burden when personnel are required to perform strenuous tasks. Excessive bodily stress frequently represents the most significant hazard encountered during fieldwork.

3.6.10 Types of Protective Materials

1. Cellulose or Paper: suitable for nuisance dust and coarse fibers.
2. Natural and Synthetic Fibers
   a. Tyvek™: suitable small-sized hazardous particles, including lead, asbestos, and mold.
   b. Tychem™: is suitable for a variety of hazards, from light liquid splashes to heavy exposures to industrial chemicals and agents.
   c. Nomex™: is suitable for flame-resistance, radiation resistance, acids, alkalis, fluorocarbon refrigerants (CFCs), and non-polar solvents.
3. Elastomers
   a. Polyethylene: suitable for polar substances and solvents.
   b. Saran™ : suitable for flame-resistance, acids, alkalis, oils, and organic solvents.
   c. Polyvinyl Chloride (PVC): suitable for alcohols, oils, inorganic acids, alkalis, and salts.
   d. Neoprene: suitable for polar/non-polar substances, petroleum mixtures, and ≤ 200 F heat resistance.
   e. Butyl Rubber: suitable for polar substances and solvents.
   f. Viton: suitable for non-polar substances, petroleum mixtures, and ≤ 200 F heat resistance.
   g. Nitrile: suitable for polar/non-polar substances and petroleum mixtures.

3.7 Protection Levels

3.7.1 Level A Protection

Level A protection (a fully encapsulated suit) is used when skin hazards exist or when no known data positively rule out skin and other absorption hazards. Per the Roux Respiratory Protection Management

Program, Roux employees are not authorized to enter an IDLH atmosphere; therefore, the program does not allow supplied air respirators (SARs) or self-contained breathing apparatus (SCBA). At no time will Level A work be performed without the consent of the CHSD and OM.

The following conditions warrant the use of Level A protection:

- Hazardous substances have been identified and require the highest level of protection for skin, eyes, and the respiratory system;
- The atmosphere contains less than 19.5% oxygen or an atmosphere immediately dangerous to life and health (IDLH) that have not been ruled out;
- Site operations involve a high potential for splash, skin immersion, or exposure to suspected skin hazards;
- Direct-reading instruments indicate high levels of unidentified but potentially hazardous vapors or gases in the air (e.g., Total atmospheric readings on the Photoionization Detector (PID), Flame Ionization Detector (FID), and similar instruments indicate 500 to 1,000 ppm of unidentified substances); and
- Direct-reading instruments are not available to test the air and suspected highly toxic substances may be present.

It may be necessary to base the decision to use Level A protection on indirect evidence. Other conditions that may indicate the need for Level A protection include:

- Confined spaces;
- Sites containing known skin hazards;
- Sites with no established history to rule out skin and other absorption hazards;
- Site exhibiting signs of acute mammalian toxicity (e.g., dead animals, illnesses associated with past entry into the site by humans);
- Sites at which sealed drums of unknown materials must be opened;
- Visible indicators such as leaking containers or smoking chemical fires; and
- Extremely hazardous substances (e.g., cyanide compounds, concentrated pesticides, Department of Transportation Poison "A" materials, suspected carcinogens, and infectious substances) are known or suspected to be present, and skin contact is possible.

Table 1: Recommended Level A Ensemble Components

Component	Type	Manufacturer / Recommended Material	Notes
Respirator	Positive-pressure full- facepiece SCBA or positive-pressure supplied-air respirator with escape SCBA[1]	NIOSH approved respirator	See Roux's Respiratory Protection Program. Roux employees are not approved to utilize Supplied Air (SAR) and/or Self-contained breathing apparatus (SCBA).
Suit	Totally encapsulated chemical- and vapor-protective suit	DuPont® Tychem™ or Responder CSM™	Other material types may be substituted based on known contaminants.
Inner Gloves	Light weight	Nitrile, Neoprene, PVC, or Viton®	Other material types may be substituted based on known contaminants.
Outer Gloves	Integral part of suit	See Appendix A for additional information	Confirm chemical performance rating for suspected contaminants. Glove material may have different performance ratings than suit material. All fully-encapsulating suit materials must be compatible with substances involved.
Inner Boot	Integral Part of Suit	-	-
Outer Boot	HazMat boot[2]	–	Confirm chemical performance rating of outer boot for suspected contaminants. Provides slip/abrasion resistance.
Hard Hat	Standard[3]	-	-

[1] Must be NIOSH approved.
[2] Must meet NFPA 1991/NFPA 1994 requirements depending on the site hazard assessment.
[3] Must comply with the applicable ANSI standard.

3.7.2 Level B Protection

Level B protection is utilized when the highest level of respiratory protection is needed, but hazardous material exposure to the few unprotected areas of the body is unlikely. At no time will Level B work be performed by Roux personnel without the consent of the CHSD and OM.

The following conditions suggest a need for Level B protection:

- The type and atmospheric concentration of toxic substances have been identified, and they require the highest level of respiratory protection;

- IDLH atmospheres where the substance or concentration in the air does not present a severe skin hazard;
- The type and concentrations of toxic substances do not meet the selection criteria permitting the use of air-purifying respirators and
- It is highly unlikely that the work being done will generate high concentrations of vapors, gases, particulates, or splashes of materials that will affect personnel's skin.

Table 2: Recommended Level B Ensemble Components

Component	Type	Manufacturer / Recommended Material	Notes
Respirator	Positive-pressure full- facepiece SCBA or positive-pressure supplied-air respirator with escape SCBA[1]	NIOSH approved respirator	See Roux's Respiratory Protection Program. Roux employees are not approved to utilize Supplied Air (SAR) and/or Self-contained breathing apparatus (SCBA).
Suit	Chemical-resistant clothing (liquid-splash protective suit with integral boot and hood)[2]	DuPont® Tychem® CPF 3	Other material types may be substituted based on known contaminants.
Inner Gloves	Light/medium weight	Nitrile, Neoprene, PVC, Viton®, or PE/EVAL	Other material types may be substituted based on known contaminants.
Outer Gloves	Medium/heavy weight	Butyl MIL-G12223, Nitrile, Neoprene, PVC, Viton®, PE/EVAL, or heavy weight Nitrile or Neoprene	Confirm chemical performance rating. Other material types may be substituted based on known contaminants.
Inner Boot	Safety work boot	–	Other boot types may be substituted based on known contaminants and physical hazards. Puncture resistant shanks may be required.
Outer Boot	Heavy weight Latex booties or outer boots[2]	Latex booties are used to protect suit for light duty applications. NFPA-rated outer boots may be required based on anticipated site conditions and tasks.	Other outer boot coverings may be substituted based on known contaminants/anticipated tasks.
Hard Hat	Standard[3]	-	-

[1] Must be NIOSH approved.
[2] Must meet NFPA 1991/NFPA 1994 requirements depending on the site hazard assessment.
[3] Must comply with the applicable ANSI standard.

3.7.3 Level C Protection

Level C protection is utilized when skin and respiratory hazards are well defined, and the criteria for using negative pressure respirators have been fulfilled (i.e., known contaminants and contaminant concentrations, acceptable oxygen levels, approved filter/cartridge available, known cartridge service life, etc.). Level C protection may require an emergency escape respirator during specific initial entry and site reconnaissance situations or when applicable after that.

Table 3: Recommended Level C Ensemble Components

Component	Type	Manufacturer / Recommended Material	Notes
Respirator	Full-face air-purifying respirator with appropriate cartridge[1]	NIOSH approved respirator	See Roux's Respiratory Protection Program for information about the brand, model, acceptable configurations, and specific care instructions for the standard issue respirator. Half-faced respirators may be donned if hazard assessment warrants.
Suit	Puncture/tear resistant suit material with boot and hood[2]	DuPont® Tychem® CPF 2/CPF 3 or Saranex	Other material types may be substituted based on known contaminants, if considered more appropriate.
Inner Gloves	Light weight	Nitrile, Neoprene	Other material types like Neoprene, PVC, Viton®, or PE/EVAL may be substituted based on known contaminants, if considered more appropriate.
Outer Gloves	Medium/heavy weight	Butyl, Nitrile, or other work glove	Confirm chemical performance rating. Other material types may be substituted based on known contaminants, if considered more appropriate.
Inner Boot	Safety work boot	–	Other boot types may be substituted based on known contaminants and physical hazards. Puncture resistant shanks may be required.
Outer Boot	Heavy weight Latex booties or outer boots[2]	Latex booties are used to protect suit for light duty applications. NFPA rated outer boots may be required based on anticipated site conditions and tasks.	Other outer boot coverings may be substituted based on known contaminants.
Hard Hat	Standard[3]	-	-
Eye Protection	Safety glasses/goggles[3],[4]	-	-

1 Must be NIOSH approved.
2 Must meet NFPA 1991/NFPA 1994 requirements depending on the site hazard assessment.
3 Must comply with the applicable ANSI standard.
4 In the case a ½ face respirator is worn eye protection is required.

3.7.4 Level D Protection

Level D is the basic work uniform. Level D is worn when the atmosphere contains no known hazard. Work functions preclude splashes, immersion, potential for inhalation, or direct contact with hazard chemicals. For most Roux field jobs Level D is the standard minimum level of protection worn.

Table 4: Recommended Level D Ensemble Components

Component	Type	Manufacturer / Recommended Material	Notes
Respirator	None	-	-
Suit	Coveralls, street clothes, or disposable Tyvek suit	–	Other types may be substituted as appropriate.
Inner Gloves	N/A		
Outer Gloves	As appropriate for physical hazards and for comfort	–	-
Boot	Safety work boot	–	Roux's standard safety boot is 6", steel/composite safety toe, and electrical hazard (EH) rated.
Outer Boot Covering	As appropriate	–	–
Hard Hat	Standard[3]	-	-
Eye Protection	Safety glasses/goggles[3]	-	-
High Visibility Clothing	High Visibility Vest /Jacket[3]	-	ANSI Class 2 Safety Vests/Jackets are the standard. Class 3 Safety vests/jackets shall be worn in worksites with 50+ MPH traffic.
Hearing Protection	Ear muffs/plugs	-	Workers exposed to excessive noise shall don hearing protection. Refer to Roux's Hearing Conservation Program for more information.

[1] Must be NIOSH approved.
[2] Must meet NFPA 1991/NFPA 1994 requirements depending on the site hazard assessment.
[3] Must comply with the applicable ANSI standard.

3.7.5 Level E Protection

Level E protection is used when radioactivity above 10 millirems per hour (mrems/hr) is detected at the site. Personal protective equipment for Level E includes:

- Coveralls;
- Air purifying respirator (i.e., P100 or equivalent);
- Time limits on exposure;
- Appropriate dermal protection for the type of radiation present, and

- Radiation dosimetry and ambient monitoring.

3.7.6 Additional Considerations

Fieldwork will contain a variety of situations due to chemicals in various concentrations and combinations. These situations may be partially ameliorated by following the work practices listed below:

1. Foot protection is needed on every site. If the ground to be worked on is contaminated with liquid, and it is necessary to walk in the chemicals, some sort of protective shoe coverings or "booties" can be worn over the boots. Shoe coverings should be designed with soles to help prevent slips. Using disposable shoe coverings when contacting liquid contamination can on and reduce overall decontamination requirements. If non-liquids are to be encountered, a Tyvek™ bootie could be used. The advantage of booties is questionable if the ground contains any sharp objects. Boots should be worn with either cotton or wool socks to help absorb perspiration.
2. If the site requires hard hats, chin straps should be used if a person will be stooping over where his/her hat may fall off. Respirator straps should not be placed over the hard hats, as this will affect the respirator’s fit.

   Some types of protective materials conduct heat and cold readily. In cold conditions, natural material clothing should be worn under protective clothing. Protective clothing should be removed before allowing a person "to get warm.” Applying heat, such as with a space heater, to the outside of the protective clothing may drive contaminant permeation. In hot weather, under clothing will absorb sweat. It is recommended that workers use all cotton undergarments.
3. Body protection should be worn and taped to prevent anything from running into the top of the boot. Gloves should be worn and taped to prevent substances from entering the top of the glove. Duct tape is preferred, but masking tape can be used. When aprons are used, they should be taped across the back for added protection. However, this should be done so that the person has mobility.
4. Atmospheric conditions such as precipitation, temperature, wind direction, humidity, wind velocity, and pressure determine the behavior of contaminants in air or the potential for volatile materials to become airborne. These parameters should be considered in determining the need for and the level of protection.
5. A program must be established for periodic air monitoring during site operations. Without an air monitoring program, any changes to air quality would go undetected and might jeopardize on-site personnel. Monitoring can be done with various types of air pumps and filtering devices, followed by laboratory analysis of the filtration media, personnel dosimeters, and periodic walk-throughs by personnel carrying real-time direct-reading survey instruments.
6. For operations in the exclusion zone, different levels of protection may be selected, and various types of chemical-resistant clothing may be worn. This selection should be based on the job function, reason for being in the area, and the potential for skin contact with, or inhalation of, the chemicals present.
7. Escape masks must be readily available when levels of respiratory protection do not include an SCBA and the possibility of an IDLH atmosphere exists. The use and placement of escape masks should be made on a case-by-case basis. Escape masks should be strategically located at the site in areas with higher potential for vapors, gases, or particulates.

3.8 Decontamination of PPE

Roux prefers the use of single use PPE to minimize the requirement for significant decontamination. The following procedures shall be considered should a field project require the need for decontamination of PPE. Roux has also developed a Site Control and Decontamination Management Program.

3.8.1 Site-Specific Decontamination Plans

The Project Manager (or another authorized individual) is responsible for formulating the site-specific PPE decontamination plan as an integral part of the Health and Safety Plan (HASP). The SHSO/SS' responsibilities include ensuring the plan's implementation and adapting it as site conditions evolve. Refer to Roux's Site Control and Decontamination Management program for additional requirements.

The decontamination plan, often created in conjunction with PPE selection, must be established prior to workers entering potentially contaminated areas. The plan should address the following key aspects:

- Decontamination Hazard Evaluation and Risk Assessment: Assessing risks associated with decontamination processes.
- PPE for Decontamination Line Assistants: Specifying appropriate PPE for personnel involved in decontamination.
- Roles and Responsibilities During Decontamination: Defining tasks and duties during the decontamination process.
- Layout and Quantity of Decontamination Stations: Determining the number and arrangement of decontamination stations, along with the designated PPE decontamination procedures at each station.
- Decontamination Equipment: Identifying the necessary equipment for effective decontamination.
- Decontamination Methods: Describing the methods and protocols for decontaminating personnel and equipment.
- Preventing Contamination of Clean Areas: Outlining procedures to prevent contamination of uncontaminated zones.
- Minimizing Contact with Contaminants During CPC Removal: Providing guidelines to reduce wearer exposure during the removal of Chemical Protective Clothing (CPC).
- Disposal Procedures for Inadequately Decontaminated Clothing and Equipment: Ensuring proper disposal practices for items that have not been adequately decontaminated.

The initial decontamination plan, which is developed in conjunction with the initial site hazard assessment, should be based on worst-case assumptions about the extent and type of contamination.

3.8.2 Emergency Decontamination of PPE

The designated SHSO/SS (or another authorized individual) assumes responsibility for addressing emergency decontamination within the site-specific Health and Safety Plan (HASP). Emergency decontamination may become necessary due to events such as fires, explosions, sudden violent storms, or medical emergencies. The emergency decontamination plan must clearly delineate emergency egress routes, as well as procedures for both decontamination and egress.

Some key points to consider regarding emergency decontamination.

- Immediate Notification: The SHSO/SS (or their designated counterpart) must be promptly informed of any circumstances requiring emergency decontamination. Additionally, they are accountable for tracking all personnel during the process.
- Urgent Medical Treatment: If urgent medical attention is necessary, decontamination of PPE may be delayed until the victim's condition stabilizes.
- Balancing Priorities: When feasible, decontamination should occur without hindering essential first aid. However, if a worker is exposed to an extremely toxic or corrosive substance, immediate decontamination is crucial to prevent severe injury or fatality.

- Heat-Related Illness: In cases of heat-related illness, protective clothing must be promptly removed (refer to Roux's Heat Illness Prevention Program).

Emergency Facilities:

- For workers potentially exposed to corrosive materials, quick drenching or flushing facilities must be provided in accordance with 29 CFR 1910.151(c) and 1926.50(g).
- Similarly, if workers face other hazards (such as splash or dust) that could harm the eyes or body, readily accessible wash stations are essential. These stations should be properly located and maintained, including regular water changes, as per the manufacturer's instructions.

3.8.3 Protection of Decontamination Line Assistants

Should work require a decontamination corridor the following shall be used as guidance. The SHSO/SS (or other designated person) must for ensuring that decontamination line assistants receive appropriate PPE and addressing their protection within the site-specific HASP. Key zones—namely, the Exclusion Zone (EZ), Contamination Reduction Zone (CRZ), and Clean Support Zone—must be clearly marked both in the field and within the site-specific HASP. The following should be considered when preparing for protection of decontamination line assistants.

1. Task Hazard Analysis: A thorough analysis must be conducted for line assistants to determine the optimal PPE level required. Factors influencing this decision include:
    - Expected or Visible Contamination on Responders
    - Type of Contaminant and associated respiratory and skin hazards
    - Total Vapor/Gas Concentrations in the CRZ
    - Presence of Particulates and specific inorganic or organic vapors in the CRZ
    - Results of Wipe Tests (refer to Section 5.4)
    - Slope and Configuration of the CRZ
2. PPE Levels: Depending on the situation:
    - Line assistants may need to wear the same PPE level as workers in the EZ.
    - Alternatively, line assistants may be adequately protected by using PPE one level lower (e.g., wearing Level C protection while decontaminating workers who are wearing Level B)."

3.8.4 Procedures to Minimize PPE Contamination

Proper work practices and procedures should be implemented at sites to minimize the potential for contact with chemicals of concern while onsite. The following guidance should be considered when developing site specific procedures:

- Opt for single-use Personal Protective Equipment (PPE) when feasible to minimize decontamination needs.
- Ensure complete sealing of PPE closures and interfaces, including pockets, zippers, and other potential openings.
- Position gloves and boots underneath the sleeves and pant legs of outerwear to reduce exposure.
- Place hoods outside the collar if they are not already attached.
- Utilize disposable outerwear and equipment when suitable to facilitate easy disposal and reduce decontamination efforts.
- Secure all junctions with tape to block contaminants from entering gloves, boots, jackets, and suits.

- Adopt work practices that limit contact with hazardous substances, such as avoiding unnecessary exposure.
- Employ remote techniques for sampling, handling, and opening containers, like using drum grapples and pneumatic impact wrenches.
- Store monitoring and sampling devices in bags designed with openings for sample ports and sensors.
- Cover contaminant sources with plastic sheeting or overpacks to shield PPE from contamination.

3.8.5 PPE Disposal

The PM in coordination with the field team shall ensure the safe disposal of all wastes generated from PPE use. PPE must be placed in appropriate containers, labeled, and prepared for disposal separately from other forms of waste. Refer to Roux's General Waste Corporate Management Program for further guidance.

APPENDIX A
EPA's
GUIDELINES TO ENSEMBLES FOR SPECIFIC ACTIVITIES/TASKS
WHERE CHEMICAL EXPOSURE IS POSSIBLE

GUIDELINES TO ENSEMBLES FOR SPECIFIC ACTIVITIES/TASKS WHERE CHEMICAL EXPOSURE IS POSSIBLE

IMPORTANT: READ FOOTNOTES AND ASSUMPTIONS/JUSTIFICATIONS PRIOR TO USING TABLE

Notes:

1. This table is for use by trained environmental professionals only. To use this table:
   a. Scan the activity description to find activities (bolded) that most closely matches those you plan to engage in.
   b. Review Hazard/Conditions section to make sure the hazards of the planned activity match those listed. Note the Required Work Practices and be ready to follow them.
   c. For those activities most likely to be conducted as part the response, select Targeted Minimum PPE (Personal Protective Equipment).
   d. Necessary equipment needs to be available and used unless other information becomes available which necessitates an upgrade or allows a downgrade in the protection level. The work area must be continuously re-evaluated to ensure workers have the proper safety equipment.
   e. When working in hazardous environments, workers must always be aware of their surroundings. In addition to this Table, workers entering these environments need to use “common sense” prior to proceeding.
2. These ensembles focus on chemical protection and may not be adequate for all hazards. This Table can be used as a starting point but does not circumvent proper evaluation by an industrial hygienist in appropriate situations. See Table 2 for more specific chemical agents.
3. Suits, gloves, boots listed in the Minimum PPE column will not be appropriate for all activities, hazards and conditions. The listings should be used as a guide only. Confirm PPE compatibility with specific chemical contaminants.
4. A comprehensive Task Hazard Analysis must be performed prior to final selection of ensembles/PPE material types.
5. Hardhat (Class A or C), safety glasses/other eye protection are typically required but may not be specified here. In noisy environments (above 85dB) hearing protection is required. In areas where there is traffic, heavy machinery, or other hazards involving worker visibility problems a Class 2 High Visibility Vest must be worn. Activities requiring vests include natural disaster responses, demolitions, and excavations.
6. PPE makes and models referenced in these tables are only suggestions. Other comparable, adequate makes and models may be used.

Activity Description	Hazards/Conditions	Targeted Minimum PPE
Emergency Response and/or Initial Entry/Assessment – Low Hazard Expected (Sites/Facilities): • Air and Radiation Monitoring Sweep • Visual Assessment • Note Taking • Photo-documentation	• Suspected low hazard based on site history/visual evidence. • No CBRN suspected. • No visible/suspected vapors. • No potential for IDLH atmosphere. • Unknown physical hazards. • Some site background information. • No intrusive work expected. • Low potential for chemical splash/contact (based on expected tasks/ known conditions). • **Required Work Practice:** Immediate PPE Change-out (i.e., gloves, etc.) upon contact with chemicals. • **Required Work Practice:** Must follow standard air monitoring protocol.	**Level B** (Downgrade/upgrade based on knowledge of contaminants and monitoring with PID/FID, radiation detector, LEL/O_2 per HASP/ SOSGs) **Respirator: Scott or MSA Full Face** **Suit Type:** [I]Tychem CPF-3 (with boot, hood)/ChemTape **Inner Glove:** [II]Nitrile (6 mil min recommended) **Outer Glove:** [II]Neoprene, Nitrile, (28 mil min recommended) **Outer Steel Toe Boot:** [IV]Tingley HazProof Model 82330 **or** **Steel Toe Boot Cover**: [V]Latex HazMaster Booty and rely on suit boot material for permeation protection. **Steel Toe/Steel Shank Boots:** ASTM F-2413/ANSI Z41 **DECON**: Dry or soap & water

Activity Description	Hazards/Conditions	Targeted Minimum PPE
Emergency Response and/or Initial Entry/Assessment of Unknown – Potential Moderate Hazard (Sites/Facilities): • Air and Radiation Monitoring Sweep • Visual Assessment • Note Taking • Photo-documentation	• Possible high hazard chemicals based on site history/visual evidence (spills, corrosion, industrial practices, etc.). • No CBRN suspected. • No visible/suspected vapors. • **No** reasonable potential for **IDLH** atmosphere. • Unknown physical hazards. • Little/ no site background information. • No intrusive work expected. • Low potential for chemical splash/contact. • **Required Work Practice:** Immediate PPE Change-out (i.e., gloves, etc.) upon contact with chemicals. • **Required Work Practice:** Must follow standard air monitoring protocol.	**Level B** (Downgrade/upgrade based on knowledge of contaminants and monitoring with PID/FID, radiation detector, LEL/O_2 per HASP/ SOSGs) **Respirator: Scott or MSA Full Face** **Suit Type:** [I]Tychem Responder (with boot, hood)/ChemTape **Inner Glove:** [II]Nitrile (6 mil min recommended) **Outer Glove:** [II]Neoprene, Nitrile, (28 mil min recommended) **Outer Steel Toe Boot:** [IV]Tingley HazProof Model 82330 **or** **Steel Toe Boot Cover**: [V]Latex HazMaster Booty and rely on suit boot material for permeation protection. **Steel Toe/Steel Shank Boots:** ASTM F-2413/ANSI Z41 **DECON**: Dry or soap & water

Activity Description	Hazards/Conditions	Targeted Minimum PPE
Emergency Response and/or Initial Entry/Assessment of Unknown - Suspected High Hazard (Sites/Facilities): • Air and Radiation Monitoring Sweep • Visual Assessment • Note Taking • Photo-documentation	• Potential for high hazard chemicals/ IDLH based on site history/visual evidence (visible/expected reactions, spills, vapors, fumes, smoke, known releases, etc.). • No CBRN suspected. • Potential for chemical reactions. • Unknown physical hazards. • Little/ no site background information or information suggesting high hazard. • Intrusive work possible. • Potential for chemical splash/contact. • **Required Work Practice:** Immediate PPE Change-out (i.e., gloves, etc.) upon contact with chemicals. • **Required Work Practice:** Must follow standard air monitoring protocol.	**Level A** (Downgrade/upgrade (Trelleborg, etc.) based on knowledge of contaminants and monitoring with PID/FID, radiation detector, LEL/O_2 per HASP/ SOSGs) **Respirator: Scott or MSA Full Face** **Suit Type:** Encapsulating [I]Tychem Responder/Responder CSM (with boot, hood, gloves)/ChemTape **Inner Glove:** [II]Nitrile (6 mil min recommended) **Outer Glove:** [II]Neoprene, Nitrile, (28 mil min recommended) **Outer Steel Toe/Steel Shank Boot:** [IV]Tingley HazProof Model 82330 and rely on suit boot material for permeation protection. (ASTM F-2413/ANSI Z41) **DECON**: Dry or soap & water: water source for emergency DECON; other DECON agents on hand.

Activity Description	Hazards/Conditions	Targeted Minimum PPE
Drum/Tank Sampling • Container opening • Continuous air monitoring • Product sampling	• Unknown chemicals. • No CBRN. • Potential splash hazard. • Physical hazard controls in place. • Assumes no initial hazardous atmosphere. • Ensure availability of water source for emergency DECON/shower/eyewash. • **Required Work Practice:** Immediate PPE Change-out (i.e., gloves, etc.) upon contact with chemicals. • **Required Work Practice:** Must follow standard air monitoring protocol.	**Level B** (Upgrade/Downgrade based on knowledge of contaminants and monitoring with PID/FID, radiation detector, LEL/O_2 per HASP/ SOSGs) **Respirator: Scott or MSA Full Face** **Suit Type:** [I]Tychem Responder (with boot, hood)/ChemTape **Inner Glove:** [II]Nitrile, Neoprene, Viton, PVC **Outer Glove:** [II]Heavy Duty Butyl, Nitrile, **Other:** ANSI Approved Splash Shield **Outer Steel Toe Boot:** [IV]Tingley HazProof Model 82330 **or** **Steel Toe Boot Cover**: [V]Latex HazMaster Booty and rely on suit boot material for permeation protection. **Steel Toe/Steel Shank Boots:** ASTM F-2413/ANSI Z41 **DECON:** Dry DECON or soap and water; water source for emergency DECON and eyewash suggested.

Activity Description	Hazards/Conditions	Targeted Minimum PPE
Hazardous Categorization Testing (**HAZCAT**) - Opening sample containers in controlled environment - Working with small sample quantities in well ventilated area - Conducting HAZCAT testing with appropriate lab equipment	- Assumes known chemical classes and site situation/background. - No CBRN suspected. - Assumes immediate suit removal if contaminated and frequent glove changes. - **Required Work Practice:** Immediate PPE Change-out (i.e., gloves, etc.) upon contact with chemicals. - **Required Work Practice:** Must follow standard air monitoring protocol.	**Level B** (Upgrade/Downgrade based on knowledge of contaminants and monitoring with PID/FID, radiation detector, LEL/O_2 per HASP/ SOSGs) **Respirator: Scott or MSA Full Face** **Suit Type:** [I]Tychem CPF4 (with hood, boot) **Inner Glove:** [II]Nitrile **Outer Glove:** [II]Viton or 4-H (use surgie over the 4-H for dexterity) **Outer Steel Toe Boot:** [IV]Tingley HazProof Model 82330 **or** **Steel Toe Boot Cover**: [V]Latex HazMaster Booty and rely on suit boot material for permeation protection. **Steel Toe/Steel Shank Boots:** ASTM F-2413/ANSI Z41 **DECON:** Dry or soap and water; water source for emergency DECON and eyewash suggested

Activity Description	Hazards/Conditions	Targeted Minimum PPE
Oil Spill Response/Recovery Operations – Fresh Product: - Recovery operations (vac truck, skimmers, boom deployment where direct contact expected) - Product sampling - Continuous air monitoring at/near source of spill	- Crude oil/diesel/kerosene/gasoline spill. - Assumes fresh/ongoing spill, close proximity to source. - Assumes early phase while evaporation of light organics, benzene/other aromatics is still occurring (24-48 hours or if spill is on-going). - Assumes down-wind location. - Continuous air monitoring required for %LEL, Organics, %O_2 (and H_2S as necessary for sour crude). - **Required Work Practice:** Immediate PPE Change-out (i.e., gloves, etc.) upon contact with chemicals. - **Required Work Practice:** Must follow standard air monitoring protocol.	**Modified Level C:** 1/2 face respirator w/safety glasses/goggles as needed for splash protection. Downgrade as appropriate based on air monitoring. **Respirator: Scott or MSA ½ Face** **Respirator Cartridge:** [III] Multi-Phase Cartridge (Scott 642 Multi-purpose; MSA with/GME P-100 or equivalent). **Suit Type:** [I]Tychem CPF4 w/boot [jet fuel use Tychem BR] **Inner Glove:** [II]Neoprene (for protection at DECON line only, not for prolonged contact) **Outer Glove:** [II]Viton-Butyl Rubber (assumes potential for direct contact with fresh material – based on benzene/aromatic constituents) SEE NEXT ROW FOR WEATHERED PRODUCT. **Outer Steel Toe Boot:** [IV]Tingley HazProof Model 82330 **or** **Steel Toe Boot Cover**: [V]Latex HazMaster Booty and rely on suit boot material for permeation protection. **Steel Toe/Steel Shank Boots:** ASTM F-2413/ANSI Z41 **DECON:** Dry DECON/ Soap and water as feasible

Activity Description	Hazards/Conditions	Targeted Minimum PPE
Oil Spill Response Assessment/Recovery – Weathered Product • Shoreline clean-up assessment (SCAT) • Environmental sampling/weathered product sampling • Recovery Operations for weathered material • Assessment via boat/on or near water – use appropriate flotation device with ensemble.	• Crude oil/diesel/kerosene/gasoline spill. • Assumes weathered oil (over 24-48 hours, depending on spilled material and ambient temperatures). • Assumes operations are remote from source of spill. • Assumes no other potential for airborne aromatics/benzene/flammable vapors.	**Modified Level D** (Upgrade/Downgrade based on potential for contact and air monitoring with FID/PID, LEL/O_2 Meter. **If contact with material suspected, use following:** **Suit Type:** [I]Tychem F w/boot [jet fuel-Tychem BR] (Tychem SL may be an option for weathered crude/diesel – see manufacturer's information) **Inner Glove:** [II]Nitrile **Outer Glove:** [II]Nitrile (Best Nitri-solv 727) **Outer Boot Cover:** [V]Latex HazMaster Booty **Steel Toe/Steel Shank Boots:** ASTM F-2413/ANSI Z41 **DECON:** Dry DECON/Soap and water as feasible

Activity Description	Hazards/Conditions	Targeted Minimum PPE
Demolition/Excavation Operations: - Heavy equipment operation - Excavation/Trenching - Continuous air monitoring when soil is disturbed or demolition activities conducted. - Fuel Oil underground tank removal. - Drum Excavation activities EXCLUDED.	- Demolition activities generating potentially hazardous particulates (asbestos, lead, silica, etc.). - Excavation activities that could expose soil contaminated with low levels of known hazardous chemicals to the surrounding area /in the trench/ excavation. - No potential for IDLH atmosphere. - Site background information available. - Known physical hazards. - Workers will have minimal/ no contact with contaminants (i.e., operators in a cab, inspectors/ observers at a safe distance). - Continuous air monitoring required in trench for %LEL, Toxics, and %O_2 when workers are in trench and for particulate when activities generating particulate are conducted. - **Required Work Practice:** Must follow standard air monitoring protocol.	**Modified Level C:** 1/2 face respirator w/safety glasses. Downgrade or upgrade as appropriate based on air monitoring. **Respirator: Scott or MSA ½ Face** **Respirator Cartridge:** [III] Multi-Phase Cartridge (Scott 642 Multi-purpose P-100; MSA with/GME P-100 or equivalent). **Suit Type:** [I]Proshield Next Gen **Inner Glove:** NA **Outer Glove:** Leather **Outer Steel Toe Boot: NA** **Steel Toe Boot Cover**: [V]Latex HazMaster Booty (if chemical in soil is possible) **Steel Toe/Steel Shank Boots:** ASTM F-2413/ANSI Z41 **DECON:** Dry DECON/ Soap and water as feasible

Activity Description	Hazards/Conditions	Targeted Minimum PPE
Natural Disaster Response (Hurricane, Tornado, Flood, Earthquake) - Orphan Container Recovery: • Routine hand collection/pick-up of small containers from debris piles/lines • Land based operations - conducted on foot **Note:** Physical Hazards may necessitate PPE modifications.	• Unknown materials – confident identification based on visual observations. • **Required Work practice:** re-evaluate prior to moving suspicious containers. Air monitoring and PPE upgrade may be required. • **Required Work Practice:** Immediate PPE Change-out (i.e., gloves, etc.) upon contact with chemicals. • **Required Work Practice:** Must follow standard air monitoring protocol.	**Modified Level D:** Upgrade/downgrade based on suspicious containers (not easily identified visually) and air monitoring with PID/FID, radiation detector, LEL/O_2 per HASP/ SOSGs **Suit Type:** ^{I}Tychem CPF-3 w/boot **Inner Glove:** ^{II}Nitrile **Outer Glove:** ^{II}Nitrile (Best Nitri-solv 727) or Leather **Outer Boot Cover:** ^{V}Latex HazMaster Booty **Steel Toe/Steel Shank Boots:** ASTM F-2413/ANSI Z41 **DECON:** Dry DECON/Soap and water as feasible
Natural Disaster Response (Hurricane, Tornado, Flood, Earthquake) - Orphan Container Recovery: • Routine Drum recovery from debris lines/piles/ other – conducted on land **Note:** Physical Hazards may necessitate PPE modifications.	• Unknown materials – confident identification based on visual observations. • **Required Work practice:** re-evaluate prior to moving suspicious containers. Air monitoring and PPE upgrade may be required. • **Required Work Practice:** Immediate PPE Change-out (i.e., gloves, etc.) upon contact with chemicals. • **Required Work Practice:** Must follow standard air monitoring protocol.	**Modified Level D:** Upgrade/downgrade based on suspicious containers (not easily identified visually) and air monitoring with PID/FID, radiation detector, LEL/O_2 per HASP/ SOSGs **Suit Type:** ^{I}Tychem CPF-3 w/boot **Inner Glove:** ^{II}Nitrile **Outer Glove:** ^{II}Nitrile (Best Nitri-solv 727) or Leather **Outer Boot Cover** ^{V}Latex HazMaster Booty **Steel Toe/Steel Shank Boots:** ASTM F-2413/ANSI Z41 **DECON:** Dry DECON/Soap and water as feasible

Activity Description	Hazards/Conditions	Targeted Minimum PPE
Natural Disaster Response (Hurricane, Tornado, Flood, Earthquake) – Flood water sampling: • Water Sampling of flood waters where potential for contact with hands/feet is high **Note:** Physical Hazards may necessitate PPE modifications.	• Unknown contaminants • Potential for pathogens suspected • Low potential for acute exposure to hazardous chemicals • Assumes open air/well ventilated areas **Required Work Practice:** Monitor all poorly ventilated areas in appropriate PPE/Respiratory Protection for organic vapors (PID & FID), %LEL/flammable atmospheres, H_2S prior to entry	**Modified Level D:** Upgrade based on more information as it becomes available. **Suit Type:** [I]Proshield Next Gen **Inner Glove:** [II]Nitrile **Outer Glove:** [II]Nitrile (Best Nitri-solv 727) **Outer Boot**: Waders (butyl, neoprene) as needed. **Steel Toe/Steel Shank Boots:** ASTM F-2413/ANSI Z41 **DECON:** Dry DECON/Soap and water as feasible
Environmental Sampling (Low Concentration Water/Soil/Perimeter Air): • Multi-media Sampling • Documentation (written/photo) • Inspection of clean-up operations	• Known Chemical Contaminants. • Airborne concentrations well below PELs. • Minimal chance of skin exposure to chemicals. • Insects possible.	**Level D:** Upgrade based on more information as it becomes available. **Suit Type:** [I]Proshield 1 (if ticks, etc. maybe a problem) **Inner Glove:** [II]Nitrile **Outer Glove:** NA **Outer Boot:** NA **Steel Toe Boots:** ASTM F-2413/ANSI Z41 **DECON:** NA

i. Tychem and Proshield suits can be purchased from Safeware: 800-331-6707, http://www.safewareinc.com , (see also LSS, http://www.labsafety.com, Dupont: 1-800-931-3456, http://www2.dupont.com/Personal_Protection/en_US/index.html)

ii. Nitrile Inner/Outer Gloves; Viton; Butyl Rubber; 4-H (polymeric) can be purchased from Safeware: 800-331-6707, http://ww.safewareinc.com ; Airgas: 1-866-718-0685, http://www.airgas.com (see also North Safety, http://www.northsafety.com); Best Gloves, http://www.bestglove.com ; Lab Safety Supply (LSS), http://www.labsafety.com; Airbill, http://www.airbill.com)

iii. Multi-Phase Cartridge (Scott 642 Multi-purpose; MSA with/GME P-100 or equivalent) can be purchased from LSS: 1-800-356-0673, http://www.labsafety.com (see also Safeware, http://www.safewareinc.com; Scott Safety, http://www.scotthealthsafety.com/; MSA, http://www.msanet.com/)

iv. Tingley HazProof Overboots or similar can be purchased from LSS: 1-800-356-0673, http://www.labsafety.com; National Safety, Inc.: 1-800-213-7092, http://www.nationalsafetyinc.com

v. Latex Hazmaster Booties, Nuke Boot or similar can be purchased from Safeware: 800-331-6707, http://www.safewareinc.com; Airbill: 1-215-632-2000, http://www.airbill.com; (see also Airgas, http://www.airgas.com; LSS, http://www.labsafety.com

APPENDIX D

Subsurface Utility Clearance Management Program

SUBSURFACE UTILITY CLEARANCE MANAGEMENT PROGRAM

CORPORATE HEALTH AND SAFETY DIRECTOR	:	**Brian Hobbs, CIH, CSP**
EFFECTIVE DATE	:	**01/2019**
REVIEW DATE	:	**03/2024**
REVISION NUMBER	:	**4**

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APPENDICES

1. PURPOSE

Roux Associates, Inc. and its affiliated companies, Roux Environmental Engineering and Geology, D.P.C., and Remedial Engineering (collectively, “Roux”) has instituted the following program for completing proper utility mark-outs and for conducting subsurface clearance activities. This establishes a method to ensure, to the greatest extent possible, that utilities have been identified and contact and/or damage to underground utilities and other subsurface structures will be avoided. For the purpose of this program, a structure is defined as any underground feature that may present a potential source(s) of energy, such as, but not limited to, utility vaults, bunkers, piping, electrical boxes, wires, conduits, culverts, utility lines, underground tanks, and ducts.

2. SCOPE AND APPLICABILITY

The Subsurface Utility Clearance Management Program applies to all Roux employees, its contractors, and subcontractors. Employees are expected to follow this program for all intrusive work involving Roux or other personnel (e.g., contractors/subcontractors) working for Roux unless the client’s requirements are more stringent. Intrusive work activities can include, but are not limited to, digging or scraping the ground surface, including, but not limited to, excavation; test pitting or trenching; soil vapor sampling or the installation of soil borings, soil vapor monitoring points and wells, or monitoring wells; and drilling within concrete slabs on grade.

Deviation from the program, regardless of the specific work activity or location, must be pre-approved based on the client’s site knowledge, experience, site conditions, and additional documentation on the site. Any exceptions shall be documented through the Roux Subsurface Utility Clearance Variance Form located within the Roux Health & Safety Online Application or through OKTA. Approval is required by the Project Principal (PP) and the Operations Manager (OM) in consultation with the Office Health and Safety Manager (OHSM) or Corporate Health and Safety Director (CHSD) prior to mobilization. Depending on the work location, more stringent federal, state, local, or client requirements may apply. It is the responsibility of the Project Team to identify such requirements prior to mobilization.

3. PROCEDURES

3.1 Before Intrusive Activities/Job Planning Process

Prior to intrusive work at a site, the Project Manager (PM) shall ensure that the notification of the State One Call or equivalent service (Nationwide-811) is completed a minimum of 48-72 hours (One-Call State Law Directory) before intrusive work activities (this timeline excludes Saturdays, Sundays, Legal Holidays and 811 observed holidays). This notification is required by law for all states. State-specific/local laws related to utility location may vary. The project team is responsible for understanding requirements that may affect their work site.

Obtain, review, and field verify relevant historical site data that may include: as-builts/site plans; easement/right-of-way information; historical aerial photos/development plans; local/state permitting records; previous site investigation/boring logs; and/or interviews with site representative/client. Interviews with site or client personnel should ask the following:

- Employee(s) Name and Relationship with the site;
- Types of utilities, including structure and location of utilities on-site;
- Depth of known utilities; and

- Any other relevant information as it pertains to the site.

Prior to intrusive work activities, information pertaining to the site should be included in Roux's Subsurface Utility Clearance Checklist and Utility Verification/Site Walkthrough forms. This form is located within the Roux Health & Safety Online Application or through OKTA.

If there is the potential for unexploded ordinances or munitions, consultation with your OM and CHSD is required prior to site operations.

3.1.1 Project Kick-Off Meeting

During the project kick-off meeting for intrusive activities, the PM will review the Roux Subsurface Utility Clearance Checklist, Utility Verification / Site Walkthrough Record (Appendix A) and the below bullet points with the project field team:

- Confirm that the State One Call or equivalent is received and that the ticket number is confirmed, reviewed, and valid for the time of work. If intrusive work activities are not conducted during this valid time period, the One Call ticket must be renewed, and the site must be remarked;
- Review the work scope to be performed with the site owner/tenant to determine if it may impact any utilities;
- Determine the need for utility owner companies to be contacted or to have their representatives on site;
- Where mark-outs terminate at the property boundary, consider the use of private utility locating / (e.g., Radio Frequency Detection, Electromagnetic Induction), Ground Penetrating Radar (GPR) , and other applicable geophysical inspection services. The use of private utility locating firms, however, does not eliminate the legal requirement for the subcontractor (e.g., driller, excavation firm) to submit a request for Public Utility Mark-outs. Also, the information provided by the service may be inaccurate and unable to locate subsurface utilities and structures in urban areas, landfills, urban fill areas, below-reinforced slabs, etc. They should not be relied upon as the only means of performing utility clearance;
    - A mark-out is defined as the process of contracting with a competent and qualified company to confirm the presence or absence of underground utilities and structures. This process will clearly mark out and delineate identified utilities so that intrusive work activities can be performed without causing disturbance or damage to the subsurface utilities and structures. After utility mark-outs are completed, soft Digging must completed prior to intrusive work. Section 3.4 Preferred Methods of Clearing the Subsurface (Pre-Clearing) outlines requirements for pre-clearing techniques in order of preference.
- Documented description of the dig site, which is included in the project's Health and Safety Plan (HASP), and one call report will be maintained in the field and distributed amongst Roux personnel, its contractors, and subcontractors; and
- Documentation of the actual placement of mark outs in the field shall be collected using dated pictures, videos, and/or sketches with distance from markings to fixed objects. All documentation shall be maintained within the project file.

3.2 Utility Mark Out

- Ensure the Mark-out / Stake-out Request Information Sheet (or one-call report) is complete and accurate for the site, including address and cross streets, and review for missing utilities. Ensure ticket life is still valid for work.

  - Note: utility mark-out organizations do not have contracts with all utilities, and it is often necessary to contact certain utilities separately, such as the local water and sewer authorities, local transportation departments, and railroad operators. In the event the Project Teams anticipate subsurface work will impact public utilities, railroad operations, or public roadways, coordination with the utility owners/operators is required.

- Have written confirmation prior to mobilizing to the site that the Project Team or Roux personnel performing the intrusive activity has correctly completed the mark-out notification process, including requesting mark-outs, waiting for mark-outs to be applied to ground surfaces at the site, and receiving written confirmation of findings (via fax or email) from utility operators for all known or suspected utilities in the proposed area of intrusive activity, and provided utility owner written confirmation to Roux personnel for review and project files documentation.

- Do not begin any intrusive activity until all utility mark-outs have been completed (i.e., Did all utilities mark-out the site?) and any unresolved mark-out issues are finalized. Perform a site walk to review the existing utilities and determine if the utility locators have located said utilities.

  (Note: The Tolerance Zone is defined as three feet from the outside edge of any subsurface structure.)

- For non-subscribing utility owners or if public one-call service is not available, perform due diligence and request further information regarding utility type, construction details, location, and burial depth directly from public service providers/utility owners. Request utility mark-out by each public service provider/utility owner as applicable. Confirm contact and response by each public utility owner on the Subsurface Utility Clearance Checklist.

- If utilizing a Private Mark out, ensure the contractor has a plan regarding what types of technology will be used based on Table 1 in Appendix B: Private Utility Technology Applications and Considerations. If possible, it is recommended that multiple technologies be used to sweep each location/work area. Use a tracer wire to locate the utility (when tracer wires are present). Record the results of the private utility mark-out on the Utility Verification/Site Walkthrough Record form.

3.3 Site Visit/Utility Walkthrough

Before mobilization with the subcontractor or during the pre-work safety tailgate with the subcontractor, perform a site walkthrough after utility mark-outs have been completed to determine whether additional potential hazards are present and look for visible signs of utilities that may be present. Outlined below are considerations regarding a site walk before intrusive activities. Before initiating any intrusive work, verify that the utilities marked on-site align with the information provided in the One Call response notification/ticket and with site plans and documents. If any discrepancies arise, address them promptly to ensure accuracy and do not start intrusive work until they are rectified.

- Identify overhead utilities that may impede equipment mobilization or work zones to ensure adequate Occupational Safety and Health Administration (OSHA) clearance distance(s), as specified within the site-specific Health and Safety Plan (HASP) and 29 CFR 1926.1408 Table A.

The presence of any of the following may indicate potential subsurface structures:

- Locations of buildings, equipment, and features like area lights, signs, sprinkler systems, phones, drains, natural gas meters, manholes, etc.;
- Warning tape, which is often a sign of underground services;
- Material like pea gravel, sand, or other non-native materials can indicate the presence of tanks or lines or any deviations from the established native soil or backfill conditions;

- Red concrete, which is often used for electrical duct banks;
- Evidence of damaged utilities, such as piping materials, insulation, or odors present in the work area; and
- Other utilities, including fire hydrants, electrical transformers, pipeline markers, valve covers, steam lines, valve box covers, clean-outs, etc.

By observing the path between the main service line and the connection point (e.g., a utility meter at the exterior of the site building), it may be possible to determine the likely routing of on-site utilities. However, this method should not be relied upon solely, and proper risk mitigation strategies should be in place before proceeding with any ground disturbance activities. Look outside your work zone for other potential utilities that may cross through your work zone.

For sites with potential underground storage tanks present (UST), the following guidance applies:

- Identify if the product piping is either rigid or flexible.
- Conduct a visual examination of the tank field, observation wells, dispensers, vent stacks, and UST fill points to determine their location.
- Locate and become familiar with the emergency shutoff button/switch, if present.
- Determine the orientation, arrangement, and location of the tanks, as well as their size and capacity, through the examination of visible features at grade, such as fill ports and extractor covers, and by consulting any available as-built drawings.

Before commencing any subsurface intrusive work, field staff should thoroughly address any discrepancies in utility company mark-outs or the absence of mark-outs.

3.3.1 Project Management-Field Personnel

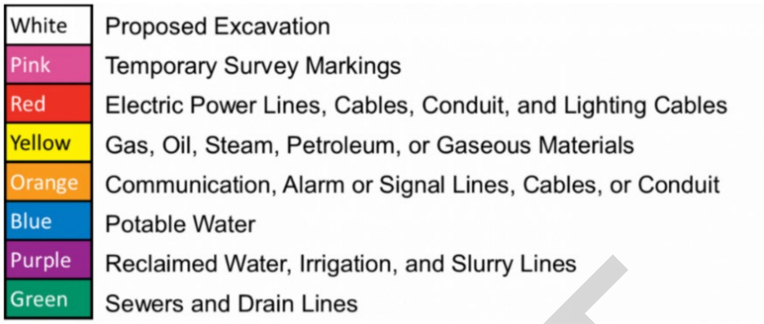
Whenever possible, it is advisable to assign the same project personnel to both utility location and clearance tasks as well as intrusive activities. This continuity ensures that site knowledge and utility information gathered during the clearance phase remain up-to-date. Having this historical perspective helps minimize the risk potential of utility strikes.

In cases where maintaining the same personnel throughout the project isn’t feasible, a thorough knowledge transfer regarding site utilities, locations, clearance results, and proposed intrusive activities becomes essential. The PM must ensure that there is a successful handoff of information when there is a change in field personnel.

3.3.2 Utility Markings

The utility marking color code includes various uniform colors. The following APWA uniform color code (ANSI Z535.1) is provided below. While certain government agencies or large industrial facilities may use additional colors, Roux’s policy is to consider any unlisted paint marking or pin flag color as a subsurface utility marking unless proven otherwise.

If utilities or subsurface anomalies are identified but their type or classification remains uncertain, it is advised to employ pink paint or pin flag (Temporary Survey Marking) for marking. Once the utility type is definitively established, the pink marks should be updated to accurately represent the correct type of utility.



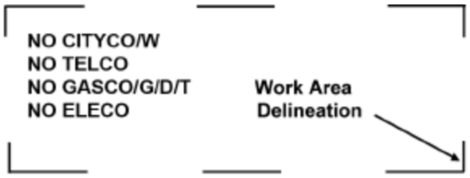
White	Proposed Excavation
Pink	Temporary Survey Markings
Red	Electric Power Lines, Cables, Conduit, and Lighting Cables
Yellow	Gas, Oil, Steam, Petroleum, or Gaseous Materials
Orange	Communication, Alarm or Signal Lines, Cables, or Conduit
Blue	Potable Water
Purple	Reclaimed Water, Irrigation, and Slurry Lines
Green	Sewers and Drain Lines

Understanding the markings left by locators during the 811 process is crucial for avoiding utility-related issues. Typically, these markings are done when Roux staff members are not physically present on-site. To enhance understanding/accuracy, it is advisable for staff to be present during the 811 process or engage in conversations with locators, both public and private, while on-site. Additionally, utility marks must adhere to the proper standards outlined in the Uniform Color Code.

Common Abbreviations

Source: Common Ground Alliance

Facility Identifier		**Underground Construction Descriptions**		**Infrastructure Materials**	
CH	Chemical	C	Conduit	ABS	Acrylonitrile - Butadiene - Styrene
E	Electric	CDR	Corridor	ACP	Asbestos Cement Pipe
FO	Fiber Optic	D	Distribution Facility	CL	Cast Iron
G	Gas	DB	Direct Buried	CMC	Cement Mortar Coated
LPG	Liquefied Petroleum	DE	Dead End	CML	Cement Mortar Lined
PP	Petroleum Products	JT	Joint Trench	CPP	Corrugated Plastic Pipe
RR	Railroad Signal	HP	High Pressure	CMP	Corrugated Metal Pipe
S	Sewer	HH	Hand Hole	CU	Copper
SD	Storm Drain	MH	Manhole	CWD	Creosote Wood Duct
SS	Storm Sewer	PB	Pull Box	HDPE	High Density Polyethylene
SL	Street Lighting	R	Radius	MTD	Multiple Tile Duct
STM	Steam	STR	Structure (vaults, junction inlets, lift station)	PLA	Plastic (conduit or pipe)
SP	Slurry System	T	Transmission Facility	RCB	Reinforced Concrete Box
TEL	Telephone			RCP	Reinforced Concrete Pipe
TS	Traffic Signal			RF	Reinforced Fiberglass
TV	Television			SCCP	Steel Cylinder Concrete Pipe
W	Water			STL	Steel
W	Reclaimed Water "Purple"			VCP	Vertrified Clay Pipe



3.4 Preferred Methods of Clearing the Subsurface (Pre-Clearing)

At least one of the methods listed below shall be carried out during pre-clearing activities. The Project Team is responsible for evaluating risks associated with the Scope of Work to determine which method is selected. If none of the following pre-clearing activities are performed, a Subsurface Utility Clearance Variance must be submitted to the OM. This Subsurface Utility Clearance Variance must provide clear lines of evidence that there are no utilities present within the intrusive work zone. Examples include demolition permits of the site, utility closure documents indicating no live utilities on-site, as-builts, site history, etc.

The following approaches shall be considered and implemented based on the Scope of Work.

- ***Soft Digging***
  - This is the preferred method of utility clearance when clearing higher-risk utilities. Soil should be cleared through the use of a vacuum truck/equivalent, an accompanying air knife (preferred), or a water lance to break up and loosen the soil for removal with the vacuum.
- ***Hand Digging***
  - Soil should be broken up and removed using a shovel or other appropriate hand tools without excessive force. Limit the use of dig bars or other tools that, if used incorrectly, can significantly damage utilities.
- ***Hand Augering***
  - The hand auger must be turned slowly using even hand pressure without excessive force. Rounded edge augers are preferred. Hand augers should not be used in pea stone/pea gravel where utilities may be present and could potentially be damaged by the hand auger. The abrupt absence of soil recovery in a hand auger could indicate utilities as pea gravel or sand may have spilled out of the auger (exception: native soil conditions that typically result in poor hand auger recoveries). If any resistance is encountered while operating the hand auger for pre-clearance, the equipment will be removed, and the exploratory test hole will be visually inspected by onsite personnel for any obstructions or indications of subsurface structures.

3.4.1 Guidance for Tools and Equipment

Personnel performing pre-clearance activities shall keep tools and equipment in safe working order and be properly inspected before use. If tools or equipment are broken, they will be tagged and removed from service. The following specify additional guidelines regarding tools and equipment:

- Hand-digging tools must have a non-conductive handle, such as fiberglass, wood, or composite, or fully insulated handles and potential contact surfaces.
- Blades on shovels and post-hole diggers should have rounded or blunt edges.
- Pick axes or pointed spades should not be used for physical clearance.
- Crowbars, pinch-bars, or pry bars should not be used to break hardened soil or backfill except when authorized by the Site Supervisor (SS). This should only be used to loosen materials like bricks or larger stones.

- Electric-powered equipment must have ground fault protection.
- Should there be refusal or difficulty with advancing hand tools, the contractor shall stop work and notify the Roux SS or Site Health and Safety Officer (SHSO) immediately.

3.5 During Intrusive Activities

3.5.1 Concrete/Paving Surface Removal

Remove any surface coverings (i.e., pavement, brush, debris, etc.) to ensure workers have clear visibility of the work area and subsurface conditions. Avoid mechanical jackhammering over known lines unless they are de-energized, locked-out/tagged-out, and potential repairs are planned or if the utility has been completely disconnected prior. When cutting or coring, go only as far as needed to penetrate the surface cover. When removing a large surface area, begin at the perimeter of the removal zone. This initial step helps identify any utilities passing through the work zone. For extensive areas, using a concrete saw might not be practical. Instead, heavy equipment is often employed. During this process, a designated spotter should guide the heavy equipment. Their role is to watch for warning signs of utilities. It's crucial that the heavy equipment does not have "teeth" that could potentially pass through the surface and damage utilities.

3.5.2 Pre-Clearance Procedures

Install pre-clearance exploratory test holes using one of the techniques, as outlined in Section 3.4, for the first 5-ft below land surface (BLS) at each location before conducting intrusive mechanized activities. Should utilities be located at a greater depth than 5-ft BLS consult with the OM, OHSM and CHSD regarding adjustments to the pre-clearance requirements to go greater than 5-ft BLS. Some Clients may require greater than 5-ft BLS for pre-clearance test holes; Project teams should be aware of such Client requirements prior to work.

Pre-clearance exploratory test holes should be defined in the SOW/proposal provided to the client to prevent project delays and to allow adequate time for the PM and PP to evaluate alternative approaches for the project. Alternative approaches will need to be pre-approved by the OM through a Subsurface Utility Clearance Variance.

Both single-point and three-point clearance are acceptable as long as the following criteria are met below. For single-point clearance, the exploratory test hole is advanced at the exact location of the proposed borehole. If three-point clearance is performed, it must be done in a triangular pattern around the proposed borehole and in a configuration that would not allow utilities to enter the borehole.

- The size of the pre-clearance exploratory test hole should be, at a minimum, twice the diameter of any downhole tool or boring device.
- For direct push applications (CPT, Geoprobe®, etc.), the borehole clearance diameter shall be at least 125% of the diameter of the largest tool being pushed through the subsurface (e.g., tip, rod, sampler, etc.), to the minimum required depth.
- For excavations, all utilities need to be marked and then exposed by soft-digging or by hand following the protocols in this program. Pre-clearing for excavations may be performed by the "moat" technique (i.e., soft Digging around the perimeter). In these cases, dig in small lifts (<12" for first 5 feet) using a dedicated spotter.)
- For Tolerance Zone work, unless otherwise agreed upon with the Utility Operator, work within the tolerance zone requires verification by means of pre-clearance test holes specified in Section 3.4 to expose the utility. Once structures have been verified, a minimum clearance of three feet must be maintained between the utility and any powered equipment. If considered a high-risk utility, additional requirements may be necessary and required by the Operator of the utility. Consultation with the OM and CHSD may be appropriate.

The PM, field team lead, or personnel performing oversight is to:

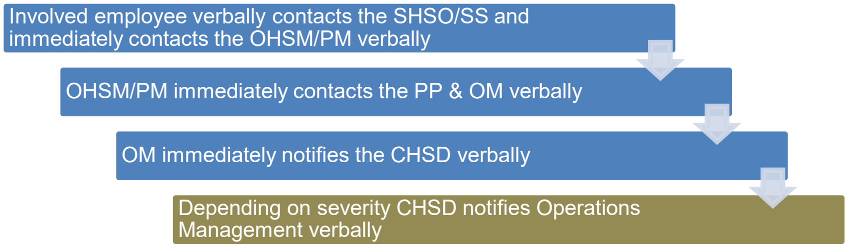
- Ensure the mark-out remains valid. (In certain states, there are limits regarding the duration of time after the mark-out was applied to the ground surface work can be started or interrupted.) Additionally, the mark-outs must be maintained, documented, and in many cases, refreshed periodically to be considered valid. This will be accomplished through calls to the one call center.
- Ensure intrusive activities are only performed within the safe boundaries of the mark-out as detailed in the One-Call Report.
- Halt all work if intrusive activities have resulted in the discovery of an unmarked utility. Roux personnel shall notify the facility owner/operator and the one call center. All incidents such as this will be reported as per Roux Incident Investigation and Reporting Management Program.
- Halt all work if intrusive activities must take place outside of the safe boundaries of a mark-out and only proceed after new mark-outs and subsurface utility clearance are performed.
- Halt the intrusive activities and immediately consult with the PP if an unmarked utility is encountered.
- Complete any loss reports associated with subsurface utility strikes as necessary.
- If a utility cannot be found as marked, Roux personnel shall notify the facility owner/operator directly or through the one-call center. If the facility operator is not responsive, then the one-call center must be notified. Following notification, the excavation/mechanical intrusive work may continue unless otherwise specified in state law.
- Contractors/subcontractors must contact the one-call center to refresh the ticket when the excavation continues past the life of the ticket. State law dictates ticket life. Project teams must be aware of their state-specific requirements.

3.6 Stop Work Authority

Each Roux employee has Stop Work Authority that he or she will execute upon determination of any imminent safety hazard, emergency situation, or other potentially dangerous situation, such as hazardous weather conditions. This Stop Work Authority includes subsurface clearance issues such as the adequacy of a mark-out or identification during intrusive operations of an unexpected underground utility. Authorization to proceed with work will be issued by the PM/PP in consultation with the OHSM after such action is reviewed and resolved. The PM will initiate and execute all management notifications and contact emergency facilities and personnel when this action is appropriate.

3.7 Reporting Utility Incidents

Roux field personnel engaged in any utility strike (e.g., subsurface/aboveground) must promptly stop work, shutdown any equipment and get to a safe location at the Site. Then notify the PM to discuss the incident. In case of injuries, field personnel must call 911 or the local emergency services number and then inform the PM. Additional notifications shall follow Roux's Incident Notification Process. Depending on the utility strike additional notifications shall be made to utility operators and/or clients/site contacts.



Appendix A
Roux Subsurface Utility Clearance Checklist

Appendix A

Roux Subsurface Utility Clearance Checklist/Utility Verification/Site Walkthrough Record

Roux Subsurface Utility Clearance Checklist

Date of Revision:
3/2024

Work site set-up and work execution

ACTIVITY	Yes	No	N/A	COMMENTS INCLUDING JUSTIFICATION IF RESPONSE IS NO OR NOT APPLICABLE
Daily site safety meeting conducted, SPSAs performed, JSAs reviewed, appropriate work permits obtained (if applicable).				
HASP is available and reviewed by site workers / visitors.				
Subsurface Utility Clearance Procedure has been reviewed with all site workers.				
Mechanical intrusive work activities may not be performed at any location without authorization from the Roux Site Supervisor (SS). Clearance activities may not be performed at any location unless the SS is physically present.				
Work area secured; traffic control established as needed. Emergency shut-off switch located. Fire extinguishers / other safety equipment available as needed.				
Utility mark-outs (public / private) clear and visible. Provide Excavator's Stake-Out Reference Number / Request Date / Time.				
Tolerance zone work identified. Intrusive work activities cannot be performed in areas that are in direct conflict with any markings made by public or private locators.				
Unless the PP & OM authorizes it, all boreholes and test pit locations must be physically cleared before using mechanized equipment. Required minimum physical clearance depths and diameters are as follows: • Physically clear to a depth of 5 feet bls. • The size of the pre-clearance exploratory test hole must be, at a minimum, twice the diameter of any downhole tool or boring device. • For direct push applications (CPT, Geoprobe®, etc.) the borehole clearance diameter shall be at least 125% to the diameter of the largest tool being pushed through the subsurface (e.g., tip, rod, sampler, etc.).				
Work execution plan reviewed and adhered to (ground disturbance methods, clearance depths, any special utility protection requirements, or any other execution requirements; especially for Tolerance Zone work).				

Mechanical intrusive work is prohibited within 3-feet distance in all directions from subsurface structures that will be intentionally exposed during pre-clearance. Any removal of material within 3-feet of the subsurface structure may only proceed by hand using non-conductive tools/compressed air if authorized by state law and the owner/operator of the utility.				
All equipment onsite must maintain the appropriate horizontal distance from any point on the equipment to the nearest overhead electrical power line. Refer to site-specific HASP and local/utility company requirements.				
Verbal endorsement received from Roux PM and OM for any required field deviations to work execution plan.				

Key Reminders for Execution

The Subsurface Utility Clearance Protocol should be referenced to determine all requirements while executing subsurface work. The bullet points below are intended as general reminders only and should not be relied upon solely.

- The size of the pre-clearance exploratory test hole must be at a minimum twice the diameter of any downhole tool or boring device to minimum required depth of 5 feet bls.
- For direct push applications (CPT, Geoprobe®, etc.) the borehole clearance diameter shall be at least 125% of the diameter of the largest tool being pushed through the subsurface (e.g., tip, rod, sampler, etc.), to the minimum required depth of 5 feet bls.
- The tolerance zone is defined as three feet plus half of the diameter or half of the greatest dimension (for elliptical sewers, duct banks, and other non-cylindrical utilities) of a utility and three feet from the outside of any subsurface structure.
- For excavations, all utilities need to be marked and then exposed by hand, following the protocols in this program. Pre-clearing for excavations may be performed by the “moat” technique (i.e., soft digging around the perimeter). In these cases, dig in small lifts (<12” for first five feet) using a dedicated spotter.) For Tolerance Zone work, unless otherwise agreed upon with the Utility Operator, work within the tolerance zone requires verification by means of hand-dug test holes to expose the utility. Once structures have been verified, a minimum clearance of three feet must be maintained between the utility and any powered equipment.

Utility Verification/Site Walkthrough Record

Employee Name:____

Date: ____

Instructions: For each utility suspected at the job site, indicate the location on the job site, approximate burial depth, and means of detecting the utility. Leave blank if that utility is not believed to be present.

Utility	Description of Utility Location Identified Onsite	Approx. Depth (bls)	Method / Instrumentation used to determine Utility Location	Utility Owner Response (Date/Time)	Mark Out Indicates (Clear / Conflict)
Electrical Lines					
Gas Lines					
Pipelines					
Steam Lines					
Water Lines					
Sanitary and Stormwater Sewer lines					
Pressured Air-Lines					
Tank Vent Lines					
Fiber Optic Lines					
Underground Storage Tanks					
Phone Lines/ Other					

* bls - below land surface

Site Sketch Showing Utilities:

Color Code

- ELECTRIC
- Gas-oil Steam
- Communications CATV
- WATER
- Reclaimed Water
- SEWER
- Temp. Survey Markings
- Proposed Excavation

Other Comments / Findings:

Completed by: ______________________________

Signature: ______________________________ Date: ____________

Appendix B
Private Utility Technology Applications and Considerations

Appendix B – Private Utility Technology Applications and Considerations

Technology ⇒ **Utility/Object** ⇓	Radio Frequency Electro-Magnetic Detector (connection to utility, or induction without connection)	Radio Frequency Electro-Magnetic Detector (passive sweep)	Ground Penetrating Radar (GPR)⦿	Acoustic Plastic Pipe Locator	Beacon, Sonde or Conductive Rodder Insertion	EM-61 (time domain electromagnetics) Ξ
Power/Instrument Line (Energized/Signaled) □	**❋ G**	**G**	**G**	**R**	**R**	**G**
Power Line (Non-energized) □	**❋ G**	**R**	**G**	**R**	**R**	**G**
Sewer/Water Line (Metallic) □	**❋ G**	**Y**	**G**	**Y**	**G**	**G**
Sewer/Water Line (Non-metallic)	**R**	**R**	**G**	**G**	**❋ G**	**R**
Instrument / Telecomm Lines (Non-energized)	**❋ G**	**R**	**G**	**R**	**R**	**Y Only if metallic**
Hydrocarbon Transmission Line (Pipeline)◆ □	**❋ G**	**R**	**G**	**R**	**R**	**G**
Metallic/Non-Metallic Line (with Tracer Wire)	**❋ G**	**Y**	**G**	**Y**	**Y**	**G metallic** **Y non-metallic**
Metallic/Non-Metallic Line (without Tracer Wire)	**G metallic** **R non-metallic**	**R**	**❋ G**	**Y**	**Y**	**G metallic** **R non-metallic**
Metal or Fiberglass UST	**R**	**R**	**❋ G**	**R**	**R**	**G metallic** **R non-metallic**

Additional Considerations

Technology ⇒ **Variable** ⇓	Radio Frequency Electro-Magnetic Detector	Ground Penetrating Radar (GPR)⦿	Acoustic Pipe Locator	Beacon, Sonde, or Conductive Rodder Insertion	EM-61 Ξ
Moist Soil	**G**	**Y**	**G**	**G**	**G**
Dry Soil	**Y**	**G**	**Y**	**G**	**G**
Clay	**Y**	**R**	**G**	**G**	**G**
Concrete w/Rebar	**R**	**Y**	**G**	**G**	**R**
Long Horizontal Profile	**G**	**G**	**G**	**G**	**G**
Short Horizontal but Deep Vertical Profile	**Y**	**G**	**R**	**R**	**G**
Access to Line✚	**G**	**N/A**	**G**	**G**	**G**
No Access to Line✚	**G (induction or passive)** **R (direct connect)**	**G**	**R**	**R**	**G** **G**
Ferrous Metal	**G**	**G**	**G**	**G**	**G**
Non-ferrous Metal	**Y**	**G**	**G**	**G**	**G**
Adjacent or crossing conductive utility(ies)	**Y**	**N/A**	**N/A**	**N/A**	**Y**

Each site will be unique. Do not use this table as the sole criteria for technology selection. Use it as a starting point to assess available, applicable technology(s).

❋ Indicates best technology for given object. Site structures, rebar in concrete, shallow groundwater tables, perched storm water, etc. can significantly affect performance and reliability of any electro/magnetic method. Other utilities which cross or are adjacent to the target line can cause the EM signal to bleed or jump to the other utility line.
□ Metallic lines that have power running through them or can be connected to a tracer signal generator.
◆ Natural gas pipeline locating technicians must be trained/certified (in the U.S. requires DOT and Office of Pipeline Safety standards, other regions may have similar certification or requirements).
⦿ Most sensitive to interpretation. The skill, training and experience of operator are critical.
Ξ Emerging technology with limited availability.
✚ Access: induce unique electronic signature, apply acoustical impulse or insert conductive rodder/beacon/sonde.

Green Generally, an applicable technology **Yellow** May or may not be applicable **Red** Not generally applicable

APPENDIX E

Heavy Equipment Exclusion Zone (HEEZ) Management Program

HEAVY EQUIPMENT EXCLUSION ZONE MANAGEMENT PROGRAM

CORPORATE HEALTH AND SAFETY DIRECTOR	:	**Brian Hobbs, CIH, CSP**
EFFECTIVE DATE	:	**01/2019**
REVIEWED DATE	:	**03/2024**
REVISION NUMBER	:	**3**

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1. PURPOSE

The Exclusion Zone Management Program aims to establish the minimum clearance distance that must be maintained between workers and heavy equipment while equipment is in operation (i.e., engaged or moving). The intent is to have no personnel or equipment entering the Exclusion Zone while the equipment is in operation or moving to ensure that Roux and Subcontractor employees are unnecessarily exposed to the hazards of the equipment.

2. SCOPE AND APPLICABILITY

This Management Program applies to all Roux Associates, Inc. and its affiliated companies, Roux Environmental Engineering and Geology, D.P.C., and Remedial Engineering (collectively, “Roux”) employees and their subcontractors performing fieldwork and are potentially exposed to heavy equipment. Heavy equipment includes, but is not necessarily limited to, excavation equipment, drill rigs, vacuum trucks, forklifts, lull telehandlers, man lifts, bobcats, delivery trucks, etc.

3. PROCEDURES

As specified in the following sections of this program, Exclusion Zones must be established and maintained during activities involving the movement/operation of heavy equipment. The Exclusion Zone requirements apply to all personnel on the site but are primarily focused on personnel required to work near the equipment. The exclusion zone is in effect when heavy equipment is moving or engaged (e.g., movement of an arm or bucket of an excavator, rotation of an auger, lifting of a load with a forklift, raising/lowering of a man lift, etc.).

1. The Exclusion Zone must meet the following minimum requirements:
   - A minimum distance of 10 feet from all heavy equipment and loads being moved by the equipment;
   - Greater than the swing/reach radius of any moving part on the heavy equipment (i.e., for large equipment, this may mean an exclusion zone distance larger than 20 feet);
   - Greater than the fall zone of equipment and their contents; and
   - Greater than the tip-over distance of the heavy equipment.

   The size of the Exclusion Zone will need to be determined on a task-specific basis considering the size of the heavy equipment in use and the task being performed. Prior to all heavy equipment operations, the Exclusion Zone(s) distance must be specifically identified in the Job Planning Process and incorporated in the pre-job tailgate meeting with the subcontractor(s), including any updates to our Job Safety Analysis (JSA).

2. The spotter (or another authorized individual) is responsible for enforcing the Exclusion Zone and not conducting any other task. The spotter should be positioned immediately outside of the Exclusion Zone within a clear line of sight of the equipment operator. The spotter must signal the operator to stop work if anyone or anything has the potential to enter or compromise the Exclusion Zone. The operator should stop work if the spotter is not within their line of sight. If a spotter must be within the Exclusion Zone, they must be in a designated area outside the swing/tip radius, fall zone, line of fire of lifted loads, etc. If multiple pieces of equipment are being used, one spotter may be adequate so long as there is a clear line of sight and the spotter can control the zone(s). Radios would be required since hand signals would not be adequate if two pieces of equipment are in operation at the same time in the Exclusion Zone.

3. If an individual must enter the Exclusion Zone, the designated Spotter must signal the Equipment Operator to stop the equipment. Once the equipment is no longer moving (e.g., movement of an arm of an excavator is STOPPED, lifting of a load with a forklift STOPPED, raising/lowering of a man lift is STOPPED, etc.), the operator must bring the boom/arm to the ground ensuring a “Zero Energy State” and DISENGAGE THE CONTROLS and STOP and SIGNAL BY “SHOWING HIS HANDS.” This signal will indicate that it is safe for the person to enter the limits of the Exclusion Zone to perform the required activity. The equipment must remain completely stopped/disengaged until all personnel exited the Exclusion Zone's boundaries and the designated Spotter has signaled by “SHOWING HIS HANDS” to the Equipment Operator that it is safe to resume operations.
4. When entering the limits of the Exclusion Zone, personnel must, at a minimum:
    - Establish eye contact with the operator and approach the heavy equipment in a manner that is in direct line of sight to the Equipment Operator;
    - Never walk under any suspended loads or raised booms/arms of the heavy equipment; and
    - Identify a travel path free of Slip/Trip/Fall hazards.
5. The Exclusion Zone should be delineated using cones with orange snow fences or solid poles between the cones, barrels, tape, or other measures. For work in rights-of-way, rigid barriers, such as Jersey barriers or temporary chain link fences, should be used. For certain types of widespread or moving/mobile equipment operations, such delineation may not be practicable around equipment or individual work areas. In such instances, it is expected that the entire operation will be within a larger secure work area or that additional means will be utilized to ensure the security of the work zone.

All subcontractors who provide heavy equipment operations to field projects must implement a program that meets or exceeds the expectations described above as well as any additional requirements that may be required on a client or site-specific basis. Logistics involving heavy equipment should be understood and discussed prior to the field event during the job planning phase.

3.1 Exceptions

It is recognized that certain heavy equipment activities may require personnel to work within the limits of the Exclusion Zone as specified in this program. Such activities may include certain excavation clearance tasks, drill crew activities, or construction tasks. However, any such activity must be pre-planned, emphasizing limiting the amount and potential exposure of any activity required within the zone. The critical safety steps to mitigate the hazards associated with working within the Exclusion Zone must be defined in the JSA and potentially other project-specific plans (i.e., critical lift plans, etc.), and approved by the Roux Project Principal (PP), Office Health and Safety Manager (OHSM) and client representative, if required, prior to implementation.

4. TRAINING

Many Roux projects have different requirements that are client-specific or site-specific in nature. However, all Roux employees are provided initial training, as well as annually thereafter, on our Heavy Equipment Exclusion zone policy.

5. STOP WORK AUTHORITY

All Roux employees and their subcontractors have stop-work authority. Upon initial hire, all Roux employees are provided initial safety orientation, including stop work authority. All Roux employees and subcontractors are encouraged to stop work whenever any task or operation presents unreasonable risk or employees are unsure how to carry out work safely. This includes upon observing any questionable safety-related behavior or condition, they are to stop work immediately and discuss the behavior or condition with the individual(s) involved. Upon stopping work, the following actions will be taken:

- Notify the affected parties to include the Project Manager (PM) and Site Health and Safety Officer (SHSO);
- Work to correct the situation or not proceed until the situation is corrected by the PM or SHSO;
- Resume work only when told to proceed by either the PM or SHSO;
- The SHSO will document the Stop-Work intervention in the field logbook;
- Stop-Work interventions will be reported to the PP for review to ensure the interventions are closed; and
- The PP will share learnings from the interventions, as appropriate, throughout the firm, to demonstrate the importance of the Stop-Work interventions.

Please note: Any form of retribution or intimidation directed at any individual or company for exercising their right to issue a stop work authority will not be tolerated.

APPENDIX F

Incident Investigation and Reporting Management Program

INCIDENT INVESTIGATION AND REPORTING MANAGEMENT PROGRAM

CORPORATE HEALTH AND SAFETY DIRECTOR	:	**Brian Hobbs, CIH, CSP**
EFFECTIVE DATE	:	**01/2019**
REVIEW DATE	:	**03/2024**
REVISION NUMBER	:	**5**

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APPENDICES

1. PURPOSE

Roux Associates, Inc. and its affiliated companies, Roux Environmental Engineering and Geology, D.P.C., and Remedial Engineering (collectively, “Roux”) has instituted the following management program for reporting Environmental Health and Safety (EHS) incidents and near losses; investigation and correcting the causes of incidents; tracking incidents and corrective actions are taken; and sharing the cause and corrective actions with Roux personnel. These practices and procedures establish a method to track progress and improvements to the company’s EHS performance.

2. SCOPE AND APPLICABILITY

These procedures apply to all Roux employees. Employees must follow these procedures for all incidents involving Roux personnel or other personnel (e.g., subcontractors) working for Roux, regardless of the specific work activity or work location.

This program is intended, in part, to fulfill the Occupational Safety and Health Administration (OSHA) occupational injury and illness reporting and recording requirements cited in the Code of Federal Regulations (CFR) at 29 CFR 1904. All work-related fatalities, injuries, and/or illnesses shall be recorded, and written records are kept in accordance with 29 CFR 1904. OSHA 300 Log, privacy case list (if applicable), annual summary reports, and OSHA incident report forms shall be maintained for a minimum of five (5) years following the end of the calendar year.

3. RESPONSIBILITIES

All Roux employees are responsible for reporting all incidents as soon as possible to the PM (or Administrative Manager for office-related incidents), Site Health and Safety Officer (SHSO), Office Health and Safety Manager (OHSM), Corporate Health and Safety Director (CHSD), and Operations Manager (OM), regardless of severity. Additionally, the following positions have specific responsibilities for implementing this specific SOP.

3.1 Corporate Health and Safety Director (CHSD)

- The CHSD is responsible for ensuring a system is in place for reporting, investigating, correcting, and communicating EHS incidents and near losses. This responsibility includes providing appropriate training in Root Cause Analysis. All field personnel and their supervisors and managers shall be trained accordingly.
- The CHSD is responsible for ensuring workplace fatalities are reported to OSHA within 8 hours, and any in-patient hospitalization, amputation, or eye loss must be reported to OSHA within 24 hours. Additionally, required incidents will be reported to the client (host facility) within 24 hours, if applicable.
- The CHSD is responsible for implementing and communicating this program's contents to OHSMs.
- The CHSD will review all incidents and corrective actions taken. The CHSD will summarize serious incidents to the Board of Directors.
- The CHSD will communicate learnings from incidents and corrective actions taken to all personnel through quarterly communications.
- The CHSD will periodically review and evaluate the effectiveness of this procedure.
- The CHSD shall coordinate updates to OSHA 300 logs within seven calendar days of receiving information that an OSHA recordable injury occurred.

3.2 Chief Executive Officer (CEO)

- The CEO (Company Official) is responsible for signing off on the OSHA 300A Summary form provided by the CHSD.

3.3 Operations Manager (OM)

- The OM will designate the individual to serve as the OHSM responsible for ensuring that requirements in this procedure are met.
- The OM will ensure that sufficient resources are allocated to fulfill the requirements of this procedure.
- The OM will review all incident reports prepared under this procedure.

3.4 Office Health and Safety Manager (OHSM)

- The OHSM is responsible for reviewing draft incident reports, assisting the OM in finalizing reports of all accidents, illnesses, and incidents related to work activity, and assisting the SHSO when necessary.
- The OHSM is responsible for determining root causes of all loss incidents and any near loss incident which could have resulted in a serious injury or fatality and/or significant property damage.
- The OHSM may not approve a site-specific Health and Safety Plan (HASP) unless the HASP includes incident reporting procedures and forms, as applicable.
- The OHSM will suggest and implement corrective actions to prevent the same type of incident from re-occurring.
- The OHSM will keep all incident reports, corrective action taken, and follow-up forms on file. The OHSM will provide copies of all final reports and documents to the CHSD within one week of the incident. If a serious incident occurs, the CHSD will be notified as soon as possible.
- The OHSM shall post the annual OSHA 300A summary within a common space (i.e., kitchen, break area) within the office visible to all employees from February 1st through April 30th.
- The occurrence of a serious incident will trigger an health and safety audit by the OHSM.

3.5 Project Manager (PM)

- It shall be the PM’s responsibility to promptly correct any deficiencies that were determined to cause or contribute to the incident investigated.
- If a site-specific HASP is not utilized, the PM must ensure that field personnel have copies of the Roux Accident Reporting and Investigation Forms, which are available digitally on Roux’s Health and Safety App Gateway and online.
- The PM has the responsibility of ensuring that the SHSO and other field personnel understand the need for timely incident reporting.
- In the event of an incident, the PM will assist in determining the root cause of the incident with the assistance of the SHSO and OHSM. The PM should provide input as to corrective preventative measures.

3.6 Site Health and Safety Officer (SHSO)

- The SHSO shall provide the details of the incident to the OHSM, PM, and OM. The OM or his delegate will provide additional notifications, such as, in the event of a work-related motor vehicle accident, to include the Roux Legal Department and Accounting.

- It is the SHSO's responsibility to immediately notify the OHSM and the PM when any incident occurs. Such notification should occur immediately following the completion of any emergency actions required by the HASP.
- The SHSO should provide input as to corrective preventative measures.
- The SHSO must ensure corrective actions proposed by the OHSM or OM are carried out.

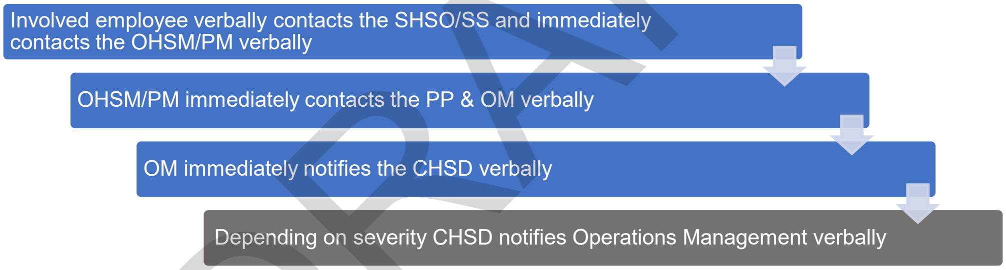
3.7 All Personnel

- All personnel are responsible for reporting and describing the details of any incident they are involved to the SHSO and PM. Such notification should occur immediately following the completion of any emergency actions required by the HASP, after the loss, and before the scene is disturbed or vehicles are moved.

4. PROCEDURE

4.1 Emergency Medical Treatment and First Aid

In the event of a work-related injury or illness, employees must follow the procedures outlined below. All workplace injury and illness situations require Roux's Project and Corporate Management Team to be notified when an injury/illness incident occurs, and communication with the contracted Occupational Health Care Management Provider, is initiated, as necessary. The Injury/Illness Notification Flowchart is provided below.



If on-Site personnel require any medical treatment, the following steps will be taken:

- Notify Roux's Project and Corporate Management Team for any work-related injury and/or illness occurrence, and communicate with the contracted Occupational Health Care Management Provider, immediately following the notifications provided above.
- Based on discussions with the Project Team, Corporate Management, and the Occupational Health Care Management Provide, if medical attention beyond onsite first aid is warranted, transport the injured / ill person (IP) to the Urgent Care Center, or notify the Fire Department or Ambulance Emergency service and request an ambulance or transport the victim to the hospital, and continue communications with Corporate Management Team.
- Decontaminate to the extent possible prior to administration of first aid or movement to medical or emergency facilities.
- First aid medical support will be provided by onsite personnel trained and certified in First Aid, Cardio Pulmonary Resuscitation (CPR), Automatic External Defibrillation (AED), and Blood-Borne Pathogens (BBP) Awareness, until relieved by emergency medical services (EMS).
- The SHSO and PM will perform a Loss Investigation (LI), and the Project Team will complete the final Loss Report. As outlined below.

4.2 Incident Investigation

Upon receiving a report of an incident or near loss occurrence from a Roux employee, the SHSO or OHSM shall immediately investigate the circumstances and make appropriate recommendations to prevent a recurrence. All reports are filed digitally within Roux's Health and Safety Management System. Should hard copies be requested the Health and Safety Department may provide Roux's Incident Report form which can be found in **Appendix A**, and Near Loss form which is found in **Appendix B**. The OM may also participate in the investigation of more serious accidents and incidents that occur on-site. The CHSD should also be immediately notified by telephone the on occurrence of a serious accident or incident. At the CHSD's discretion, he may also participate in the investigation.

The investigation process is summarized below:

- An initial identification / assessment of evidence will be made before anything is moved. Any item potentially considered as evidence will be secured and preserved under the guidance of the Legal Department.
- Witness interviews/statements will include the witnesses' names and the content of the information provided and will be captured on the Accident Report and Investigation Form. Notes from witness interviews will be collected as part of the investigation report.
- Appropriate equipment will be available to conduct the investigation. This equipment will include, as needed, a phone with a camera, tape measure, and industrial hygiene sampling equipment (e.g., direct reading instruments).

4.3 Incident Report

Details of the incident shall be documented using the Accident Report and Investigation Forms (**Appendix A**) within twenty-four (24) hours of the incident and shall be distributed to the SHSO, the OHSM, PM, OM, and the CHSD. The CHSD will update OSHA Forms 301 and the 300 log when necessary and distribute them to the affected office.

Appendix A

Accident Report and Investigation Form

Accident Report and Investigation Form

☐ Roux Environmental Engineering and Geology, D.P.C.
☐ Roux Associates, Inc. ☐ Remedial Engineering, P.C.

ACCIDENT REPORT

Brian Hobbs, Corporate Health and Safety Director
Cell: (631) 807-0193; Office: (631) 630-2416

PART 1: ADMINISTRATIVE INFORMATION

Project #: ______________________________
Project Name: ______________________________
Project Location (street address/city/state):
____
____

Client Corporate Name / Contact / Address / Phone #:
____
____
____
____
____

Immediate Verbal Notifications Given To:

Corporate Health & Safety	☐Yes	☐No
Office Health & Safety	☐Yes	☐No
Operations Manager	☐Yes	☐No
Project Principal	☐Yes	☐No
Project Manager	☐Yes	☐No
Client Contact	☐Yes	☐No

REPORT STATUS (time due):

☐ Initial (24 hr.) ☐ Final (5-10 days)
Date: ____________ Date: ____________

Accident Report Delivered To:

Corporate Health & Safety	☐Yes	☐No
Office Health & Safety	☐Yes	☐No
Operations Manager	☐Yes	☐No
Project Principal	☐Yes	☐No
Project Manager	☐Yes	☐No

REPORT TYPE: ☐ Loss ☐ Near Loss Estimated Costs: $ _____
______

OSHA CASE # Assigned by Corporate Health & Safety if Applicable:

Corporate Health & Safety Confirmed Final Accident Report
☐Yes ☐No

DATE OF INCIDENT: ________________

TIME INCIDENT OCCURRED: ____________ ☐AM ☐PM

INCIDENT LOCATION – City, State, and Country (If outside U.S.A.)
____

INCIDENT TYPES: (Select most appropriate if Loss occurred.)
From lists below, please select the option that best categories the incident. When selecting an injury or illness, also indicate the severity level.

☐**INJURY** ☐**ILLNESS**

------------------------**Severity Level**---------------------------

☐Fatality
☐Restricted Work
☐First Aid
☐Lost Time
☐Medical Treatment

OTHER INCIDENT TYPES

☐Spill / Release
Material involved:________________
Quantity (U.S. Gallons): ____________
☐Misdirected Waste
☐Property Damage
☐Motor Vehicle
☐Consent Order
☐Exceedance
☐Fine / Penalty
☐NOV

ACTIVITY TYPE (Check most appropriate one.)

☐CAMP
☐Construction
☐Drilling
☐Driving
☐Excavation / Trenching
☐Gauging
☐O&M
☐Other Soil Work (e.g., Compaction)
☐Sampling
☐Site Walk/Inspection
☐Subsurface Clearance
☐Trucking
☐Waste Mgmt.
☐Work Area Prep.
☐Other

INJURY TYPE (Check all applicable.)

☐Abrasion
☐Amputation
☐Burn
☐Cold/Heat Stress
☐Inflammation
☐Laceration
☐Occupational Illness
☐Puncture
☐Rash
☐Repetitive Motion
☐Sprain/Strain
☐Other__________

BODY PART AFFECTED (Check all applicable.)

☐Respiratory
☐Neck
☐Chest
☐Abdomen
☐Groin
☐Back
☐Shoulder
☐Arm
☐Wrist
☐Hand/Fingers
☐Eye
☐Head
☐Face
☐Leg
☐Knee
☐Ankle
☐Foot/Toes
☐Other______

I. PERSON(S) DIRECTLY / INDIRECTLY INVOLVED IN INCIDENT (Attach additional information as necessary/applicable.)

Name/Phone # of Each Person Directly/Indirectly Involved in Incident:	Designate: Roux/Remedial Employee Roux/Remedial Subcontractor Client Employee Client Contractor Third Party	As applicable, Current Occupation; Yrs in Current Occupation; Current Position; and Yrs in Current Position:	As applicable, Employer Name; Address; and Phone #:	As applicable, Supervisor Name; and Phone #:
1)				
2)				

II. PERSONS INJURED IN INCIDENT (Attach additional information as necessary/applicable.)

Name/Phone # of Each Person Injured in Incident:	Designate: Roux/Remedial Employee Roux/Remedial Subcontractor Client Employee Client Contractor Third Party	As applicable, Current Occupation; Yrs in Current Occupation; Current Position; and Yrs in Current Position:	As applicable, Employer Name; Address; and Phone #:	As applicable, Supervisor Name; and Phone #:	Description of Injury:
1)					
2)					

III. PROPERTY DAMAGED IN INCIDENT (Attach additional information as necessary/applicable.)

Property Damaged:	Property Location:	Owner Name, Address & Phone #:	Description of Damage:	Estimated Cost:
1)				
2)				$

IV. WITNESSES TO INCIDENT (Attach additional information as necessary/applicable.)

Witness Name:	Address:	Phone #:
1)		
2)		

PART 2: WHAT HAPPENED AND INCIDENT DETAILS

PROVIDE FACTUAL DESCRIPTION OF INCIDENT (e.g., describe loss/near loss, injury, response / treatment).

I. AUTHORITIES/GOVERNMENTAL AGENCIES NOTIFIED (Attach additional information as necessary/applicable.)

Authority/Agency Notified:	Name/Phone #/Fax # of Person Notified:	Address of Person Notified:	Date & Time of Notification:	Exact Information Reported/Provided:

II. PUBLIC RESPONSES TO INCIDENT (if applicable)

Response/Inquiry By: (check one)	Entity Name:	Name/Phone # of Respondent/ Inquirer:	Address of Entity/Person:	Date & Time of Response/Inquiry:
☐Newspaper ☐Television ☐Community Group ☐Neighbors ☐Other ________________				

Describe Response/Inquiry:

Roux/Remedial Response:

(Check all that apply.) (Attach photos, drawings, etc. to help illustrate the incident.)
ATTACHED INFORMATION: ☐Photo ☐Sketches ☐Vehicle Acord Form ☐Police Report ☐Other

Name(s) of person(s) who prepared Initial and Final Report:	**Title(s):**	**Phone number(s):**

PART 3: INVESTIGATION TEAM ANALYSIS

Date Investigation Started (MM/DD/YYYY):

Factors, Root Causes, and Solution (FRCS): Complete FRCS form and answer all 7 factor questions. If answering NO to Factors 1 – 4 identify root cause(s) and explain why QIs) occurred. If answering YES to Factors 5 – 7 circle the root cause(s). Transfer the solutions guidance that addresses each root cause from the FRCS form to this form. Attach your completed FRCS Worksheet. If Factors 1-7 do not apply to the incident, write “External Cause” in the Factor column below and leave the remaining fields blank.

DESCRIPTION OF UNDESIRABLE BEHAVIOR/CONDITION

1.

2.

FACTOR(S) AND SOLUTION(S): HOW TO REDUCE POSSIBILITY OF INCIDENT RECURRING

Selection of factors and solutions reflects the analysis of investigation team and is not meant to be a legally binding conclusion as to the Root Cause and/or solution.

CAUSAL FACTOR/ BEHAVIOR/ CONDITION	ROOT CAUSE	SOLUTION(S) [Must Match Root Cause(s)]	PERSON RESPONSIBLE	AGREED DUE DATE	ACTUAL COMPLETION DATE

INVESTIGATION TEAM:

PRINT NAME	JOB POSITION	DATE	SIGNATURE

QUALITY REVIEW Correct root cause(s) identified? Do root cause(s) and solution(s) match? Are solution(s) feasible / maintainable?

Name:

Job Title:

PART 4: Date Solutions were Implemented & Validated (Were Solutions Effective?)

Date	Solution	Verifier / Validator Name and Job Title	Details (of I & V performed)

Appendix B

Near Loss Form

Appendix B – Near Loss Form

ROUX HEALTH & SAFETY NEAR LOSS REPORT FORM

☐ **Roux Environmental Engineering and Geology, D.P.C.**
☐ **Roux Associates, Inc.** ☐ **Remedial Engineering, P.C.**

(Check applicable company name)

PART 1: ADMINISTRATIVE INFORMATION		
Office: ☐ New York ☐ Massachusetts ☐ New Jersey ☐ Illinois ☐ CA - Los Angeles ☐ CA - Oakland		
Project Manager:	**Project Principal:**	
Project Name:	**Project Location:**	
PART 2: NEAR LOSS INCIDENT DETAILS		
Date\Time Occurred (MM/DD/YYYY HH:MM):	**Date\Time Submitted** (MM/DD/YYYY HH:MM):	

NEAR LOSS INCIDENT TYPE - What could have happened? - Select all that apply (1-7)			
1. ☐ Fire / Explosion 2. ☐ Injury / Illness	3. ☐ Security (e.g., theft, trespassing, vandalism)	4. ☐ Environmental (Spill, permit exceedance, etc.) 5. ☐ Transportation of personnel (vehicle accident)	6. ☐ Property/Equipment Damage 7. ☐ Business Interruption

Event Leading to Potential Injury/Illness:	
Job Task*:	**Equipment Involved*:**

WHAT HAPPENED? Do not include individuals' names. Ensure photos, sketches, etc. are not personally identifiable unless written consent has been obtained.

Summary (1-2 sentences. Provide brief description of the incident. Provide facts only, no speculation or opinion)**:**

Incident Details (Brief factual details of what, where, when; include photos, sketches, etc. as attachments)**:**

Immediate Corrective Actions Taken:

SERIOUS INJURY OR FATALITY (SIF): **IF AN ACTUAL SIF, USE EXISTING ROUX ACCIDENT REPORTING FORM**

Could this have resulted in a SIF? ☐ **Yes** ☐**No**

A potential SIF is defined as likely to have caused an injury resulting in significant physical body damage with probable long term and/or life altering complications.

INCIDENT INVOLVED:

Roux Employee: ☐ **Yes** ☐ **No** **Subcontractor Company Name:**

INVESTIGATION TEAM

NAME	**JOB TITLE**	**NAME**	**JOB TITLE**

PART 3: INCIDENT INVESTIGATION FINDINGS AND REPORT QUALITY REVIEW

Date Investigation Started (mm/dd/yyyy):

Factors, Root Causes, and Solution (FRCS): Complete FRCS form and answer all 7 factor questions. If answering NO to Factors 1 – 4 identify root cause(s) and explain why QIs) occurred. If answering YES to Factors 5 – 7 circle the root cause(s). Transfer the solutions guidance that addresses each root cause from the FRCS form to this form. Attach your completed FRCS Worksheet. If Factors 1-7 do not apply to the incident, write "External Cause" in the Factor column below and leave the remaining fields blank. Do not include individuals' names.

DESCRIPTION OF UNDESIRABLE BEHAVIOR/CONDITION

1.

2.

FACTOR(S) AND SOLUTION(S): HOW TO REDUCE POSSIBILITY OF INCIDENT RECURRING
Selection of factors and solutions reflects the analysis of investigation team and is not meant to be a legally binding conclusion as to the Root Cause and/or solution.

Behavior / Condition	Root Cause	Solution(s) (Must Match Root Cause)	Person Responsible for Completion	Completion Target Date	Completion Actual Date

QUALITY REVIEW Correct root cause(s) identified? Do root cause(s) and solution(s) match? Are solution(s) feasible / maintainable?

Name: **Job Title:**

PART 4: Date Solutions were Implemented & Validated (Were Solutions Effective?)

Date	Solution	Verifier / Validator Name and Job Title	**Details** (of I & V performed)

***JOB TASK - Select the most appropriate one** (primary job associated with incident-related work activity, avoid "Other" if possible)

1. CAMP
2. Construction
3. Drilling
4. Driving
5. Excavation/Trenching
6. Gauging
7. O&M
8. Other Soil Work (e.g., Compaction)
9. Sampling
10. Site Walk/ Inspection
11. Subsurface Clearance
12. Trucking
13. Waste Management
14. Work Area Preparation
15. Other

***EQUIPMENT INVOLVED THAT CONTRIBUTED TO H&S NEAR LOSS - Select all that apply**

1. Air Stripper
2. API Separator
3. Automobile
4. Boom Material
5. Bulldozer
6. Cable
7. Carbon Drum / Vessel
8. Chain Block
9. Compressor, Air
10. Control Panel (local)
11. Crane (mobile)
12. Drill Rig
13. Drilling Equipment, Vacuum
14. Drum, Vertical
15. Dump Truck
16. Electric Heater
17. Electrical Power Supply
18. Engine, Combustion
19. Equipment Safety Grounding
20. Excavator / Power Shovel
21. Exclusion Zone Equipment
22 Fan / Blower
23 Fencing
24 Filter
25. Fire Extinguisher
26. Forklift
27. Front End Loader
28. Grader
29. Hammer
30. Knife
31. Non-Powered Equipment
32. Powered Equipment
33. Drill
34. Grinder
35. Hydraulic Torque Wrench
36. Powered Saw
37. Impact Wrench
38. Saw
39. Screwdriver
40. Shears
41. Shovel
42. Snip
43. Wrench
44. Hoist
45, Hook/Clamp/Buckle, etc.
46. Jack
47. Ladder, Extension
48. Ladder, Platform
49. Ladder, Step
50. Lock Out / Tag Out
51. Maintenance Tool, General
52. Manifold
53, Manlift/Basket/Cherry Picker
54. Motor, Electric
55. Oxidizer
56. Pallet
57. Piping
58. Piping, Hose
59. Piping, Injection/Mixing Point
60. Hydrojet
61. Centrifugal Pump
62. Diaphragm Pump
63. Reciprocating Pump
64. Regenerative Pump
65. Rotary Pump
66. Transfer Pump
67. Submersible Pump
68. Face Shield
69. Fall Protection
70. Gloves
71. Hard Hat / Helmet
72. Hearing Protection
73. Respiratory PPE (Chemical)
74. Respiratory PPE (Particulate)
75. Safety Glasses
76. Safety Goggles
77. Safety Shoes / Boots
78. Safety Vest / Clothing
79. Rope
80. Bailer
81. Geoprobe
82. Hand Auger
83. PID
84. Multi-Gas Meter
85. Sample Container
86. Split-Spoon Sampler
87. Sling
88. Snow Blower
89. Snow Plow
90. Space Heater
91. Air Sparging System
92. Carbon Treatment Sys
93. Chemical Oxidation S
94. Dual Phase Product Recovery System
95. Groundwater Pump and Treat System
96. POET System
97. Shed or Trailer
98. Vapor Extraction System
99. Vapor-Phase Treatment System
100. Other System, Type:____
101. Surge Tank
102. Underground Tank
103. Telemetry System
104. Testing Devices
105. Tractor Trailer
106. Truck, Flatbed
107. Truck, Pickup
108. Truck, Tank Truck
109. Truck, Vacuum
110. Safety Valve
111. Block Valve
112. Extraction Well
113. Monitoring Well
114. Recovery Well
115. Winch
116. Wire Rope
117. No Equipment Involved
118. MPT – Traffic Control Devices
118. Not in List (describe):____

APPENDIX G

Generic Community Air Monitoring Plan (CAMP)

APPENDIX G

New York State Department of Health
Generic Community Air Monitoring Plan

Overview

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

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

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

Community Air Monitoring Plan

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

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

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

VOC Monitoring, Response Levels, and Actions

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

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

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

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

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

Particulate Monitoring, Response Levels, and Actions

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

1. If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m^3 above the upwind level and provided that no visible dust is migrating from the work area.
2. If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m^3 above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m^3 of the upwind level and in preventing visible dust migration.
3. All readings must be recorded and be available for State (DEC and NYSDOH) and County Health personnel to review.

APPENDIX H

Tailgate Form

HEALTH AND SAFETY BRIEFING / TAILGATE MEETING FORM

Site Name / Location ______________________________

Date: ______________________ Weather Forecast: ______________________

Names of Personnel Attending Briefing

Planned Work

____

____

____

Instrument Calibration: Instrument/Time/Cal. Gas/Cal. Concentration/Actual Concentration

____

____

____

Items Discussed

____

____

____

____

____

Work Permit Type and Applicable Restrictions

____

____

____

Signatures of Attending Personnel

APPENDIX I

Roux COVID-19 Interim Health and Safety Guidance

COVID-19 INTERIM HEALTH AND SAFETY GUIDANCE

CORPORATE HEALTH AND SAFETY MANAGER	:	**Brian Hobbs, CIH, CSP**
EFFECTIVE DATE	:	**03/2020**
REVISION DATE	:	**06/11/2021**
REVISION NUMBER	:	**7**

TABLE OF CONTENTS

APPENDICES

1. PURPOSE

This guidance has been implemented to establish work practices, administrative procedures, and engineering controls to minimize potential exposure to SARS-CoV-2, the virus that causes COVID-19. The following guidance has been developed based on local, state and federal recommendations/requirements regarding COVID-19. The purpose of this document is to supplement existing site-specific Health and Safety Plans (HASPs) and provide interim health and safety guidance to minimize potential exposure to SARS-CoV-2. Should additional scientific information or regulatory information change, this document shall be updated accordingly.

2. SCOPE AND APPLICABILITY

This guidance covers all Roux employees and the subcontractors that Roux oversees. Site specific HASPs shall be developed to incorporate elements of mitigative measures against COVID-19 exposure. If work cannot be carried out in compliance with this guidance, the project shall be further evaluated by the Project Principal (PP), Office Manager (OM), and Corporate Health and Safety Director (CHSD) prior to work authorization.

Roux subcontractors are required to review, comply with, and implement Roux's COVID-19 Interim Health and Safety Guidance while on Site. Subcontractors may implement additional preventative measures as they see fit. All work shall be conducted in a manner consistent with the federal, state, and local guidance as it relates to COVID-19.

3. BACKGROUND

What is COVID-19?

COVID-19 is a respiratory illness that can spread from person to person. The virus that causes COVID-19 is a novel coronavirus that was first identified during an investigation into an outbreak in Wuhan, China. This virus continues to spread internationally and within the United States. Multiple variants of the virus that causes COVID-19 are circulating globally. There are currently several vaccines which have been developed which are authorized, recommended and effective at protecting you from getting sick.

What are the symptoms of COVID-19?

Reported illnesses have ranged from mild symptoms to severe illness and death for confirmed COVID-19 cases. Symptoms may appear 2 to 14 days following exposure to the virus. People with these symptoms or combinations of symptoms may have COVID-19:

- Fever or chills
- Cough
- Shortness of breath or difficulty breathing
- Fatigue
- Muscle or body aches
- Headache
- New loss of taste or smell
- Sore throat
- Congestion or runny nose
- Nausea or vomiting
- Diarrhea

This list is not all possible symptoms. The CDC will continue to update this list as they learn more about the virus. For an updated symptom list please reference the following link for CDC Symptoms of Coronavirus.

If someone develops emergency warning signs for COVID-19, they should be instructed to get medical attention immediately. Emergency warning signs can include those listed below; however, this list is not all inclusive. Please consult your medical provider for any other symptoms that are severe or concerning.

- Trouble breathing
- Persistent pain or pressure in the chest
- New confusion
- Inability to wake or stay awake
- Pale, gray, or blue-colored skin, lips, or nail beds, depending on skin tone

How does COVID-19 spread? [1]

Individuals who are within close contact (within 6 feet) of a person with COVID-19 or have direct contact with that person are at greatest risk of infection.

- When people with COVID-19 cough, sneeze, sing, talk, or breathe they produce respiratory droplets. These droplets can range in size from larger droplets (some of which are visible) to smaller droplets. Small droplets can also form particles when they dry very quickly in the airstream.
- Infections occur mainly through exposure to respiratory droplets when a person is in close contact with someone who has COVID-19.
- Respiratory droplets cause infection when they are inhaled or deposited on mucous membranes, such as those that line the inside of the nose and mouth.
- As the respiratory droplets travel further from the person with COVID-19, the concentration of these droplets decreases. Larger droplets fall out of the air due to gravity. Smaller droplets and particles spread apart in the air.
- With passing time, the amount of infectious virus in respiratory droplets also decreases.

Transmission of SARS-CoV-2 from inhalation of virus in air farther than six feet from an infectious source can occur.

Some infections can be spread by exposure to virus in small droplets and particles that can linger in the air for minutes to hours. These viruses may be able to infect people who are further than 6 feet away from the person who is infected or after that person has left the space. This kind of spread is referred to as **airborne transmission** and is an important way that infections like tuberculosis, measles, and chicken pox are spread.

- There is evidence that under certain conditions, people with COVID-19 seem to have infected others who were more than 6 feet away. These transmissions occurred within enclosed spaces that had inadequate ventilation. Sometimes the infected person was breathing heavily, for example while singing or exercising.
  - Under these circumstances, scientists believe the amount of infectious smaller droplet and particles produced by the people with COVID-19 became concentrated enough to spread the virus to other people. The people who were infected were in the same space during the same time or shortly after the person with COVID-19 had left.
- Available data indicate it is much more common for the virus that causes COVID-19 to spread through close contact with a person who has COVID-19 than through airborne transmission.[2]

Per published reports, factors that increase the risk of SARS-CoV-2 infection under these circumstances include:

- Enclosed spaces with inadequate ventilation or air handling within which the concentration of exhaled respiratory fluids, especially very fine droplets and aerosol particles, can build-up in the air space.
- Increased exhalation of respiratory fluids if the infectious person is engaged in physical exertion or raises their voice (e.g., exercising, shouting, singing).
- Prolonged exposure to these conditions, typically more than 15 minutes.

Spread from contact with contaminated surfaces or objects is less common.

Respiratory droplets can also land on surfaces and objects. It is possible that a person could get COVID-19 by touching a surface or object that has the virus on it and then touching their own mouth, nose, or eyes. Spread from touching surfaces is not thought to be a common way that COVID-19 spreads.

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[1] How COVID-19 Spreads https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/how-covid-spreads.html#edn1

[2] Scientific Brief: SARS-CoV-2 and Potential Airborne Transmission | CDC https://www.cdc.gov/coronavirus/2019-ncov/more/scientific-brief-sars-cov-2.html

4. TRAINING REQUIREMENTS

All employees with potential exposure to COVID-19 shall be provided training that incorporates COVID-19 exposure mitigation strategies, such as implementation of proper social distancing, personal hygiene (e.g., handwashing), as well as disinfection procedures, as outlined by CDC guidelines.

5. EXPOSURE RISK POTENTIAL

Worker risk of occupational exposure to COVID-19 can vary from very high, high, medium, or lower (caution) risk. This level of exposure is dependent on several factors, which can include industry type; need for contact within 6 feet of people known to be or suspected of being infected with COVID-19; density of work environment; and industrial setting (i.e., healthcare building, occupied interior work area, minimal ventilation).

Provided below is background risk level information taken from the U.S. Department of Labor Occupational Safety and Health Administration Guidance on preparing workplaces for COVID-19. Risk evaluations for each project shall be conducted by the PP and OM in consultation with the CHSD to ensure Roux employees and subcontractors remain within the lower exposure (caution) category. If it is identified there is a medium exposure risk or higher, further evaluation and mitigative measures shall be evaluated to reduce overall exposure risk prior to work authorization.

Very High Exposure Risk (Activities not conducted by Roux)

Very high exposure risk includes occupations/work activities with high potential for exposure to known or suspected sources of COVID-19 during specific medical, postmortem, or laboratory procedures. This can include but is not limited to:

- Healthcare workers (e.g., doctors, nurses, dentists, paramedics, emergency medical technicians) performing aerosol-generating procedures (e.g., intubation, cough induction procedures, bronchoscopies, some dental procedures and exams, or invasive specimen collection) on known or suspected COVID-19 patients.
- Healthcare or laboratory personnel collecting or handling specimens from known or suspected COVID-19 patients (e.g., manipulating cultures from known or suspected COVID-19 patients).
- Morgue workers performing autopsies, which generally involve aerosol-generating procedures on the bodies of people who are known to have, or suspected of having, COVID-19 at the time of their death.

High Exposure Risk (Activities not conducted by Roux)

High exposure risk occupations/work activities include exposure to known or suspected COVID-19 positive individuals. This can include but not limited to:

- Healthcare delivery and support staff (hospital staff who must enter patients' rooms) exposed to known or suspected COVID-19 patients.
- Medical transport workers (ambulance vehicle operators) moving known or suspected COVID-19 patients in enclosed vehicles.
- Mortuary workers involved in preparing bodies for burial or cremation of people known to have, or suspected of having, COVID-19 at the time of death.

- Those who have frequent or sustained contact with coworkers, including under close working conditions indoors or in poorly ventilated spaces in various types of industrial, manufacturing, agriculture, construction, and other critical infrastructure workplaces.
- Those who have frequent indoor or poorly ventilated contact with the general public, including workers in retail stores, grocery stores or supermarkets, pharmacies, transit and transportation operations, law enforcement and emergency response operations, restaurants, and bars.

Medium Exposure Risk

Medium exposure risk occupations/work activities include those that require frequent and/or close contact with (i.e., within 6 feet for a cumulative total of 15 minutes or more over a 24-hour period)) people who may be infected with COVID-19, but who are not known or suspected to be COVID-19 positive. For most of our worksites, it is assumed there is on-going community transmission for COVID-19. Therefore, workers who work at sites and may have contact with the general public, other contractors, high-population-density work environments (i.e., greater than 10 people) fall within medium exposure risk group category. This can include, but is not limited to, sampling events that require two or more workers to collect and log samples in close contact or work occurring in an interior space with limited ventilation and several workers present.

Lower Exposure Risk (Caution)

Lower exposure risk (caution) occupations/work activities are those that do not require close contact (within 6 feet for a cumulative total of 15 minutes or more over a 24-hour period) with other people. During these activities, there is limited contact (i.e., within 6 feet of) the general public or other workers. Workers in this category have minimal occupational contact with the public and other coworkers. This includes construction oversight that does not require close contact, sampling or gauging events performed by one worker and our remote workers as well as office workers who do not have frequent close contact with coworkers, clients, or the public.

6. CDC FULLY VACCINATED GUIDANCE

Roux has adopted the updated CDC guidance for those fully vaccinated, where state/local jurisdictions and clients allow. This is based on growing evidence that the vaccine is highly effective at protecting those vaccinated and preventing further spread. Roux Human Resources shall collect information on vaccination status of employees who have been vaccinated to make informed decisions and ensure conformance with state/local requirements, as appropriate. Should employees want to go without wearing a mask or applying social distancing, etc. they must provide proof of vaccination to Human Resources at HR@rouxinc.com.

In general, employees shall be considered fully vaccinated:

- 2 weeks after their second dose in a 2-dose series, such as the Pfizer or Moderna vaccines, or
- 2 weeks after a single-dose vaccine, such as Johnson & Johnson's Janssen vaccine.

If you do not meet these requirements, regardless of age, you are not fully vaccinated and are asked to continue to take all precautions until you are fully vaccinated.

If you have been fully vaccinated:

- You can resume activities without wearing a mask or staying 6 feet apart, except where required by federal, state, local, tribal, or territorial laws, rules, and regulations, including local business and workplace guidance.
- If you travel in the United States, you do not need to get tested before or after travel or self-quarantine after travel.

- You need to pay close attention to the situation at your international destination before traveling outside the United States.
  - You do NOT need to get tested before leaving the United States unless your destination requires it.
  - You still need to show a negative test result or documentation of recovery from COVID-19 before boarding an international flight to the United States.
  - You should still get tested 3-5 days after international travel.
  - You do NOT need to self-quarantine after arriving in the United States.
- If you have been around someone who has COVID-19, you do not need to stay away from others or get tested unless you have symptoms.

7. COVID-19 HEALTH SCREENING

7.1. Roux Employees

All Roux employees are required to self-attest to a COVID-19 Daily Health Questionnaire which is to be completed at home through a mobile application on scheduled workdays. The purpose of this program is to ensure business continuity as well as mitigate any potential exposure to our employees and others if it is determined employees are at-risk for contracting COVID-19. As part of this self-attestation, all employees are required to take their temperatures daily at home to confirm they do not have a fever (≥ 100.4). Employees who answer yes to any of these questions are instructed to contact their Office Manager and/or Department Head immediately and should not enter the office or go to a field site. Information shall be used to determine appropriate internal response in consultation with the Human Resources Director (HRD) and CHSD.

Below, you will find our COVID-19 Daily Health Questionnaire that all Roux employees are required to self-attest to **every scheduled workday by 9:30 AM.** If employees do not promptly fill out the questionnaire by the time listed above, there will be additional follow up by HR, H&S, and/or OMs.

According to the U.S. Centers for Disease Control and Prevention & the World Health Organization, COVID-19 Symptoms include:

- *Fever (≥100. 4°F) or chills*
- *Cough*
- *Shortness of breath or difficulty breathing*
- *Fatigue*
- *Muscle or body aches*
- *Headache*
- *New loss of taste or smell*
- *Sore throat*
- *Congestion or runny nose*
- *Nausea or vomiting*
- *Diarrhea*

Have you experienced any of the COVID-19 related symptoms noted above in the last 14 days? Please Note: We do not expect employees to answer "yes" to the symptoms question if these are symptoms you normally experience due to another condition or medication.

- *Yes*
- *No*

Have you been in close contact with someone who is suspected or confirmed to have COVID-19 or who is under investigation for COVID-19 within the last 14 days? * Close contact as defined by the CDC is being within 6 feet of someone who has COVID-19 for a cumulative total of 15 minutes or more over a 24-hour period.*

- *Yes*
- *No*

Have you traveled outside of the country, been on a cruise ship and/or traveled to areas within the United States which have state mandated travel restrictions in the last 14 days?

- *Yes*
- *No*

Have you tested positive for COVID-19 within the last 14 days?

- *Yes*
- *No*

7.2. Subcontractors

In an effort to mitigate the risk of transmission of COVID-19, Subcontractors who shall perform work onsite are required to attest to the fitness of their work crew on a daily basis. This requires each worker to self-assess by asking themselves the four questions listed in the section above and also contained within the Roux Subcontractor Work Crew COVID-19 Daily Health Attestation. If any crew member answers "Yes" to any of the questions, that worker is not to report to the field site and should seek proper medical advice in accordance with local, state and federal guidelines. In addition, the Sub-Contractor shall self-attest to vaccination status in order for the Field Team to ensure conformance with updated guidance for fully vaccinated individuals should state/local/client requirements allow. See Section 6. CDC Fully Vaccinated Guidance.

On a daily basis, the subcontractor supervisor must provide the Subcontractor Work Crew COVID-19 Daily Health Attestation complete with the names of all work crew fit to be on the Site for that day (i.e., who have answered "No" to all questions on the self-assessment) to Roux's Project Manager or Site Supervisor. The Subcontractor must notify Roux if there have been any "Yes" responses daily. Subcontractors shall not be required to provide the name or any other personal information of any employee who has answered "Yes" to any of the self-assessment questions, however, the Subcontractor should provide the date and times that the employee has been onsite in the prior 14 days. Records shall be maintained within the project files indicating health screening has been performed, records shall be retained for not less than 14 days following the date of submission. The Roux Subcontractor Work Crew COVID-19 Daily Health Check Attestation can be found within Appendix A.

8. SELF-ISOLATION & QUARANTINE

8.1. Self-Isolation

What if I am asked to self-isolate at home and when can I return from home isolation?

Depending on the situation, if you are COVID-19 positive or suspected to have COVID-19, employees may be required to self-isolate in their homes, as per CDC or local health department guidelines. As per CDC guidance, return from isolation has been broken out into two categories. The first includes confirmed or suspected COVID-19 individuals exhibiting symptoms, and the second includes those who have not had COVID-19 symptoms (i.e., asymptomatic), but tested positive and are under self-isolation. Both categories, along with strategies to return from home isolation, are outlined below.

People with COVID-19 under home isolation:

Accumulating evidence supports ending isolation and precautions for persons with COVID-19 using a symptom-based strategy. Specifically, researchers have reported that people with mild to moderate COVID-19 remain infectious no longer than 10 days after their symptoms began, and those with more severe illness or those who are severely immunocompromised remain infectious no longer than 20 days after their symptoms began. Therefore, CDC has updated the recommendations for discontinuing home isolation as follows:

1. **Persons with COVID-19 who have symptoms** and were directed to care for themselves at home may discontinue isolation under the following conditions:
    a. At least 10 days* have passed since symptom onset;
    b. At least 24 hours have passed since resolution of fever without the use of fever-reducing medications; and
    c. Other symptoms of COVID-19 have improved.

    * *A limited number of persons with severe illness may produce replication-competent virus beyond 10 days, which may warrant extending the duration of isolation for up to 20 days after symptom onset. Consultation with your healthcare provider will be warranted in such cases of severe illness.*
2. **Persons infected with SARS-CoV-2 who never develop COVID-19 symptoms** may discontinue isolation and other precautions 10 days after the date of their first positive RT-PCR test for SARS-CoV-2 RNA.

8.2. Quarantine

Employees may be required to self-quarantine due to potential exposure with a suspected and/or confirmed COVID-19 positive individual as well as recent travel as per local/state guidelines. People in quarantine should stay home, separate themselves from others, monitor their health, and follow directions from their state or local health department.

8.2.1. Close Contact Quarantine

Employees who have come into close contact with someone who has COVID-19 are required to self-quarantine for 14 days following their last contact with the COVID-19 positive person. Close contact as defined by the CDC is being within 6 feet of someone who has COVID-19 for a cumulative total of 15 minutes or more over a 24-hour period. A person is still considered a close contact even if they were wearing a mask while they were around someone with COVID-19. Please note an infected person can spread SARS-CoV-2 starting from 2 days before they have any symptoms (or, for asymptomatic patients, 2 days before the positive specimen collection date) until they meet the criteria for discontinuing home isolation.

Employees who have been fully vaccinated (as per CDC guidance) or who were previously diagnosed with COVID-19 within the last three months and show no symptoms are not required to quarantine. If there is a need to reduce quarantine as allowed by local public health authorities, additional consultation with the HRD and CHSD shall occur in these circumstances.

8.2.2. Travel Related Quarantine/Testing

All travel out of state must be communicated with the OM and/or Department Head prior to departure. Please note, some federal/state/local entities require submissions of traveler health forms and potentially require additional testing for COVID-19. It is expected all Roux employees will comply with such federal/state/local travel requirements.

9. WORKPLACE CONTROLS

During the project planning phase, worksite evaluations shall be carried out by the PP and OM in consultation with the CHSD to determine risk exposure levels for work activities. If it is determined there is a medium exposure risk level or higher, additional workplace controls shall be evaluated and implemented as required in addition to the basic infection prevention measures outlined below in Section 10. Additional workplace controls can include engineering controls (i.e., ventilation, physical barriers), administrative controls (i.e., minimizing contact between workers, rotating shifts, site specific training), and additional personal protective equipment (i.e., respiratory protection). If exposure risk cannot be mitigated, potential project postponement may be necessary at the discretion of the OM in consultation with the CHSD.

A Job Safety Analysis (JSA) has been developed and is provided in Appendix B, which summarizes and applies concepts within this guidance, including the infection prevention measures listed below. This JSA shall be required for all fieldwork in areas where there is community-based transmission of COVID-19.

10. INFECTION PREVENTION MEASURES

The following is basic infection prevention and personal hygiene practices which shall be implemented for all Roux field activities as well as in the office setting.

- ***Personal Hygiene***
    - Wash your hands often with soap and water for at least 20 seconds.
        - If soap and water are not available, use an alcohol-based sanitizer that contains at least 60% alcohol.
        - Key times to wash your hands include after blowing your nose, coughing or sneezing, after using the restroom, and before eating or preparing food.
    - Do not touch your eyes, face, nose and mouth with unwashed hands.
    - Cover your mouth and nose with a tissue when you cough or sneeze or use the inside of your elbow.
    - Throw potentially contaminated items (e.g., used tissues) in the trash.
- ***Avoid Close Contact/Secondary Contact with People and Potentially Contaminated Surfaces***
    - Apply appropriate social distance (6+ feet), if unvaccinated.
    - Do not work in areas with limited ventilation with other Site workers (e.g., small work trailer which lacks HVAC system).
    - Morning tailgate/safety meetings are recommended to occur outside and not within work trailers.
    - Contact your lab/equipment vendor to confirm equipment is properly disinfected prior to being shipped.
    - Do not carpool with others unless all individuals are fully vaccinated and are comfortable with traveling together. In circumstances when carpooling is required and does not meet this criteria please consult with your OM and CHSD.
    - For company owned vehicles limit sharing of vehicles with coworkers. If unable to limit sharing of company owned vehicles, properly clean vehicle before driving with a focus on commonly touched surfaces (e.g., steering wheels, shifters, buttons, etc.).
    - Use caution when using public restrooms, portable toilets. Use paper towel as a barrier when touching door handles and faucets.
- ***Cleaning and Disinfecting***
    - Clean high touched surfaces daily. Examples of high-touch surfaces include: counters, tables, doorknobs, handles, stair rails, desks, toilets, faucets, and sinks. In most situations, regular cleaning (at least once a day) is enough to sufficiently remove virus that may be on surfaces. However, if certain conditions apply, you may choose to disinfect after cleaning. When there is no confirmed or suspected COVID-19 cases known to have been in a space, cleaning once a day is usually enough to sufficiently remove virus that may be on surfaces and help maintain a healthy facility.
    - Under certain circumstances additional cleaning and/or disinfection shall take place in shared spaces in consultation with the OM and CHSD. The following conditions will be evaluated to determine cleaning and/or disinfection frequency:
        - High transmission of COVID-19 within community,
        - Low number of unvaccinated people wearing masks,
        - Infrequent hand hygiene, or

        - The space is occupied by individuals at increased risk for severe illness.

The following below outlines cleaning and disinfection protocols for specific types of surfaces as required. Please consult with the CHSD when developing site-specific cleaning and disinfection protocols.

- ***Hard (Non-porous) Surfaces***
    - If surfaces are dirty, they should be cleaned with a detergent/soap and water prior to disinfection.
    - Refer to the manufacturer's instructions to ensure safe and effective use of the product and wear appropriate personal protective equipment (e.g., gloves, safety glasses, face shield).
    - Many products require:
        - Keeping surface wet for a period of time (i.e., contact time)
            - Refer to manufacturer's instructions outlining adequate contact time.
        - Precautions such as wearing gloves and making sure you have good ventilation during use of the product.
    - Disposable gloves should be removed aseptically and discarded after cleaning. Wash hands immediately following removal of gloves. Refer to Appendix C for how to remove gloves aseptically.
    - If products on EPA List N: Disinfectants for Coronavirus (COVID-19) are not available, bleach solutions can be used if appropriate for the surface and will be effective against coronaviruses when properly diluted.
        - Most household bleach contains 5%–9% sodium hypochlorite. Do not use a bleach product if the percentage is not in this range or is not specified, such as some types of laundry bleach or splash-less bleach as these are not appropriate for disinfection.
        - Follow the directions on the bleach bottle for preparing a diluted bleach solution. If your bottle does not have directions, you can make a bleach solution for disinfecting by mixing:
            - 5 tablespoons (1/3 cup) of bleach per gallon of room temperature water OR
            - 4 teaspoons of bleach per quart of room temperature water
        - Follow the manufacturer's application instructions for the surface. If instructions are not available, leave the diluted bleach solution on the surface for at least 1 minute before removing or wiping. This is known as the "contact time" for disinfection. The surface should remain visibly wet during the contact time.
        - Ensure proper ventilation during and after application (for example, open windows).
        - Never mix household bleach (or any disinfectants) with any other cleaners or disinfectants. This can cause vapors that may be very dangerous to breathe in.
        - Make a new diluted bleach solution daily. Bleach solutions will not be as effective after being mixed with water for over 24 hours. Products with EPA-approved emerging viral pathogen claims are expected to be effective against COVID-19. Follow the manufacturer's instructions for all cleaning and disinfecting products (e.g., concentration, application method and contact time, etc.).
- ***Soft (Porous) Surfaces***
    - For soft (porous) surfaces, remove visible contamination if present and clean with appropriate cleaners indicated for use on the surfaces. After cleaning:
        - Launder items as appropriate in accordance with the manufacturer's instructions. If possible, launder using the warmest appropriate water setting for the item and dry items completely; or
        - Use products with the EPA-approved emerging viral pathogens that claim they are suitable for porous surfaces.

- ***Electronics***
  - For electronics such as tablets, touch screens, keyboards, remote controls, etc. remove visible contamination if present.
    - Follow the manufacturer's instructions for all cleaning and disinfection products.
    - Consider use of wipeable covers for electronics.
    - If no manufacturer guidance is available, consider the use of alcohol-based wipes or sprays containing at least 70% alcohol to disinfect touch screens. Dry surfaces thoroughly to avoid pooling of liquids.
- ***Linens, Clothing, and Other Items that Go in the Laundry***
  - Although it is unlikely field clothing would become potentially contaminated with COVID-19, it is recommended that field staff regularly launder field clothing following any field event upon returning home.
  - In order to minimize the possibility of dispersing the virus from potentially contaminated clothing, do not shake dirty laundry.
  - Wash items as appropriate in accordance with the manufacturer's instructions. If possible, launder items using the warmest appropriate water setting for the items and dry items completely.
  - Clean and disinfect hampers or other containers used for transporting laundry according to guidance listed above.
- ***Office/Site Specific-Cleaning and Disinfection Protocols***
  - Each office and long-term field site has developed internal cleaning and disinfecting practices, which are broken into three categories: routine cleaning; enhanced cleaning and disinfecting; and deep cleaning and disinfecting.
  - In the instance there is someone who is suspected or confirmed positive for COVID-19 and has worked at the office or field site within the last 24 hours, deep cleaning and disinfecting shall be considered. The CHSD shall work with the OM and Office Health and Safety Manager (OHSM) to evaluate site-specific measures that shall be carried out prior to deep cleaning and disinfecting. If more than 24 hours have passed since the person who is sick or diagnosed with COVID-19 has been in the space, cleaning shall be carried out. You may choose to also disinfect depending on certain conditions and in consultation with the CHSD. If more than 3 days have passed since the person who is sick or diagnosed with COVID-19 has been in the space, no additional cleaning (beyond regular cleaning practices) is needed.
  - If deep cleaning and disinfection is carried out the following will be considered:
    - Closing off all areas potentially affected and wait at least several hours before you clean and disinfect.
    - Areas should remain closed off until cleaning and disinfecting takes place; if able, ventilation shall be increased in the space (e.g., opening doors, windows, increasing CFM).

11. CLOTH FACE COVERINGS

The CDC recommends the use of cloth face coverings/masks in public settings where other social distancing measures are difficult to maintain. Masks are required on planes, buses, trains and other forms of public transportation traveling into, within, or out of the United States and in U.S. indoor transportation hubs such as airports and stations. The use of cloth face coverings is to supplement and NOT replace the existing practices outlined above.

Based on existing studies and on-going recommendations and/or requirements from federal, state, and local entities, Roux is recommending the use of cloth face coverings, when appropriate. Appropriate use is defined when local authorities or clients require the use of cloth face coverings in conjunction with established social distancing, or if an employee elects to use a cloth covering on their own accord. Roux will provide cloth face coverings that shall meet the basic requirements outlined by the CDC guidance.

Cloth Face Coverings (i.e., masks) should:

- Have two or more layers of washable, breathable fabric;
- Completely cover the nose and mouth;
- Fit snugly against the sides of the face and not have any gaps; and
- Have a nose wire to prevent air from leaking out of the top of the mask.

When donning and doffing the cloth face covering, individuals should avoid touching their eyes, nose, and mouth. Following removal of the cloth face covering, employees should wash their hands immediately using the guidelines described in Section 10 Infection Prevention Measures-Personal Hygiene above. Cloth face coverings should be routinely washed depending on the frequency of use.

Additional information on improving the fit and filtration of your mask can be found at the following CDC website.

12. HOTEL SELECTION PROCESS AND OVERNIGHT/REMOTE WORK

Hotel Selection

If there is a project requiring the overnight stay at a hotel, accommodations shall be made only after the hotel and hotel's location have been vetted in accordance with Roux's established guidance as defined below. The Project Team, which includes the Project Manager (PM) and PP shall verify the hotel has appropriate protocols in place to limit the potential exposure and spread of COVID- 19 through proper cleaning and disinfection practices. Discussions with the hotel shall include, but are not limited to, measures taken to keep guests safe during their stay, guest room sanitization schedule, training of staff regarding disinfecting protocols using EPA-approved disinfectants, hotel staff fitness for duty requirements, etc. Some example questions are listed below.

Sample Questions for Evaluating Hotels

1. Is there an established COVID-19 guidance/policy your location is following?
2. What additional measures are being implemented to keep workers and customers safe?; (e.g. signs/placards, social-distancing/mask reminders)
3. Is there a guest room sanitization schedule?
4. Have staff been trained on properly cleaning/disinfecting areas?
5. What types of disinfectants are in use at your location?
6. How are you evaluating staff fitness for duty? (e.g., temperature checks, not reporting to work when sick, etc.)

Employees staying overnight should abide by the following guidance:

- Ensure you properly clean your room upon arrival, as appropriate. This should include a wipe down of all commonly touched surfaces. If disinfecting use appropriate PPE (e.g., nitrile gloves).
- Place the "Do Not Disturb" placard on the room while away and consider limiting hotel housekeeping service to the extent feasible (e.g., not having the room cleaned each day) to minimize potential secondary contact with others.
- Do not spend any more time in hotel common areas (i.e., lobby, hallways, etc.) than is necessary.
- Follow proper Infection Prevention Measures found within Section 10 above.

- If the hotel has a restaurant or café, do not have your meal in a common area; instead order food to be picked up or delivered to your room.
- Employees may also pick up food from takeout locations, order groceries or food for delivery to the hotel. Call local restaurants to order food for delivery (call the hotel lobby for recommendations) or use food ordering apps. Some apps have options for contactless delivery.

13. TRANSPORTATION-RENTAL CARS AND ROUX-OWNED VEHICLES

Rental Cars

If there is a project requiring the use of a rental car (e.g., truck/van), accommodations shall be made only after the rental car company and their store's location have been vetted in accordance with Roux's established guidance, as defined below. The Project Team (PM and PP) shall verify the rental company where you are picking up your vehicle has appropriate protocols in place to limit the potential exposure and spread of COVID- 19 through proper cleaning and disinfection practices. Discussions with the rental car company shall include, but are not limited to, measures to be taken to keep customers safe during pickup/drop-off, rental car disinfection protocols, training of staff regarding disinfecting protocols using EPA-approved disinfectants, rental car company staff fitness for duty requirements, etc. Some example questions are listed below.

Sample Questions for Evaluating Rental Car Companies

1. Is there an established COVID-19 guidance your location is following?
2. What additional measures are being implemented to keep workers and customers safe?
3. Is there a car sanitization schedule?
4. Have staff been trained on properly cleaning/disinfecting vehicles?
5. What types of disinfections are in use at your location?
6. How are you evaluating staff fitness for duty? (e.g., temperature checks, not reporting to work when sick, etc.)

Roux-Owned Vehicles

Roux-owned vehicles should be dedicated to individual employees to the extent feasible, and if authorized by the OM. In the case this cannot be accommodated, employees shall clean all high-touch surfaces (steering wheel, knobs, door handles, turn signals, radio, etc.). Wash hands or use hand sanitizer immediately after each episode of cleaning.

Carpooling

Do not carpool with others unless all individuals are fully vaccinated and are comfortable with traveling together. In circumstances when carpooling is required and does not meet this criteria please consult with your OM and CHSD.

APPENDIX A

Roux Subcontractor Work Crew
COVID-19 Daily Health Screening Questionnaire

Subcontractor Work Crew
COVID-19 Daily Health Attestation

Date:

Company Name:

Supervisor Name: Signature:

Project Name:

Site Address:

Number of Workers on site:

Prior to entry onto a field site, the following questions shall be asked by the Subcontractor Supervisor to their work crew. **Subcontractors and Field Teams shall self-attest to vaccination status in order to ensure compliance with state/local guidance for fully vaccinated and unvaccinated individuals.**

It is preferred this questionnaire is completed for each individual prior to their arrival at the field site. If the answer to any of these questions is YES, the worker is not to report to the field site and seek proper medical advice, in accordance with CDC Guidelines. **The Subcontractor Supervisor must provide this form on a daily basis to the Roux primary contact for the project and notify Roux of any YES responses.**

1. Have you experienced any signs/symptoms of COVID-19 such as fever (≥100.4°F), cough, shortness of breath, chills, fatigue, muscle/body aches, headache, new loss of taste or smell, sore throat, congestion or runny nose, nausea/vomiting or diarrhea in the last 14 days?

2. Have you been in close contact* with someone who is suspected or confirmed to have COVID-19 or who is under investigation for COVID-19 within the last 14 days?

*Close contact as defined by the CDC is being within 6 feet of someone who has COVID-19 for a cumulative total of 15 minutes or more over a 24-hour period.

3. Have you traveled outside of the country, been on a cruise ship and/or traveled to areas within the United States which have state mandated travel restrictions in the last 14 days?

4. Have you tested positive for COVID-19 within the last 14 days?

Please list the crew member's names on site for the day.

1.	9.
2.	10.
3.	11.
4.	12.
5.	13.
6.	14.
7.	15.
8.	16.

APPENDIX B

Job Safety Analysis-Working in Areas Affected by COVID-19

JOB SAFETY ANALYSIS Ctrl. No. CVD-19	DATE: 06/11/2021	☐ NEW ☒ REVISED	PAGE 1 of 2

JSA TYPE CATEGORY **Generic**	WORK TYPE **Fieldwork**	WORK ACTIVITY (Description) **Working in Areas Affected by Coronavirus**

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
Kristina DeLuca	Health and Safety Specialist	Brian Hobbs	CHSD

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST	☐ GOGGLES	☐ AIR PURIFYING RESPIRATOR	☒ GLOVES – Leather/cut-resistant in field and nitrile as needed
☒ HARD HAT – In field	☐ FACE SHIELD	☐ SUPPLIED RESPIRATOR	
☐ LIFELINE / BODY HARNESS	☐ HEARING PROTECTION	☒ PPE CLOTHING – High visibility vest in field	
☒ SAFETY GLASSES – In field	☒ SAFETY SHOES – Steel/composite toe in fie		☐ OTHER

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Cloth face covering, nitrile gloves, hand soap, water source, hand sanitizer, disinfectant spray and disinfectant wipes.

Commitment to Safety – All personnel onsite will actively participate in SPSA performance by verbalizing SPSAs throughout the day.

SOCIAL DISTANCING: Maintain 6’ of distance between yourself and all other people at all times. If you do not believe the scope of work can be conducted while maintaining this distance, contact your Project Manager immediately.

Assess **[1]JOB STEPS**	**Analyze** **[2]POTENTIAL HAZARDS**	**Act** **[3]CRITICAL ACTIONS**
1. Project Preplanning	N/A	• Review and follow COVID-19 CDC, Roux, Client and local orders/protocols. • Ensure all workers are fit for duty - anyone feeling sick should remain at home even if symptoms do not align with COVID-19. If a worker has been in contact with someone potentially positive or positive for COVID-19, contact your Office Manager. • Determine PPE needs and ensure adequate supply of disinfectant wipes/spray, soap and water or hand sanitizer at Site. Due to high demands and limited supply, plan ahead. • Use the minimum number of employees necessary to safely complete the work.
2. Mobilization	**Exposure:** Becoming infected or infecting co-workers	**Personal/Rental/Roux Owned Vehicle** • Do not carpool, unless all individuals are fully vaccinated. • Verify workers/other people are not approaching vehicle prior to exiting the vehicle. Maintain 6’ of distance from general public, as appropriate. **Public Transportation** • Public transit should not be used unless absolutely necessary. Consider renting a car rather than taking public transit. If public transit is required, wear appropriate face covering/mask and apply social distancing (6 ft). Wash hands or use hand sanitizer immediately after. **Hotel Stay (Refer to COVID-19 H&S Guidance for more info)** • If a hotel stay is deemed necessary for the given field work, ensure that you clean your room upon initial arrival. • Place the “Do Not Disturb” placard on the room while away and limit housekeeping services to the extent feasible during your stay to minimize the reintroduction and spread of the virus from others.. Wash hands or use hand sanitizer often.
3. Tailgate Meeting	**Exposure:** Becoming infected or infecting co-workers	• Perform outside or indoors in areas with ample ventilation. • If unvaccinated, maintain at least a 6+ ft distance between you and others. • Discuss primary infection prevention measures listed below. • Discuss COVID-19 symptoms with coworkers and subcontractors to ensure fitness for duty. Anyone exhibiting signs or symptoms should be instructed to leave the Site, contact your Project Manager.

[1] Each Job or Operation consists of a set of tasks / steps. Be sure to list all the steps needed to perform job.

[2] A hazard is a potential danger. Break hazards into six types: Contact - victim is struck by or strikes an object; Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards, energy source; Energy Source – electricity, pressure, compression/tension.

[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".

4. Site Activities	**Exposure:** Becoming infected or infecting co-workers	• Coordinate field activities at the beginning of the day (i.e. Tailgate meeting) to minimize time spent in crowded spaces or overlap while completing job tasks. • Don cloth face coverings as appropriate. • Apply social distancing (6+ ft) when interacting with others if unvaccinated. If anyone comes within 6 ft of you while conducting work and your work prevents you from moving away, politely ask them to move back. If others are unable to move from your space, stop work and leave area. • Minimize shaking hands or touching others. • Minimize sharing of equipment or other items with co-workers and subcontractors unless wearing appropriate PPE (e.g. nitrile gloves), as appropriate. • If anyone is experiencing COVID-19 signs or symptoms in your vicinity, stop work and leave the area. • Do not work in areas with limited ventilation with others. • Cover your mouth and nose with tissue or paper towel or with your elbow when coughing or sneezing and wash hands or use hand sanitizer immediately after. If sick contact SHSO/PM and leave Site immediately. • Clean work surfaces/areas with approved cleaners you're responsible for (ex: desk, office doorknob, computer, etc.) at least daily. • Avoid public spaces and going out to eat by bringing your own lunch to the Site. If performing work in high density urban areas, it is recommended all food must be consumed at or in your vehicle or within designated work trailer. Wash hands or use hand sanitizer before eating and immediately after.

Primary Infection Prevention Measures

- Wash your hands often with soap and water for at least 20 seconds.
  - If soap and water are not available, use an alcohol-based sanitizer that contains at least 60% alcohol. Key times to wash hands include after blowing your nose, coughing or sneezing, after using the restroom, and before eating or preparing food.
- Do not touch your eyes, face, nose and mouth with unwashed hands.
- Cover your mouth and nose with a tissue when you cough or sneeze or use the inside of your elbow. Throw potentially contaminated items (e.g. used tissues) in the trash.
- Avoid close contact/secondary contact with people and potentially contaminated surfaces.
  - Apply appropriate social distance (6+ feet).
  - Minimize handshaking/touching others and use caution when accessing public spaces.
- Clean frequently touched surfaces daily. Commonly touched items can include but are not limited to tables, doorknobs, light switches, countertops, handles, desks, phones, keyboard, toilets, sinks and field equipment. If surfaces are dirty, they should be cleaned with soap and water prior to disinfection. If surface cannot be cleaned/disinfected, then wash hands or use sanitizer as soon as possible.

---

[1] Each Job or Operation consists of a set of tasks / steps. Be sure to list all the steps needed to perform job.

[2] A hazard is a potential danger. Break hazards into six types: Contact - victim is struck by or strikes an object; Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards; Energy source – electricity, pressure, compression/tension.

[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".

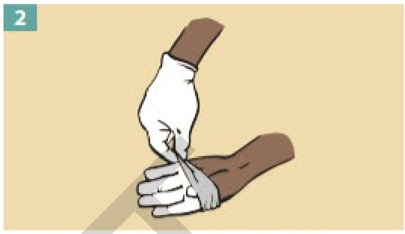
APPENDIX C

How to Remove Gloves

How to Remove Gloves

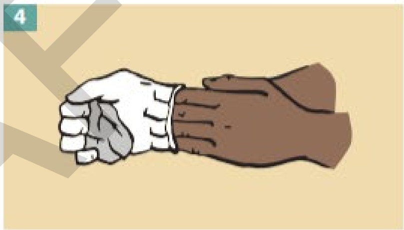
To protect yourself, use the following steps to take off gloves

Grasp the outside of one glove at the wrist.
Do not touch your bare skin.



Peel the glove away from your body,
pulling it inside out.

Hold the glove you just removed in
your gloved hand.



Peel off the second glove by putting your fingers
inside the glove at the top of your wrist.

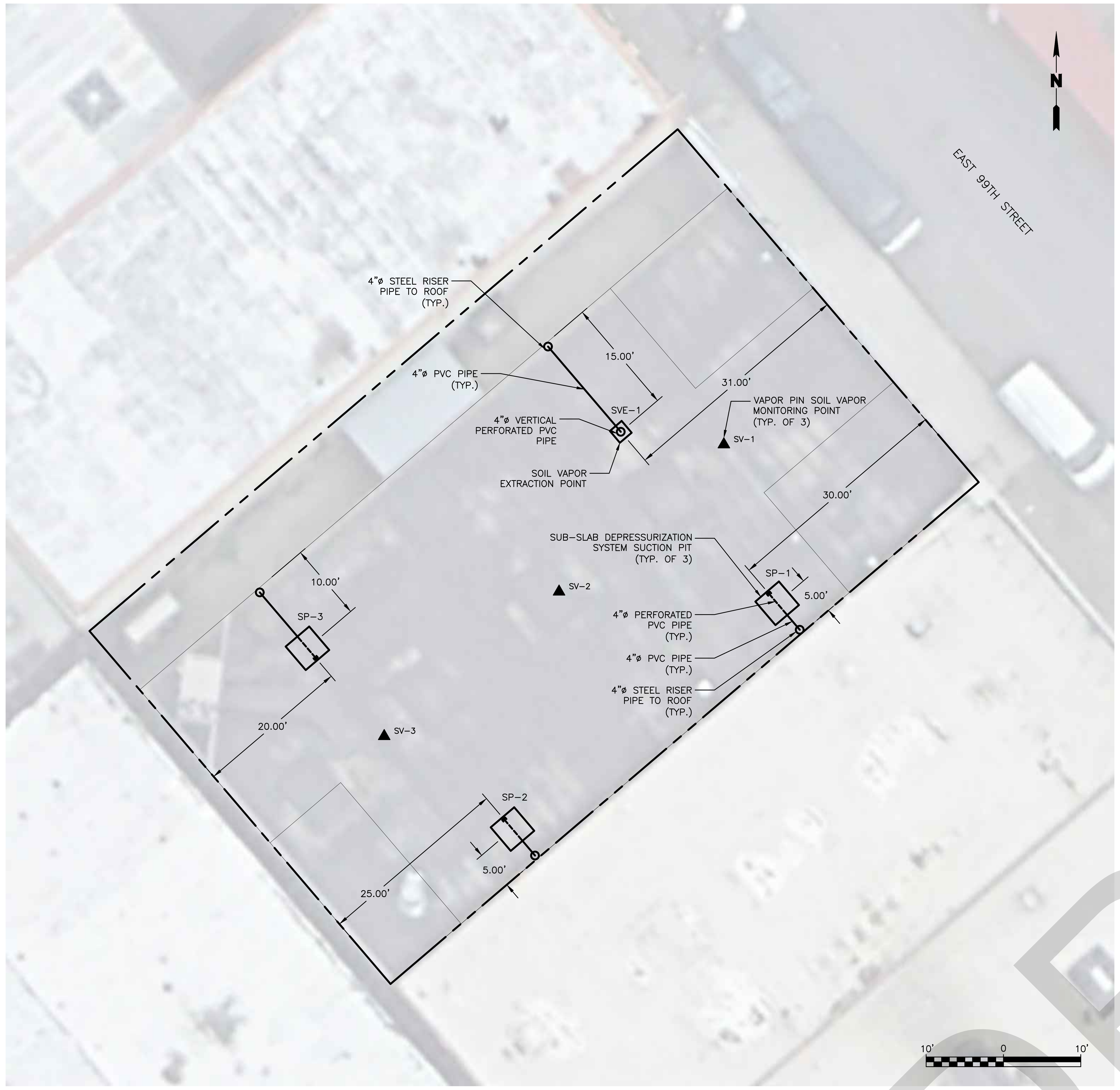
Turn the second glove inside out while pulling
it away from your body, leaving the first glove
inside the second.

Dispose of the gloves safely. Do not reuse the gloves.

Clean your hands immediately after removing gloves.

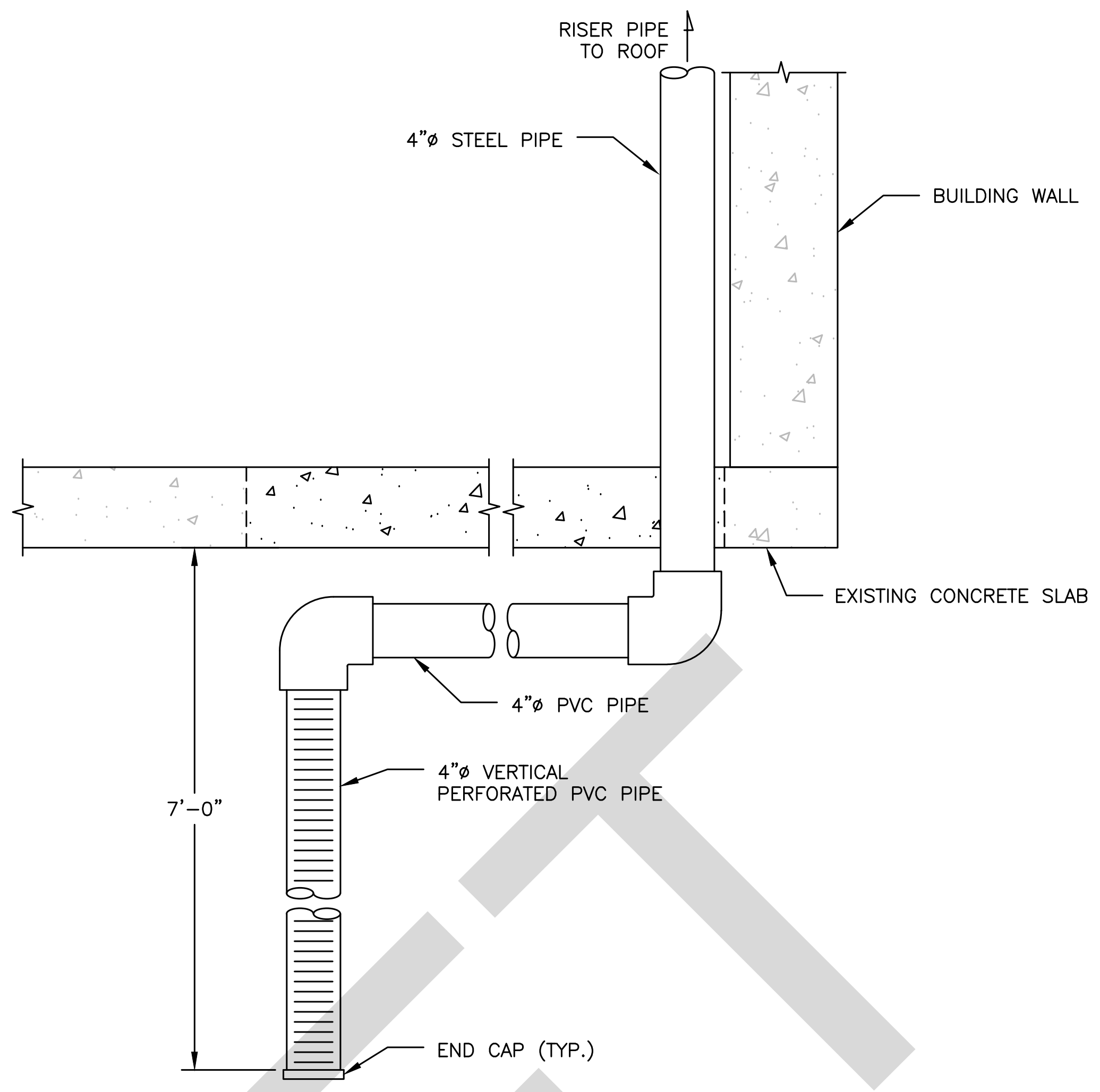
APPENDIX E

SSDS/SVES As-Built and Component Manual



SOIL VAPOR EXTRACTION SYSTEM/SUB–SLAB DEPRESSURIZATION AS–BUILT

SCALE: 1" =10'



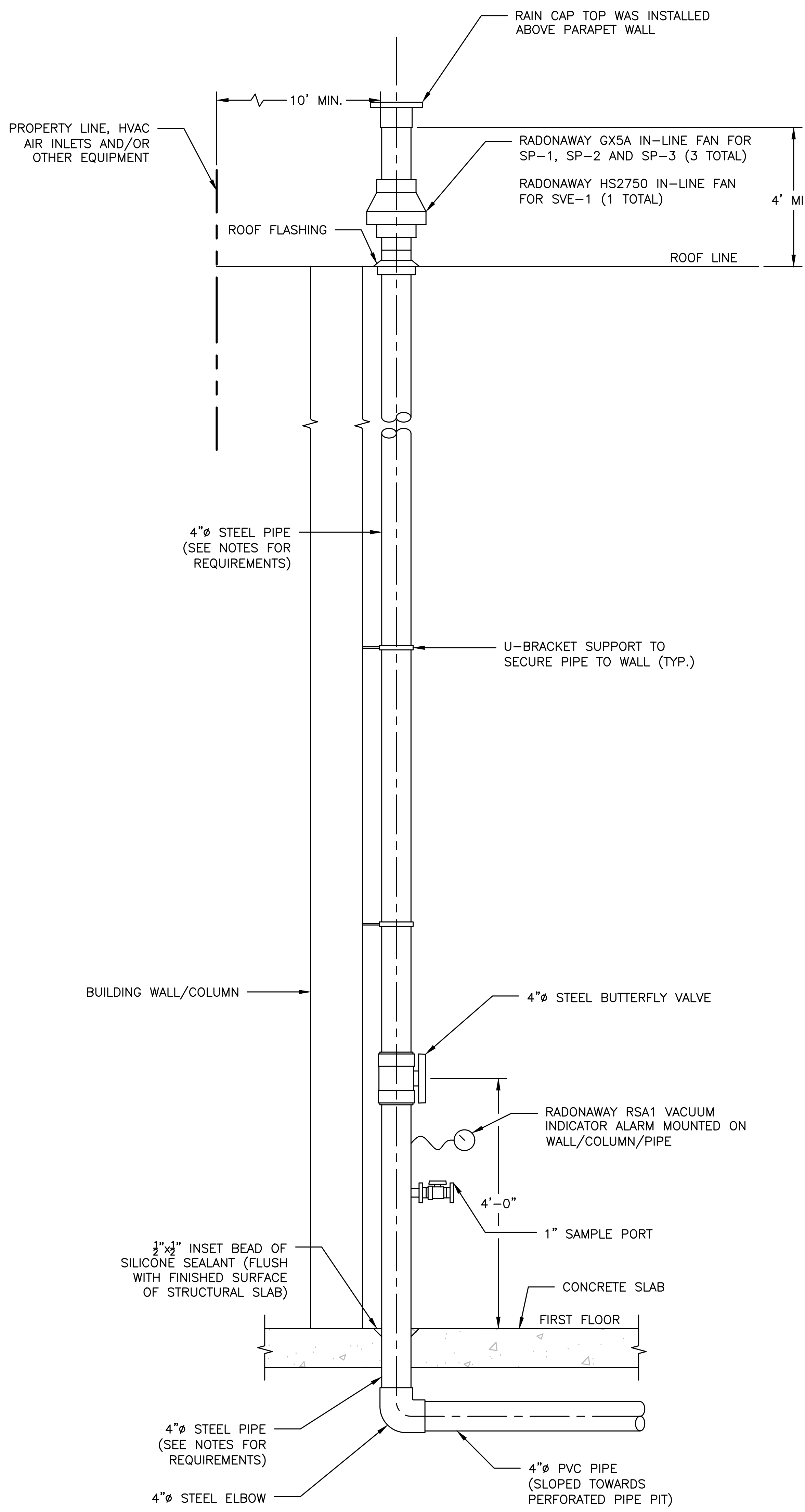
PROFILE VIEW

4 SOIL VAPOR EXTRACTION POINT DETAIL

SCALE: N.T.S.

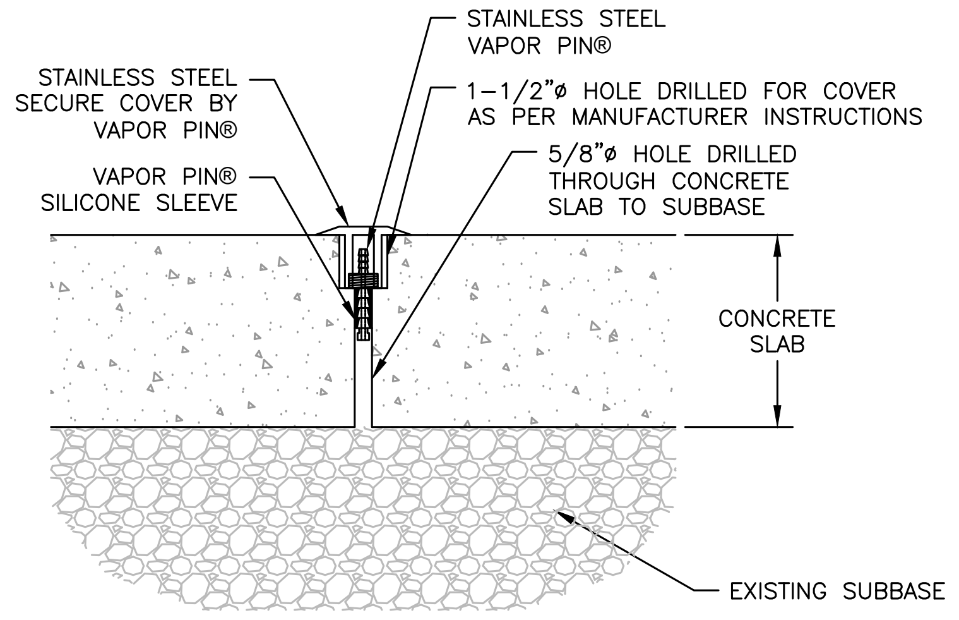
SOIL VAPOR EXTRACTION SYSTEM/SUB–SLAB DEPRESSURIZATION SYSTEM NOTES

1. CONTRACTOR COORDINATED INSTALLATION OF SOIL VAPOR EXTRACTION SYSTEM/SUB–SLAB DEPRESSURIZATION SYSTEM (SVES/SSDS).
2. CONTRACTOR VERIFIED THE DESIGN INVERT ELEVATIONS (BOTTOM OF PIPING) FOR PENETRATIONS. THE CONTRACTOR VERIFIED HORIZONTAL OFFSETS FOR THE LOCATIONS OF VERTICAL RISERS.
3. ALL SVES/SSDS PIPING IS SLOPED TOWARDS THE PERFORATED PIPE SUCTION PITS TO PREVENT ANY POTENTIAL MOISTURE BUILD UP AND BLOCKADES.
4. ALL ABOVE GRADE SVES/SSDS PIPING (ALONG WITH FITTINGS AND APPURTENANCES) CONSISTS OF CAST–IRON PIPE AND WAS INSTALLED IN ACCORDANCE WITH THE NYC PLUMBING CODE CHAPTER 7 AND 9 FOR VENT PIPE.
5. PVC PIPE IS JOINED TOGETHER USING SLIP JOINTS SECURED WITH SELF–TAPPING SCREWS AND THREADED CONNECTIONS.
6. ALL PENETRATIONS THROUGH THE FLOOR ARE SEALED USING A SILICONE BASED WATERPROOF SEALANT.
7. THE BUILDING CONCRETE SLAB WAS RESTORED IN THE AREAS OF SVES/SSDS INSTALLATION AND IMPERFECTIONS/INCONSISTENCIES IN THE SLAB ARE SEALED AS PART OF THE SVES/SSDS INSTALLATION.
8. EACH SSDS SUCTION PIT WAS INSTALLED WITH A RADONAWAY GX5A IN–LINE FAN, VALVE AND RADONAWAY RSA1 VACUUM INDICATOR ALARM.
9. THE SVES POINT WAS INSTALLED WITH A RADONAWAY HS2750 IN–LINE FAN, VALVE, AND RADONAWAY RSA1 VACUUM INDICATOR ALARM.
10. THE SURFACES THAT WERE LINED WITH GEOTEXTILE WERE FREE OF ALL ROCKS, STONES, SHARP OBJECTS OR CONSTRUCTION DEBRIS OF ANY KIND.
11. GEOTEXTILE NONWOVEN FABRIC WAS INSTALLED DIRECTLY ON FILL, MATERIAL OVERLAPS WERE A MINIMUM OF 12" AND THE OVERLAPPED SEAMS WERE SEALED WITH TAPE.
12. NON–WOVEN GEOTEXTILE FABRIC MET PROPERTY VALUES
    a. MINIMUM MASS PER UNIT AREA OF 10 OZ/YD^2 AS PER ASTM D 5261
    b. MINIMUM GRAB STRENGTH OF 250 LBS AS PER ASTM D 4632
    c. MINIMUM PUNCTURE STRENGTH OF 700 LBS AS PER ASTM D 6241
    d. MINIMUM ULTRAVIOLET RESISTANCE @ 500 HOURS OF 70% AS PER ASTM D 4355



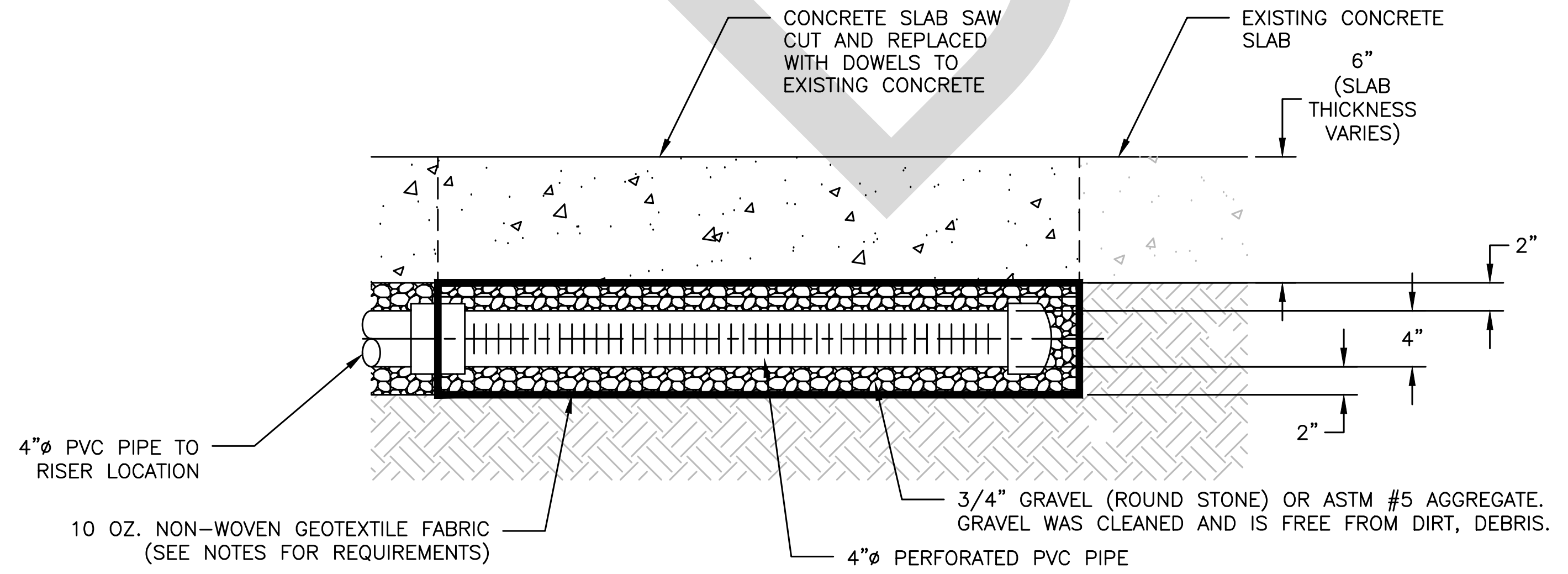
3 RISER DETAIL

SCALE: N.T.S.

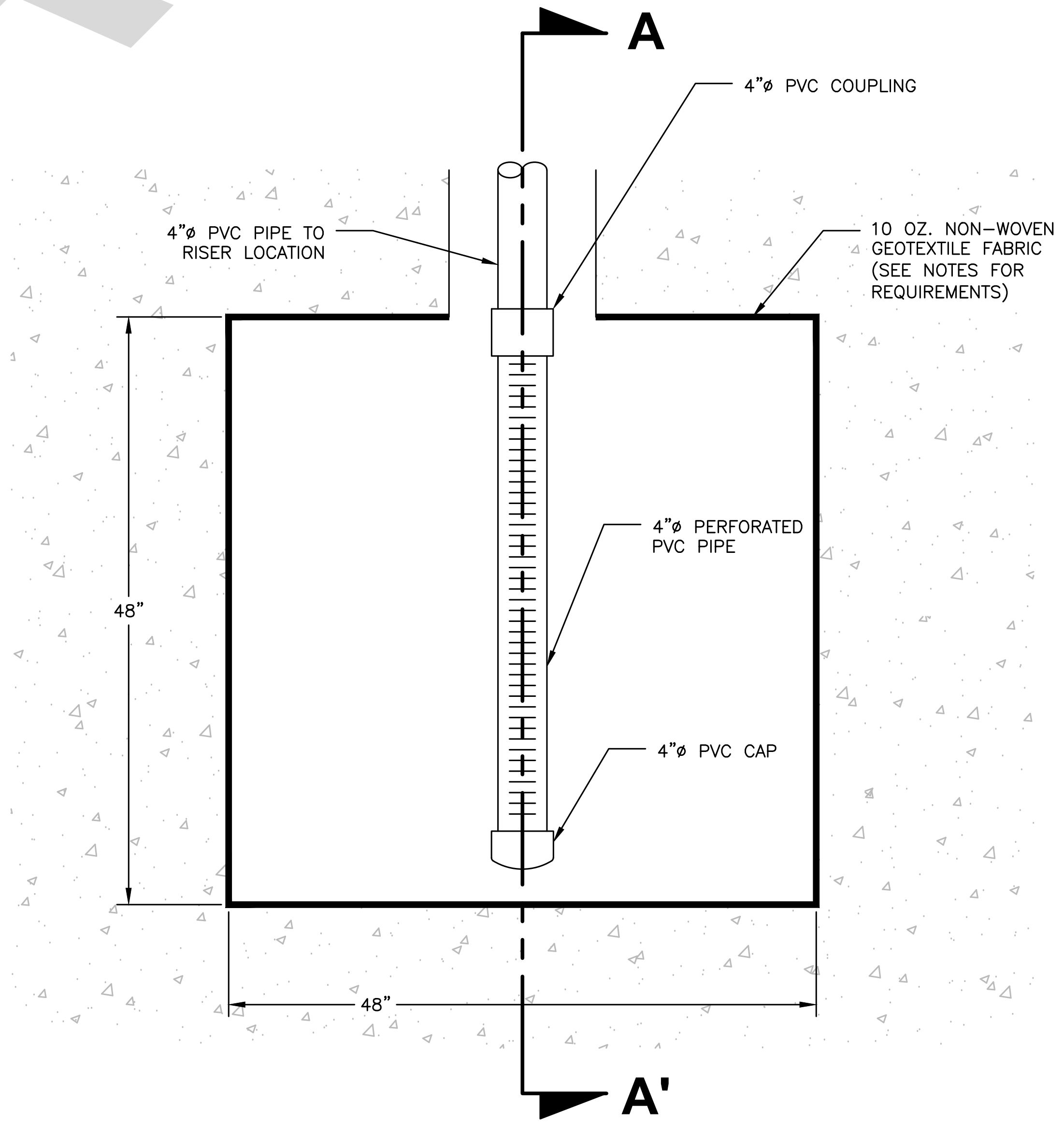


1 TYPICAL SOIL VAPOR MONITORING POINT DETAIL

SCALE: N.T.S.



PROFILE VIEW A–A'



PLAN VIEW

2 SUB–SLAB DEPRESSURIZATION SYSTEM SUCTION PIT DETAIL

SCALE: N.T.S.

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NO.	DATE	REVISION DESCRIPTION	INT.

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209 SHAFTER STREET ISLANDIA NEW YORK 11749
(631) 232-2600

PROJECT NAME:
458 EAST 99TH STREET
BROOKLYN, NY 11236

PROJECT FOR:
458 EAST OWNERS LLC

TITLE:
SSDS/SVES AS BUILT

FIGURE NO.
1

RadonAway®

The world's leading radon fan manufacturer

GX5A Pro Series Fan Installation Instructions

DO NOT CONNECT POWER SUPPLY UNTIL FAN IS COMPLETELY INSTALLED. MAKE SURE ELECTRICAL SERVICE TO FAN IS LOCKED IN “OFF” POSITION. DISCONNECT POWER BEFORE SERVICING FAN.

1. **WARNING!** For General Ventilating Use Only. Do Not Use to Exhaust Hazardous, Corrosive or Explosive Materials, Gases or Vapors. See Vapor Intrusion Application Note #AN001 for important information on VI Applications. RadonAway.com/vapor-intrusion

2. **NOTE:** Fan is suitable for use with solid state speed controls; however, use of speed controls is not generally recommended.

2. **WARNING!** Check voltage at the fan to insure it corresponds with nameplate.

3. **WARNING!** Normal operation of this device may affect the combustion airflow needed for safe operation of fuel burning equipment. Check for possible backdraft conditions on all combustion devices after installation.

4. **NOTICE!** There are no user serviceable parts located inside the fan unit.
Do NOT attempt to open. Return unit to the factory. (See Warranty, p. 7, for details.)

5. **WARNING!** Do not leave fan unit installed on system piping without electrical power for more than 48 hours. Fan failure could result from this non-operational storage.

6. **WARNING!** TO REDUCE THE RISK OF FIRE, ELECTRIC SHOCK, OR INJURY TO PERSONS, OBSERVE THE FOLLOWING:

    a) Use this unit only in the manner intended by the manufacturer. If you have questions, contact the manufacturer. (See p. 7.)

    b) Before servicing or cleaning unit, switch power off at service panel and lock the service disconnecting means to prevent power from being switched on accidentally. When the service disconnecting means cannot be locked, securely fasten a prominent warning device, such as a tag, to the service panel.

    c) Installation work and electrical wiring must be done by qualified person(s) in accordance with all applicable codes and standards, including fire rated construction.

    d) Sufficient air is needed for proper combustion and exhausting of gases through the flue (chimney) of fuel burning equipment to prevent backdrafting. Follow the heating equipment manufacturers’ guidelines and safety standards such as those published by any National Fire Protection Association, and the American Society for Heating, Refrigerating and Air Conditioning Engineers (ASHRAE), and the local code authorities.

    e) When cutting or drilling into a wall or ceiling, do not damage electrical wiring and other hidden utilities.

    f) Ducted fans must always be vented to outdoors.

    g) If this unit is to be installed over a tub or shower, it must be marked as appropriate for the application and be connected to a GFCI (Ground Fault Circuit Interrupter) protected branch circuit.

1.0 SYSTEM DESIGN CONSIDERATIONS

1.1 INTRODUCTION

The GX5A Pro Series Radon Fan is intended for use by trained, professional, certified/licensed radon mitigators. The purpose of these instructions is to provide additional guidance for the most effective use of GX Pro Series Fans. These instructions should be considered supplemental to EPA/radon industry standard practices, state and local building codes and regulations. In the event of a conflict, those codes, practices and regulations take precedence over these instructions.

1.2 FAN SEALING

The GX5A Pro Series Fan is factory sealed; no additional caulk or other materials are required to inhibit air leakage.

1.3 ENVIRONMENTALS

The GX5A Pro Series Fan is designed to perform year-round in all but the harshest climates without additional concern for temperature or weather. For installations in an area of severe cold weather, please contact RadonAway for assistance. When not in operation, the fan should be stored in an area where the temperature is never less than 32 degrees F or more than 100 degrees F.

1.4 ACOUSTICS

The GX5A Pro Series Fan, when installed properly, operate with little or no noticeable noise to the building occupants. The velocity of the outgoing air should be considered in the overall system design. In some cases the “rushing” sound of the outlet air may be disturbing. In these instances, the use of a RadonAway Exhaust Muffler is recommended.

(To ensure quiet operation of inline and remote fans, each fan shall be installed using sound attenuation techniques appropriate for the installation. For bathroom and general ventilation applications, at least 8 feet of insulated flexible duct shall be installed between the exhaust or supply grille(s) and the fan(s). The GX5A Pro Series Fan is not suitable for kitchen range hood remote ventilation applications.)

1.5 GROUND WATER

In the event that a temporary high water table results in water at or above slab level, water may be drawn into the riser pipes, thus blocking air flow to the GX5A Pro Series Fan. The lack of cooling air may result in the fan cycling on and off as the internal temperature rises above the thermal cutoff. Should this condition arise, it is recommended that the fan be turned off until the water recedes, allowing for return to normal operation.

1.6 SLAB COVERAGE

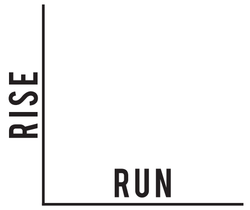
The GX5A Pro Series Fan can provide coverage up to 2000+ sq. ft. per slab penetration. This will primarily depend on the sub-slab material in any particular installation. In general, the tighter the material, the smaller the area covered per penetration. Appropriate selection of the Radon Fan best suited for the sub-slab material can improve the slab coverage. The GX5A Fan is best suited for tighter soils where higher suction is needed. Consider using the RP260 where additional airflow is required, and the RP265 and RP380 for large slab, high airflow applications. Additional suction points can be added as required. It is recommended that a small pit (5 to 10 gallons in size) be created below the slab at each suction hole.

1.7 CONDENSATION & DRAINAGE

Condensation is formed in the piping of a mitigation system when the air in the piping is chilled below its dew point. This can occur at points where the system piping goes through unheated space such as an attic, garage or outside. The system design must provide a means for water to drain back to a slab hole to remove the condensation. The GX5A Pro Series Fan MUST be mounted vertically plumb and level, with the outlet pointing up for proper drainage through the fan. Avoid mounting the fan in any orientation that will allow water to accumulate inside the fan housing. The GX5A Pro Series Fan is NOT suitable for underground burial.

For GX5A Pro Series Fan piping, the following table provides the minimum recommended pipe diameter and pitch under several system conditions.

Pipe Diameter	Minimum Rise per Ft of Run*		
	@25 CFM	@50 CFM	@100 CFM
4”	1/8”	1/4”	3/8”
3”	1/4”	3/8”	1 1/2”



See p. 6 for detailed specifications.

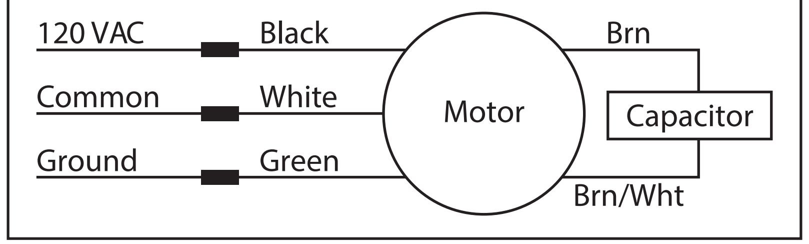
1.8 SYSTEM MONITOR & LABEL

A System Monitor is required to notify the occupants of a fan system malfunction. The GX5A Fan requires a U-tube Manometer >5.5” max. (such as P/N 50036). You may choose to also use an audible alarm (P/N 28001-2, 28001-4, 28421 or 28535). A System Label (provided with Manometers P/N 50036 and 50017) with instructions for contacting the installing contractor for service and identifying the necessity for regular radon tests to be conducted by the building occupants must be conspicuously placed in a location where the occupants frequent and can see the label.

1.9 ELECTRICAL WIRING

The GX5A Pro Series Fan operates on standard 120V, 60Hz AC. All wiring must be performed in accordance with National Fire Protection (NFPA) National Electrical Code, Standard #70, current edition, for all commercial and industrial work, and state and local building codes. All wiring must be performed by a qualified and licensed electrician. Outdoor installations require the use of a UL Listed watertight conduit. Ensure that all exterior electrical boxes are outdoor rated and properly sealed to prevent water penetration into the box. A means, such as a weep hole, is recommended to drain the box.

RP, GP, XP Pro Series Fan Wiring Diagram

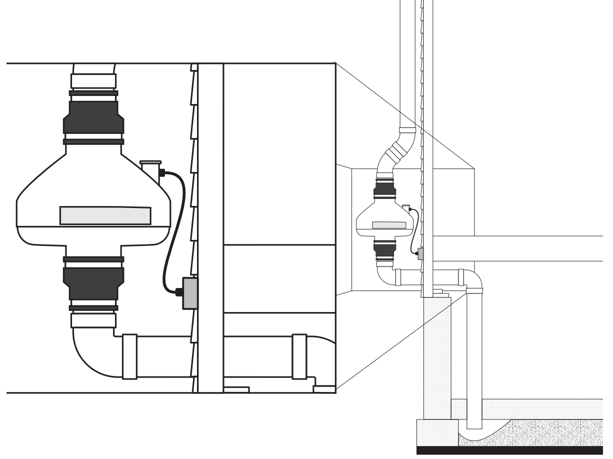


2.0 INSTALLATION

The GX5A Pro Seres Fan can be mounted indoors or outdoors. (It is suggested that EPA and radon mitigation standards recommendations be followed in choosing the fan location.) The GX5A Fan may be mounted directly on the system piping or fastened to a supporting structure by means of an optional mounting bracket.

The ducting from the fan to the outside of the building has a strong effect on noise and fan energy use. Use the shortest, straightest duct routing possible for best performance, and avoid installing the fan with smaller ducts than recommended. Insulation around the ducts can reduce energy loss and inhibit mold growth. Fans installed with existing ducts may not achieve their rated airflow.

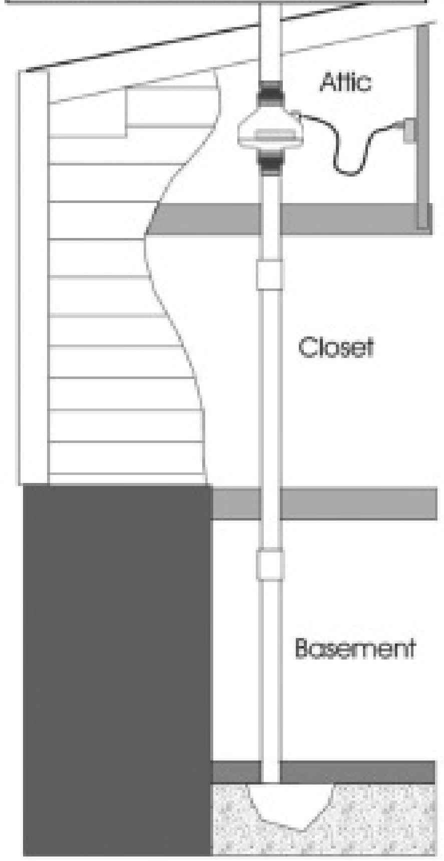
TYPICAL OUTDOOR INSTALLATION



2.1 MOUNTING

Mount the GX5A Pro Series Fan vertically with outlet up. Ensure the unit is plumb and level. When mounting directly on the system piping assure that the fan does not contact any building surface to avoid vibration noise.

TYPICAL INDOOR INSTALLATION



2.2 MOUNTING BRACKET (optional)

The GX5A Pro Series Fan may be optionally secured with the RadonAway P/N 25007 mounting bracket. Foam or rubber grommets may also be used between the bracket and mounting surface for vibration isolation.

2.3 SYSTEM PIPING

Complete piping run, using flexible couplings as a means of disconnect for servicing the unit and for vibration isolation. As the fan is typically outside of the building thermal boundary and is venting to the outside, installation of insulation around the fan is not required.

2.4 ELECTRICAL CONNECTION

Connect wiring with wire nuts provided, observing proper connections (See Section 1.9). Note that the fan is not intended for connection to rigid metal conduit.

2.5 VENT MUFFLER (optional)

Install the muffler assembly in the selected location in the outlet ducting. Solvent weld all connections. The muffler is normally installed at the end of the vent pipe.

2.6 OPERATION CHECKS & ANNUAL SYSTEM MAINTENANCE

______ **Verify** all connections are tight and **leak-free**.

______ **Ensure** the GX5A Pro Series Fan and all ducting are **secure and vibration-free**.

______ **Verify system vacuum pressure** with manometer. **Ensure** vacuum pressure is within normal operating range and **less than** the maximum recommended operating pressure.
(Based on sea-level operation, at higher altitudes reduce by about 4% per 1000 feet)
(Further reduce Maximum Operating Pressure by 10% for High Temperature environments.)
See Product Specifications. If this is exceeded, increase the number of suction points.

______ **Verify Radon levels** by testing to EPA Protocol and applicable testing standards.

THE FOLLOWING CHARTS SHOW THE PERFORMANCE OF THE GX5A PRO SERIES FAN

GX5A PRO SERIES FAN Product Specifications

Typical CFM Vs. Static Pressure "WC						
Model	**0"**	**1.0"**	**2.0"**	**3.0"**	**4.0"**	**5.0"**
GX5A	174	150	121	87	50	8

Model	Power Consumption 120VAC, 60Hz, 1.5 Amp Maximum	Maximum Recommended Operation Pressure* (Sea Level Operation)**
GX5A	77-133 watts	5.00" WC

**Reduce by 10% for High Temperature Operation **Reduce by 4% per 1000 ft. of altitude.*

Model	Size	Weight	Inlet/Outlet	L.2
GX5A	11.1"H x 11.9" Dia.	9 lbs	4.5"OD (4.0" PVC Sched 40 size compatible)	25

L.2 = Estimated Equivalent Length of Rigid Metal Ducting resulting in .2" WC pressure loss for Duct Size listed. Longer Equivalent Lengths can be accommodated at Flows Lower than that at .2" WC pressure loss (see CFM Vs Static Pressure "WC Table).

GX5A Pro Series Fan Additional Specifications

Model	Recommended Duct	PVC Pipe Mounting	Thermal Cutout	Insulation Class
GX5A	3" or 4" Schedule 20/40 PVC	Mount on the duct pipe or with optional mounting bracket. For Ventilation: 4", 6" or 8" Rigid or Flexible Ducting.	150ºC/302ºF	Class F Insulation

Continuous Duty
3000 RPM
Thermally Protected
Residential and Commercial
Rated for Indoor or Outdoor Use

LISTED
Electric Fan

Intertek
77728

Conforms to
UL STD. 507
Certified to
CAN/CSA STD.
C22.2 No.113

IMPORTANT INSTRUCTIONS TO INSTALLER

Inspect the RadonAway® GX5A Pro Series Fan for shipping damage within 15 days of receipt. **Notify RadonAway of any damages immediately.** RadonAway is not responsible for damages incurred during shipping. However, for your benefit, RadonAway does insure shipments.

There are no user serviceable parts inside the fan. **Do not attempt to open the housing.** Return unit to factory. (See Warranty below).

Install the GX Pro Series Fan in accordance with all EPA, ANSI/AARST standard practices, and state and local building codes and regulations.

Provide a copy of this instruction or comparable radon system and testing information to the building occupants after completing system installation.

Warranty

RadonAway® warrants that the GX5A Pro Series Fan (the "Fan") will be free from defects in materials and workmanship for a period of 12 months from the date of purchase or 18 months from the date of manufacture, whichever is sooner (the "Warranty Term").

RadonAway® will replace any fan which fails due to defects in materials or workmanship during the Warranty Term. This Warranty is contingent on installation of the Fan in accordance with the instructions provided. This Warranty does not apply where any repairs or alterations have been made or attempted by others, or if the unit has been abused or misused. Warranty does not cover damage in shipment unless the damage is due to the negligence of RadonAway®.

The Fan must be returned (at Owner's cost) to the RadonAway® factory. Any Fan returned to the factory will be discarded unless the Owner provides specific instructions along with the Fan when it is returned regardless of whether or not the Fan is actually replaced under this warranty. Proof of purchase must be supplied upon request for service under this Warranty.

5-YEAR EXTENDED WARRANTY WITH PROFESSIONAL INSTALLATION.

RadonAway® will extend the Warranty Term of the fan to 60 months (5 years) from date of purchase or 66 months from date of manufacture, whichever is sooner, provided that the fan is installed by a professional radon mitigation contractor. Proof of purchase and/or proof of professional installation may be required for service under this warranty. No extended warranty is offered outside the Continental United States and Canada beyond the standard 12 months from the date of purchase or18 months from the date of manufacture, whichever is sooner.

RadonAway® is not responsible for installation, removal or delivery costs associated with this Warranty.

LIMITATION OF WARRANTY

EXCEPT AS STATED ABOVE, THE GX5A PRO SERIES FAN IS PROVIDED WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULARPURPOSE.

IN NO EVENT SHALL RADONAWAY BE LIABLE FOR ANY DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES ARISING OUT OF, OR RELATING TO, THE FAN OR THE PERFORMANCE THEREOF. RADONAWAY'S AGGREGATE LIABILITY HEREUNDER SHALL NOT IN ANY EVENT EXCEED THE AMOUNT OF THE PURCHASE PRICE OF SAID PRODUCT. THE SOLE AND EXCLUSIVE REMEDY UNDER THIS WARRANTY SHALL BE THE REPAIR OR REPLACEMENT OF THE PRODUCT, TO THE EXTENT THE SAME DOES NOT MEET WITH RADONAWAY'S WARRANTY AS PROVIDED ABOVE.

For service under this Warranty, contact RadonAway for a Return Material Authorization (RMA) number and shipping information. No returns can be accepted without an RMA. If factory return is required, the customer assumes all shipping costs, including insurance, to and from factory.

RadonAway®
3 Saber Way, Ward Hill, MA 01835 USA
TEL (978) 521-3703 FAX (978) 521-3964
Email to: Returns@RadonAway.com

Record the following information for your records:

Serial Number:

Purchase Date:

The world's leading radon fan manufacturer

HS2750 and HS5500 Installation & Operating Instructions

DO NOT CONNECT POWER SUPPLY UNTIL BLOWER IS COMPLETELY INSTALLED.
MAKE SURE ELECTRICAL SERVICE TO BLOWER IS LOCKED IN “OFF” POSITION. DISCONNECT POWER BEFORE SERVICING.

1. **WARNING!** Do not use blower in hazardous environments where blower electrical system could provide ignition to combustible or flammable materials.

2. **WARNING!** Check voltage at the blower to ensure it corresponds with nameplate. See Vapor Intrusion Application Note #AN001 for important information on VI Applications. RadonAway.com/vapor-intrusion

3. **WARNING!** Normal operation of this device may affect the combustion airflow needed for safe operation of fuel burning equipment. Check for possible backdraft conditions on all combustion devices after installation.

4. All wiring must be performed in accordance with the National Fire Protection Association’s (NFPA) “National Electrical Code, Standard #70”-current edition for all commercial and industrial work, and state and local building codes. All wiring must be performed by a qualified and licensed electrician.

5. **WARNING!** In the event that the blower is immersed in water, return unit to factory for service before operating.

6. **WARNING!** Do not twist or torque blower inlet or outlet piping as leakage may result.

7. **WARNING!** Do not leave blower unit installed on system piping without electrical power for more than 48 hours. Blower failure could result from this non-operational storage.

8. **WARNING!** TO REDUCE THE RISK OF FIRE, ELECTRIC SHOCK, OR INJURY TO PERSONS, OBSERVE THE FOLLOWING:

    a) Use this unit only in the manner intended by the manufacturer. If you have questions, contact the manufacturer.

    b) Before servicing or cleaning unit, switch power off at service panel and lock the service disconnecting means to prevent power from being switched on accidentally. When the service disconnecting means cannot be locked, securely fasten a prominent warning device, such as a tag, to the service panel.

HS2750 and HS5500 Blower Installation & Operating Instructions

High Suction Series
HS2750 p/n 28595
HS5500 p/n 28596

1.0 SYSTEM DESIGN CONSIDERATIONS

1.1 INTRODUCTION

The HS2750 and HS5500 Blowers are intended for use by trained, certified/licensed, professional radon mitigators. The purpose of these instructions is to provide additional guidance for the most effective use of the HS2750 and HS5500 Blowers. These instructions should be considered supplemental to current industry standards and federal, state, county and local building codes and regulations. In the event of a conflict, those codes, practices and regulations take precedence over these instructions.

1.2 ENVIRONMENTALS

The HS2750 and HS5500 Blowers are designed to perform year-round in all but the harshest climates without additional concern for temperature or weather. For installations in an area of severe cold weather, please contact RadonAway for assistance. When not in operation, HS2750 and HS5500 Blowers should be stored in an area where the temperature is always greater than 32°F or less than 100°F. The HS2750 and HS5500 Blowers are thermally protected such that they will shut off when the internal temperature is above 185°F / 85°C. If the HS2750 or HS5500 Blower is idle in an area where the ambient temperature exceeds this shut off, it will not restart until the internal temperature falls below 75°C.

1.3 ACOUSTICS

The HS2750 or HS5500 Blower, when installed properly, operates with little or no noticeable noise to the building occupants. Recommended system design and installation considerations to minimize noise: When installing the HS2750 or HS5500 Blower above sleeping areas, select a location for mounting at the farthest possible distance. Avoid mounting near doors, fold-down stairs or other uninsulated structures which may transmit sound. Ensure a solid mounting for the HS2750 or HS5500 Blower to avoid structure-borne vibration or noise.

The velocity of the outgoing air must also be considered in the overall system design. With small diameter piping, in some cases a “rushing” sound of the outlet air may be audible. In these instances, the use of a RadonAway Exhaust Muffler (p/n 24002) is recommended.

1.4 GROUND WATER

Under no circumstances should water be allowed to be drawn into the inlet of the HS2750 and HS5500 Blowers as this may result in damage to the unit. The HS2750 or HS5500 Blower should be mounted at least 5 feet above the slab penetration to minimize the risk of filling the Blower with water in installations with occasional high water tables.

In the event that a temporary high water table results in water at or above slab level, water will be drawn into the riser pipes thus blocking air flow to the HS2750 or HS5500 Blower. The lack of cooling air will result in the Blower cycling on and off as the internal temperature rises above the thermal cutoff and falls upon shutoff. Should this condition arise, power down and disconnect the HS2750 or HS5500 Blower until the water recedes allowing for return to normal operation; then reconnect and power on to turn the Blower back on.

1.5 CONDENSATION & DRAINAGE

WARNING!: Failure to provide adequate drainage for condensation can result in system failure and damage the HS Blower.
Condensation is formed in the piping of a mitigation system when the air in the piping is chilled below its dew point. This can occur at points where the system piping goes through unheated space such as an attic, garage or outside. The system design must provide a means for water to drain back to a slab hole to remove the condensation.

The use of small diameter piping in a system increases the speed at which the air moves. The speed of the air can pull water uphill and, at sufficient velocity, it can actually move water vertically up the side walls of the pipe. This has the potential of creating a problem in the negative pressure (inlet) side piping. For HS2750 or HS5500 Blower inlet piping, the following table provides the minimum recommended pipe diameters as well as minimum pitch under several system conditions. Use this chart to size piping for a system.

Pipe Diameter	Minimum Rise per 1 Foot of Run*		
	@ 25 CFM	@ 50 CFM	@ 100 CFM
4”	1/32”	3/32”	3/8”
3”	1/8”	3/8”	1 1/2”

*Typical operational flow rates:

All exhaust piping should be 2” PVC.

1.6 SYSTEM MONITOR & LABEL

A properly designed system should incorporate a “System On” indicator for affirmation of system operation. The HS2750 and HS5500 Blowers come equipped with a built-in magnehelic pressure gauge located on the front cover which serves this purpose. Other indicator products such as u-tube manometers should be mounted at least 5 feet above the slab penetration to minimize the risk of filling the gauge with water in installations with occasional high water tables. If required, place in a conspicuous location a System Label (such as RadonAway P/N 15005-20) with instructions for contacting the installing contractor for service and also identifying the necessity for regular radon tests to be conducted.

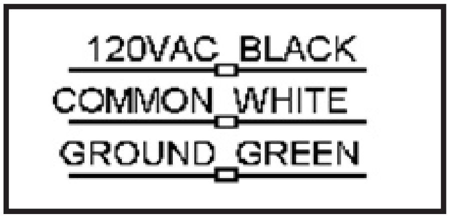
1.7 SLAB COVERAGE

The HS2750 or HS5500 Blower can provide coverage of well over 1000 sq. ft. per slab penetration. This will, of course, depend on the sub-slab aggregate in any particular installation and the diagnostic results. In general, sand and gravel are much looser aggregates than dirt and clay. Additional suction points can be added as required. It is recommended that a small pit (5 to 10 gallons in size; larger as needed) be created below the slab at each suction hole. When fine sand or dirt is present it is recommended that the pit be lined with a material such as clean gravel, size 4, 5, 56, or 6 as classified (ASTM C33).

1.8 ELECTRICAL WIRING

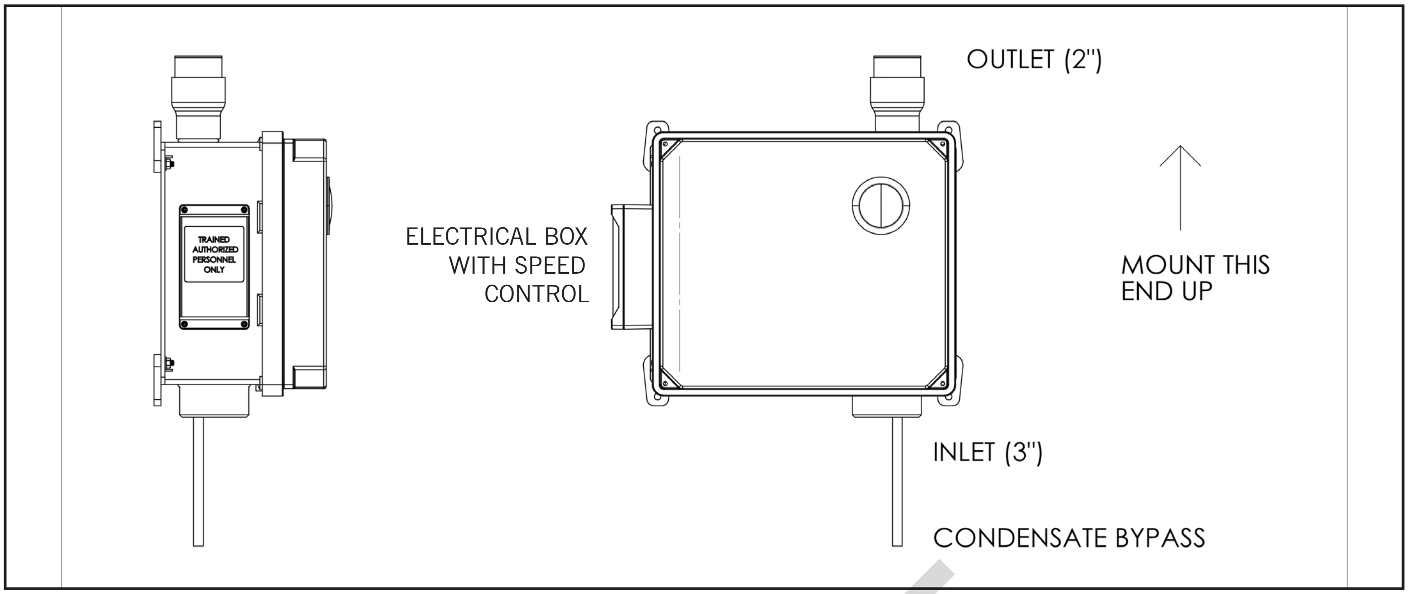
HS2750 or HSHS5500 Blower models come with an electrical switch box for hard wiring to a 120V electrical source. All wiring must be performed in accordance with the National Fire Protection Association’s (NFPA)”National Electrical Code, Standard #70”-current edition for all commercial and industrial work, and state and local building codes. All wiring must be performed by a qualified and licensed electrician. Outdoor installations require the use of a UL listed watertight conduit. Ensure that all exterior electrical boxes are outdoor rated and properly caulked to prevent water penetration into the box. A means, such as a weep hole, is recommended to drain the box.

WIRING DIAGRAM



1.9 SPEED CONTROLS

The HS2750 and HS5500 have 4-speed (low, medium, high, maximum) built-in speed controls. They are not safe for use with solid state speed controls.



2.0 INSTALLATION

2.1 MOUNTING

Mount the HS2750 or HS5500 Blower to the wall studs, or similar structure, in the selected location with (4) 1/4" x 1 1/2" lag screws (not provided). Ensure the HS2750 or HS5500 Blower is both plumb and level.

2.2 DUCTING CONNECTIONS

Make final ducting connection to HS2750 or HS5500 Blower with flexible couplings. Ensure all connections are tight. Do not twist or torque inlet and outlet piping on HS2750 or HS5500 Blower or leaks may result.

NOTE: Do NOT solvent weld fittings to unit hubs.

2.3 VENT MUFFLER INSTALLATION

Install the muffler assembly in the selected location in the outlet ducting. Solvent weld all connections. The muffler is normally installed above the roofline at the end of the vent pipe.

2.4 OPERATION CHECKS & ANNUAL SYSTEM MAINTENANCE

______ **Verify** all connections are tight and **leak-free**.

______ **Ensure** the HS2750 or HS5500 Blower and all ducting is secure and vibration-free.

______ **Verify** system vacuum pressure with Magnehelic. **Ensure** vacuum pressure is within normal operating range and **less than** the maximum recommended as shown below:

HS2750: 5" WC (low) / 10" WC (medium) / 15" WC (high) / 20" WC (maximum)
HS5500: 20" WC (low) / 30" WC (medium) / 40" WC (high) / 50" WC (maximum)

(Above are based on sea-level operation, at higher altitudes reduce above by about 4% per 1000 Feet.)
If these are exceeded, increase number of suction points.

______ **Verify Radon levels** by testing to applicable current industry standards and federal, state, county and local building codes and regulations.

HS2750 and HS5500 PRODUCT SPECIFICATIONS

Model	**Speed Setting** (Max. Op. Pressure: "WC@Sea Level)	**Typical CFM vs Static Suction WC** (Recommended Operating Range)								**Power* Watts @ 120VAC**
		2.5"	**5.0"**	**7.5"**	**10.0"**	**12.5"**	**15.0"**	**20.0"**	**25.0"**	
HS2750	**Low** (5")	33	24	n/a	n/a	n/a	n/a	n/a	n/a	112-123
	Medium (10")	47	42	34	25	n/a	n/a	n/a	n/a	199-245
	High (15")	n/a	n/a	47	43	33	23	n/a	n/a	266-337
	Maximum (20")	n/a	n/a	n/a	n/a	48	43	24	n/a	361-463

Shutoff Pressure ("WC @ Sea Level): Low 7.8", Med 13.5", High 17.6", Max 22.6"

**Power consumption varies with actual load conditions*

Model	**Speed Setting** (Max. Op. Pressure: "WC@Sea Level)	**Typical CFM vs Static Suction WC** (Recommended Operating Range)								**Power* Watts @ 120VAC**
		5.0"	**10.0"**	**20.0"**	**25.0"**	**30.0"**	**35.0"**	**40.0"**	**50.0"**	
HS5500	**Low** (20")	44	39	22	n/a	n/a	n/a	n/a	n/a	243-281
	Medium (30")	n/a	n/a	53	41	36	22	n/a	n/a	372-477
	High (40")	n/a	n/a	n/a	45	39	31	22	n/a	527-625
	Maximum (50")	n/a	n/a	n/a	n/a	n/a	34	29	17	591-632

Shutoff Pressure ("WC @ Sea Level): Low 24.5", Med 34.7", High 44.6", Max 52.6"

**Power consumption varies with actual load conditions*

Number Of Speeds: 4

Volts: 120

Hz: 60

AMPS (Max): 4

Inlet: 3" PVC (3.5" OD)

Outlet: 2" PVC (2.37" OD)

Mounting: Brackets for vertical mount

Weight: HS2750, 18 lbs; HS5500, 19.25 lbs

Size: 17.5" W x 9.0" D x 18.5" H

Minimum Recommended PVC Ducting (2" / 3" / 4" / 6" / 8"): 3" Inlet; 2" Outlet

Storage Temperature Range: 32°F-100°F

Thermal Cutout: 185°F / 85°C

Locked rotor protection

LISTED
Electric Fan

C LISTED US
Intertek

Conforms to
UL STD. 507
Certified to
CAN/CSA STD.
C22.2 No.113

IMPORTANT INSTRUCTIONS TO INSTALLER

Inspect the RadonAway® HS2750 or HS5500 Blower for shipping damage within 15 days of receipt. **Notify RadonAway® of any damages immediately.** RadonAway® is not responsible for damages incurred during shipping.

Install the HS2750 or HS5500 Blower in accordance with all current industry standards and federal, state, county and local building codes and regulations.

Provide a copy of this instruction or comparable radon system and testing information to the building occupants after completing system installation.

Warranty

RadonAway® warrants that the HS2750/HS5500 Blower (the "Blower") will be free from defects in materials and workmanship for a period of 12 months from the date of purchase or 18 months from the date of manufacture, whichever is sooner (the "Warranty Term").

RadonAway® will replace or repair any Blower which fails due to defects in materials or workmanship during the Warranty Term. This Warranty is contingent on installation of the blower in accordance with the instructions provided. This Warranty does not apply where any repairs or alterations have been made or attempted by others, or if the unit has been abused or misused. Warranty does not cover damage in shipment unless the damage is due to the negligence of RadonAway®.

The Blower must be returned (at Owner's cost) to the RadonAway® factory. Any Blower returned to the factory will be discarded unless the Owner provides specific instructions along with the Blower when it is returned regardless of whether or not the Blower is actually replaced under this warranty. Proof of purchase must be supplied upon request for service under this Warranty.

2-YEAR EXTENDED WARRANTY WITH INSTALLATION BY A FACTORY-CERTIFIED PROFESSIONAL

RadonAway® will extend the Warranty Term of the Blower to twenty-four (24) months from date of purchase or thirty (30) months from the date of manufacture, whichever is sooner, if: (1) the Blower is installed in a professionally designed and professionally installed active soil depressurization system or installed as a replacement Blower in a professionally designed and professionally installed active soil depressurization system; and (2) proof of an installer Factory Training Certificate. Upon request, proof of purchase and/or proof of professional installation may be required for service under this warranty. No extended warranty is offered outside the Continental United States and Canada beyond the standard 12 months from the date of purchase or 18 months from the date of manufacture, whichever is sooner. RadonAway® is not responsible for installation, removal or delivery costs associated with this Warranty.

EXCEPT AS STATED ABOVE, THE HS2750/HS5500 BLOWERS ARE PROVIDED WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

IN NO EVENT SHALL RADONAWAY BE LIABLE FOR ANY DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES ARISING OUT OF, OR RELATING TO, THE BLOWER OR THE PERFORMANCE THEREOF. RADONAWAY'S AGGREGATE LIABILITY HEREUNDER SHALL NOT IN ANY EVENT EXCEED THE AMOUNT OF THE PURCHASE PRICE OF SAID PRODUCT. THE SOLE AND EXCLUSIVE REMEDY UNDER THIS WARRANTY SHALL BE THE REPAIR OR REPLACEMENT OF THE PRODUCT, TO THE EXTENT THE SAME DOES NOT MEET WITH RADONAWAY'S WARRANTY AS PROVIDED ABOVE.

For service under this Warranty, contact RadonAway for a Return Material Authorization (RMA) number and shipping information. No returns can be accepted without an RMA. If factory return is required, the customer assumes all shipping costs, including insurance, to and from factory.

RadonAway®
3 Saber Way
Ward Hill, MA 01835 USA
TEL (978) 521-3703
FAX (978) 521-3964
Email to: Returns@RadonAway.com

Record the following information for your records:

Serial No. ____

Purchase Date: ____

Table 1. DER/DAR Air Emissions Analysis Worksheet
458 East Owners LLC, 458 East 99th Street, Brooklyn, NY

Calculations based on effluent sample results from 7/22/2024.
The highest concentration from each discharge and the combined flow rate of fans is used for calculation purposes.

Chemical Name	CAS Number	µg/m3	Molar Mass (g/mol)	PPMv	SGC (µg/m3)	AGC (µg/m3)
1,2,4-Trimethylbenzene (Pseudocumene)	00095-63-6	6.4	120.190	0.0013	N/A	60.00
1,3,5-Trimethylbenzene (Mesitylene)	00108-67-8	2.8	120.190	0.0006	N/A	60.00
2,2,4-Trimethylpentane (Isooctane)	00540-84-1	1.9	114.232	0.0004	N/A	3300.00
Acetone	00067-64-1	900	58.080	0.3727	180000.00	30000.00
Carbon Tetrachloride	00056-23-5	11	153.810	0.0017	1900.00	0.17
Chloroform	00067-66-3	4.2	119.370	0.0008	150.00	14.70
Chloromethane	00074-87-3	3.6	50.490	0.0017	22000.00	90.00
Cis-1,2-Dichloroethylene (DCE)	00156-59-2	49	96.950	0.0122	N/A	63.00
Cyclohexane	00110-82-7	4.6	84.162	0.0013	N/A	6000.00
Ethylbenzene	00100-41-4	16	106.168	0.0036	N/A	1000.00
Isopropanol (Isopropyl Alcohol)	00067-63-0	390	60.096	0.1561	98000.00	7000.00
m,p-Xylene (M-, O- & P- Mixture)	01330-20-7	60	106.160	0.0136	22000.00	100.00
Methyl Ethyl Ketone (2-Butanone)	00078-93-3	17	72.107	0.0057	13000.00	5000.00
Methylene Chloride (Dichloromethane)	00075-09-2	29	84.930	0.0082	14000.00	46.00
n-Butane	00106-97-8	6.2	58.124	0.0026	N/A	N/A
n-Heptane	00142-82-5	3.5	100.205	0.0008	210000.00	3900.00
o-Xylene (1,2-Dimethylbenzene)	00095-47-6	19	106.168	0.0043	22000.00	100.00
Tetrachloroethylene (PCE)	00127-18-4	4100	165.820	0.5947	300.00	3.80
Toluene	00108-88-3	860	92.141	0.2245	37000.00	5000.00
Trans-1,2-Dichloroethene (Dichloroethylene)	00156-60-5	3.1	96.950	0.0008	N/A	63.0
Trichloroethylene (TCE)	00079-01-6	230	131.380	0.0421	20.00	0.21

Calculate Emission Rate in Pounds/Hour (lb/hr):

Flow Rate = 308 cfm (combined max flow of 3 - GX5A and 1 - HS2750 at design flow/vacuum)
Emission Rate (lb/hr) = Flow Rate (cfm) * Concentration (PPMv) * Molecular Weight (g/mol) * 1.581E-07
Note that 1.581E-07 = 1/10^6 ppm-v * 60 minutes/hour * 1 lb-mole/379.5 ft^3

Emission Rates for:	Q	Qa	Part 212-2.2 Table 2 HTAC Mass Emission Limit	
1,2,4-Trimethylbenzene (Pseudocumene)	0.0000075 lb/hr or	0.066 lb/yr	N/A lb/yr	OK
1,3,5-Trimethylbenzene (Mesitylene)	0.0000033 lb/hr or	0.029 lb/yr	N/A lb/yr	OK
2,2,4-Trimethylpentane (Isooctane)	0.0000022 lb/hr or	0.019 lb/yr	N/A lb/yr	OK
Acetone	0.0010540 lb/hr or	9.233 lb/yr	N/A lb/yr	OK
Carbon Tetrachloride	0.0000129 lb/hr or	0.113 lb/yr	100 lb/yr	OK
Chloroform	0.0000049 lb/hr or	0.043 lb/yr	N/A lb/yr	OK
Chloromethane	0.0000042 lb/hr or	0.037 lb/yr	N/A lb/yr	OK
Cis-1,2-Dichloroethylene (DCE)	0.0000574 lb/hr or	0.503 lb/yr	N/A lb/yr	OK
Cyclohexane	0.0000054 lb/hr or	0.047 lb/yr	N/A lb/yr	OK
Ethylbenzene	0.0000187 lb/hr or	0.164 lb/yr	N/A lb/yr	OK
Isopropanol (Isopropyl Alcohol)	0.0004567 lb/hr or	4.001 lb/yr	N/A lb/yr	OK
m,p-Xylene (M-, O- & P- Mixture)	0.0000703 lb/hr or	0.616 lb/yr	N/A lb/yr	OK
Methyl Ethyl Ketone (2-Butanone)	0.0000199 lb/hr or	0.174 lb/yr	N/A lb/yr	OK
Methylene Chloride (Dichloromethane)	0.0000340 lb/hr or	0.298 lb/yr	N/A lb/yr	OK
n-Butane	0.0000073 lb/hr or	0.064 lb/yr	N/A lb/yr	OK
n-Heptane	0.0000041 lb/hr or	0.036 lb/yr	N/A lb/yr	OK
o-Xylene (1,2-Dimethylbenzene)	0.0000223 lb/hr or	0.195 lb/yr	N/A lb/yr	OK
Tetrachloroethylene (PCE)	0.0048016 lb/hr or	42.062 lb/yr	1000 lb/yr	OK
Toluene	0.0010072 lb/hr or	8.823 lb/yr	N/A lb/yr	OK
Trans-1,2-Dichloroethene (Dichloroethylene)	0.0000036 lb/hr or	0.032 lb/yr	N/A lb/yr	OK
Trichloroethylene (TCE)	0.0002694 lb/hr or	2.360 lb/yr	500 lb/yr	OK

Since the remedial system does not have the potential to emit greater than 0.1 lb/hr of a HTAC, nor 0.5 lb/hr of a non-HTAC VOC, and the annual total emissions do not exceed the HTAC Mass Emission Limits, no treatment is necessary.

APPENDIX F

Quality Assurance Project Plan and Field Sampling Plan

ROUX

Quality Assurance Project Plan / Field Sampling Plan

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458 East 99th Street
Brooklyn, New York 11236

November 15, 2022

Prepared for:

458 East 99th Street LLC
458 East 99th Street
Brooklyn, New York 11236

Prepared by:

Roux Environmental Engineering and Geology, D.P.C.
209 Shafter Street
Islandia, New York 11749

Environmental Consulting
& Management
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rouxinc.com

Table of Contents

Tables

Attachments

1. Introduction

Roux Environmental Engineering and Geology, D.P.C. (Roux), 458 East 99th Street LLC's authorized representative of the Volunteer, 458 East Owners, LLC, has prepared this Quality Assurance Project Plan/Field Sampling Plan (QAPP/FSP) and is being submitted as part of the Remedial Investigation Report/Remedial Action Work Plan (RIR/RAWP) to describe the measures that will be taken to ensure the data generated during performance of the RAWP for the 458 East 99th Street project occupying Tax Lot 56 of Tax Block 8131, Brooklyn, New York (Site, Figure 1 of the RIR-RAWP) are of quality sufficient to meet project-specific data quality objectives (DQOs). This QAPP/FSP also includes field sampling procedures.

The Site is enrolled in the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP) as a Volunteer (assigned Site No. C224524). Remedial action activities will be conducted under the New York State Department of Environmental Conservation (NYSDEC) BCP. This QAPP/FSP was prepared in accordance with the guidance provided in NYSDEC Technical Guidance DER-10 Technical Guidance for Site Investigation and Remediation (DER-10), the NYSDEC BCP Guide, and the United States Environmental Protection Agency's (USEPA's) Guidance for the Data Quality Objectives Process (EPA QA/G 4).

1.1 Purpose

The QAPP/FSP describes in detail the field sampling and quality assurance/quality control (QA/QC) methods to be used during soil sampling tasks performed during the Remedial Action.

This QAPP/FSP was prepared in accordance with the NYSDEC's DER-10 and provides guidelines and procedures to be followed by field personnel during performance of sampling during the Remedial Action. Information contained in this QAPP/FSP relates to:

- Sampling objectives (Section 2);
- Project organization (Section 3);
- Sample media, sampling locations, analytical suites, sampling frequencies, and laboratory analysis (Section 4);
- Field sampling procedures (Section 5);
- Sample handling, sample analysis, and quality assurance/quality control (Section 6); and
- Site control procedures and decontamination (Section 7).

2. Sampling Objectives

The sampling program is designed to meet the data quality objectives (DQOs) set forth in the DER-10. Specifically, analytical parameters selected for each sample, as described in Section 4, are comprehensive, and are intended to meet the following objectives:

- Analyze off-Site backfill, as necessary, to evaluate its suitability for use as backfill that meets the lower of the Commercial Use Soil Cleanup Objectives (CSCOs) and Protection of Groundwater SCOs (PGWSCOs) presented in Table 6.8 (a) of the latest revision of Title 6 of New York Code of Rules and Regulations (NYCRR) Part 375 (Part 375); and
- Analyze the effluent air samples from the sub-slab depressurization system/soil vapor extraction system (SVES/SSDS) as part of the system start-up testing.

Sampling procedures are discussed in Section 5 of this QAPP/FSP. A discussion of the DQOs and quality assurance/quality control is provided in Section 6.

3. Project Organization

A general and generic summary of the overall management structure and responsibilities of project team members are presented below. Professional profiles for the team are provided in Attachment 1.

Project Principal

Joseph Duminuco, P.G. of Roux will serve as Project Principal. The Project Principal is responsible for defining project objectives and bears ultimate responsibility for the successful completion of the project.

Remedial Engineer

The Remedial Engineer for this project will be Noelle M. Clarke, P.E. The Remedial Engineer is a registered professional engineer licensed by the State of New York. The Remedial Engineer will have primary direct responsibility for implementation of the Remedial Actions (RA's) and future remedial program elements for the Site. The Remedial Engineer will certify in the Final Engineering Report (FER) that the RA's were observed by qualified environmental professionals under their supervision as well as any other relevant provisions of ECL 27-1419 have been achieved in full conformance with the RAWP.

Project Manager

Levi Curnutte of Roux will serve as Project Manager. The Project Manager is responsible for defining project objectives and bears ultimate responsibility for the successful completion of the work. This individual will provide overall management for the implementation of the scope of work and will coordinate all field activities. The Project Manager is also responsible for data review/interpretation and report preparation.

Field Team Leader

Brooke Hildebrand of Roux will service as the Field Team Leader. The Field Team Leader bears the responsibility for the successful execution of the field program. The Field Team Leader will direct the activities of the technical staff in the field, as well as all subcontractors. The Field Team Leader will also assist in the interpretation of data and in report preparation. The Field Team Leader reports to the Project Manager.

Laboratory Project Manager

Laboratory analysis will be completed by TestAmerica Laboratories of Edison, New Jersey, Sacramento, California, and Burlington, Vermont, NYSDOH Environmental Laboratory Accreditation Program (ELAP)-certified laboratories (11452, 11666, and 10391, respectively). The Laboratory Project Manager is Melissa Haas. The Laboratory Project Manager will be determined prior to the start of the Work. The Laboratory Project Manager is responsible for sample container preparation, sample custody in the laboratory, and completion of the required analysis through oversight of the laboratory staff. The Laboratory Project Manager will ensure that quality assurance procedures are followed, and an acceptable laboratory report is prepared and submitted. The Laboratory Project Manager reports to the Field Team Leader.

Quality Assurance Officer

Jessica Taylor, P.G. of Roux will serve as the Quality Assurance Officer (QAO) for this project. The QAO is responsible for conducting reviews, inspections, and audits to ensure the data collection is conducted in accordance with the QAPP/FSP. The QAO's responsibilities range from ensuring effective field equipment decontamination procedures and proper sample collection to the review of all laboratory analytical data for completeness and usefulness. The QAO reports to the Project Manager and makes independent recommendations to the Field Team Leader.

Data Validator

Judy Harry of Data Validation Services, Inc. (DVS) who is independent from the project implementation team, will review the analytical data for quality assurance and quality control in accordance with NYSDEC standards. The Data Validator will prepare a Data Usability Summary Report (DUSR) meeting the requirements in Section 2.2(a)1.ii and Appendix 2B of DER-10 for all data packages generated for the RA.

4. Sample Media, Locations, Analytical Suites, and Frequency

The media to be sampled during the remedial action may include fill materials, as necessary. Sampling locations, analytical suites, and frequency is provided below and shown in Tables 1 and 2. Specifics regarding the collection of samples at each location and for each task are provided in Section 5 of this QAPP/FSP.

4.1 Imported Backfill Sampling

For imported fill proposed for use on-Site that requires chemical testing, the following sample protocols shall be followed:

- If the NYSDEC agrees that the material originated from a virgin source, then a minimum of one sample (i.e., the pre-qualification sample) will be collected and analyzed per source.
- If the source is not virgin, the sampling frequency will comply with DER-10 Table 5.4(e)10 shown below:

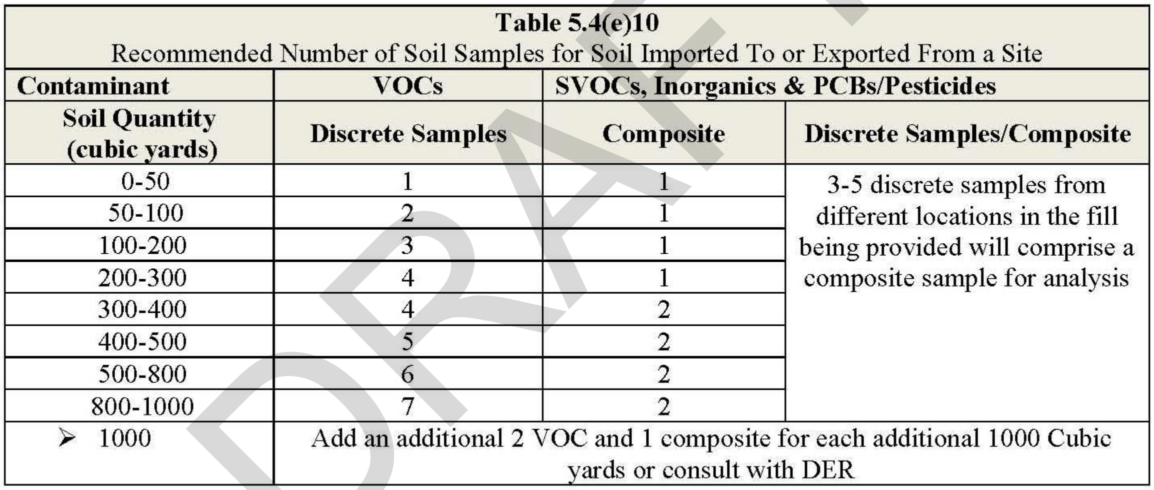

Table 5.4(e)10
Recommended Number of Soil Samples for Soil Imported To or Exported From a Site

Contaminant	**VOCs**	**SVOCs, Inorganics & PCBs/Pesticides**	
Soil Quantity (cubic yards)	**Discrete Samples**	**Composite**	**Discrete Samples/Composite**
0-50	1	1	3-5 discrete samples from different locations in the fill being provided will comprise a composite sample for analysis
50-100	2	1	
100-200	3	1	
200-300	4	1	
300-400	4	2	
400-500	5	2	
500-800	6	2	
800-1000	7	2	
➢ 1000	Add an additional 2 VOC and 1 composite for each additional 1000 Cubic yards or consult with DER		

* The source of the offsite fill must be documented by the supplier, including the location where the fill was obtained and a brief history of the site that is the source of the fill.

- One sample for pre-qualification chemical testing at the source location, including chemical testing shall be performed at a minimum for the parameters listed in Table 375-6.8(b) of the latest revision of Part 375 and specified below:
  - Herbicides by United States Environmental Protection Agency (USEPA) method SW-846 8151A.
  - Pesticides and polychlorinated biphenyls (PCBs) by USEPA methods SW-846 8081B/8082A.
  - Volatile Organic Compounds (VOCs) by USEPA method SW-846 8260C.
  - Semivolatile Organic Compounds (SVOCs) by USEPA method SW-846 8270D.
  - Arsenic, barium, beryllium, cadmium, copper, cyanide, lead, manganese, nickel, selenium, silver, and zinc by USEPA method SW-846 6010D/6010C.
  - Total mercury by USEPA method SW-846 7471B.

  - Total chromium, hexavalent chromium, and trivalent chromium by USEPA method SW-846 7196A.
  - 1,4-Dioxane by USEPA method 8270D.
  - Per- and Polyfluoroalkyl Substances (PFAS) by Modified EPA Method 537 via LC MS/MS isotope dilution.

    * QA/QC samples are not required for backfill samples. All PFAS compounds, listed above, in soil will be analyzed and reported to 1 microgram per kilogram (ug/kg). 1,4-Dioxane will be analyzed and reported to 0.1 milligram per kilogram (mg/kg).

- Off-Site backfill excluding those materials that do not require sampling as described a, shall meet criteria presented in Section 2.0. The following materials may be imported, without chemical testing, to be used as backfill beneath the building, provided that it contains less than 10 percent by weight material that would pass through a size 80 sieve:
  - gravel, rock or stone, consisting of virgin material from a permitted mine or quarry; or
  - recycled concrete or brick from a NYSDEC registered construction and demolition debris processing facility if the material conforms to the requirements of Section 304 of the 2002 New York State Department of Transportation Standard Construction and Materials Volume 1.
- Imported backfill that exceed the criteria presented in Section 2.0 shall not be imported to the Site without prior approval of the NYSDEC.
- Imported backfill will be free of extraneous debris or solid waste.

4.2 SVES/SSDS Effluent Air Sampling

As part of the SVES/SSDS start-up activities, an effluent air sample will be collected from the discharge of each leg (four legs total) of the system using a 6-liter Summa canister and analyzed for VOCs via USEPA TO-15 to determine if vapor treatment would be needed. If the sample results indicate that treatment is required on one or more legs, appropriate treatment options will be evaluated and proposed to NYSDEC under separate cover.

5. Field Sampling Procedures

This section provides a detailed discussion of the field procedures to be used during the sampling of fill material, if necessary. As discussed, the sample locations are shown on Figure 8 of the RIR-RAWP and additional information including intervals to be sampled and sample rationale is provided in the RAWP. Additional details regarding sampling procedures and protocols are described in Roux's relevant Standard Operating Procedures (SOPs), which are provided in Attachment 2.

5.1 Offsite Backfill/On-Site Reuse Soil Sampling

All imported fill material samples will be collected using pre-cleaned stainless steel sampling tools (i.e., trowels, spatulas, etc.) or new Ziploc® bags. In general, where composite samples are required for imported fill samples, composite samples will be collected from a minimum of three locations across the stockpiled materials. The exception is for VOC samples, which will be collected as grab samples. Backfill samples will be submitted under chain of custody procedures for the analysis described in Section 4.1.

5.2 SVES/SSDS Effluent Air Sampling

As shown on Figure 8 in the RIR-RAWP, each leg of the SVES/SSDS will include a sample port that will be accessible from the ground floor. Upon SSDS/SVES start-up and confirmation that blower fans are running properly, each sample port will be used to collect one effluent air sample. Sample tubing will be used to connect the sample port to a laboratory-supplied, batch-certified clean 1-liter Summa cannister to collect a grab sample. Effluent samples will be submitted under chain of custody procedures for the analysis listed in Section 4.2.

6. Sample Handling and Analysis

To ensure quality data acquisition and collection of representative samples, there are selective procedures to minimize sample degradation or contamination. These include procedures for preservation of the samples, as well as sample packaging, shipping procedures, and QA/QC.

6.1 Field Sample Handling

A discussion of the proposed number and types of samples to be collected during each task, as well as the analyses to be performed, can be found in Section 4 of this QAPP/FSP. The types of containers, volumes, and preservation techniques for the aforementioned testing parameters are presented in Table 3.

6.2 Sample Custody Documentation

The purpose of documenting sample custody is to ensure the integrity and handling of the samples is not subject to question. Sample custody will be maintained from the point of sampling through the analysis (and return of unused sample portions, if applicable).

Each individual collecting samples is personally responsible for the care and custody of the samples. All sample labels should be pre-printed or filled out using waterproof ink. The technical staff will review all field activities with the Field Team Leader to determine whether proper custody procedures were followed during the fieldwork and to decide if additional samples are required.

All samples being shipped off-Site for analysis must be accompanied by a properly completed chain of custody form. The sample numbers will be listed on the chain of custody form. When transferring the possession of samples, individuals relinquishing and receiving will sign, date, and note the time on the record. This record documents transfer of custody of samples from the sampler to another person, to/from a secure storage area, and to the laboratory.

Samples will be packaged for shipment and dispatched to the appropriate laboratory for analysis with a separate signed custody record enclosed in each sample box or cooler. Shipping containers will be locked and/or secured with strapping tape in at least two locations for shipment to the laboratory.

6.3 Sample Shipment

Laboratory analysis will be completed by TestAmerica Laboratories of Edison, New Jersey, Sacramento, California, and Burlington, Vermont, NYSDOH Environmental Laboratory Accreditation Program (ELAP)-certified laboratories (11452, 11666, and 10391, respectively). Sample packaging and shipping procedures are based upon USEPA specifications, as well as DOT regulations. The procedures vary according to potential sample analytes, concentration, and matrix and are designed to provide optimum protection for the samples and the public. Sample packaging and shipment must be performed using the general outline described below.

All samples will be shipped within 24 hours of collection and will be preserved appropriately from the time of sample collection. A description of the sample packing and shipping procedures is presented below:

1. Prepare cooler(s) for shipment:
    - tape drain(s) of cooler shut;

   - affix “This Side Up” arrow labels and “Fragile” labels on each cooler; and
   - place mailing label with laboratory address on top of cooler(s).
2. Arrange sample containers in groups by sample number.
3. Ensure all bottle labels are completed correctly. Place clear tape over bottle labels to prevent moisture accumulation from causing the label to peel off.
4. Arrange containers in front of assigned coolers.
5. Place packaging material appropriately at the bottom of the cooler to act as a cushion for the sample containers.
6. Arrange containers in the cooler so they are not in contact with the cooler or other samples.
7. Fill remaining spaces with packaging material.
8. Ensure all containers are firmly packed in packaging material.
9. If ice is required to preserve the samples, ice cubes should be repackaged in Ziploc® bags and placed on top of the packaging material.
10. Sign chain of custody form (or obtain signature) and indicate the time and date it was relinquished to courier as appropriate.
11. Separate chain of custody forms. Seal proper copies within a large Ziploc® bag and tape to inside cover of cooler. Retain copies of all forms.
12. Close lid and latch.
13. Secure each cooler using custody seals.
14. Tape cooler shut on both ends.
15. Relinquish to overnight delivery service as appropriate. Retain air bill receipt for project records. (Note: All samples will be shipped for “NEXT A.M.” delivery).

6.4 Quality Assurance/Quality Control

Jessica Taylor will review the analytical data for quality assurance and quality control in accordance with NYSDEC standards. The professional profile for Jessica Taylor is provided in Attachment 1. A laboratory SOP for analysis of PFAS is included in Attachment 2.

The primary intended use for the RA data is to confirm if remediation has been performed in accordance with the RAWP at the Site. The primary DQO of the soil program, therefore, is that data be accurate and precise, thus, representative of the actual Site conditions. Accuracy refers to the ability of the laboratory to obtain a true value (i.e., compared to a standard) and is assessed through the use of laboratory quality control (QC) samples, including laboratory control samples and matrix spike samples, as well as through the use of surrogates, which are compounds not typically found in the environment that are injected into the samples prior to analysis. Precision refers to the ability to replicate a value and is assessed through both field and laboratory duplicate samples.

Sensitivity is also a critical issue in generating representative data. Laboratory equipment must be of sufficient sensitivity to detect target compounds and analytes at levels below NYSDEC standards and guidelines whenever possible. Equipment sensitivity can be decreased by field or laboratory contamination of samples, and by sample matrix effects. Assessment of instrument sensitivity is performed through the analysis of reagent blanks, near-detection-limit standards, and response factors. Potential field and/or laboratory contamination is assessed through use of trip blanks, method blanks, and equipment rinse blanks (also called “field blanks”). Field blanks for PFAS will be collected at a minimum frequency of one per day.

Table 1 lists the requirements for field and laboratory QC samples that will be analyzed to assess data accuracy and precision, as well as to determine if equipment sensitivity has been compromised. Table 2 lists the type of field and QA/QC samples that may be collected during the Remedial Action. Table 3 lists the preservation, holding times and sample container information.

All RAWP “assessment” analyses (i.e., TCL/Part 375 / TAL, ECs) will be performed in accordance with the NYSDEC Analytical Services Protocol (ASP), using USEPA SW 846 methods.

All laboratory data are to be reported in NYSDEC ASP Category B deliverables and will be delivered to NYSDEC in electronic data deliverable (EDD) format as described on NYSDEC’s website (http://www.dec.ny.gov/chemical/62440.html) and recent updated procedures enacted in November 2018. A DUSR will be prepared meeting the requirements in Section 2.2(a)1.ii and Appendix 2B of DER-10 for all data packages generated. The DUSR will be prepared by DVS, a third-party data validator. The validator’s resume is included in Attachment 1.

7. Site Control Procedures

Site control procedures, including decontamination and waste handling and disposal, are discussed below. Site control procedures have been developed to minimize both the risk of exposure to contamination and the spread of contamination during field activities at the Site. All personnel who come into designated work areas, including contractors and observers, will be required to adhere strictly to the conditions imposed herein and to the provisions of a Site-Specific Health and Safety Plan (HASP). The HASP is included as Appendix J of the RAWP.

7.1 Decontamination

In an attempt to avoid the spread of contamination, all sampling equipment must be decontaminated at a reasonable frequency in a properly designed and located decontamination area. Detailed procedures for the decontamination of field and sampling equipment are included in Roux's SOPs for the Decontamination of Field Equipment located in Attachment 2. The location of the decontamination area will be determined prior to the start of field operations. The decontamination area will be constructed to ensure that all wash water generated during decontamination can be collected and containerized for proper disposal.

Only "PFAS-free" water will be used for decontamination of sample equipment onsite. Only Alconox will be used as decontamination detergent (Liquinox shall not be used).

Respectfully submitted,

ROUX ENVIRONMENTAL ENGINEERING AND GEOLOGY, D.P.C.

Levi Curnutte
Project Manager

Joseph Duminuco, P.G.
Principal Hydrogeologist

Noelle M. Clarke, P.E.
Principal Engineer

TABLES

Table 1. Field and Laboratory Quality Control Summary

QC Check Type	Minimum Frequency	Use
<u>Field QC</u>		
Duplicate	1 per matrix per 20 samples or SDC	Precision
Trip Blank	1 per VOC cooler	Sensitivity
Field Blank	1 per matrix per 20 samples	Sensitivity
PFAS Field Blank	1 per day when sampling for PFAS	Sensitivity
<u>Laboratory QC</u>		
Laboratory Control Sample	1 per matrix per SDG	Accuracy
Matrix Spike/Matrix Spike Duplicate/Matrix Duplicate	1 per matrix per SDG	Accuracy/Precision
Surrogate Spike	All organics samples	Accuracy
Laboratory Duplicate	1 per matrix per SDG	Precision
Method Blank	1 per matrix per SDG	Sensitivity

* SDG - Sample Delivery Group - Assumes a single extraction or preparation
** Provided to lab by field sampling personnel
PFAS - Per- and Polyfluoroalkyl Substances
QC - Quality Control

Table 2. Remedial Action Sampling Summary

Sample Medium	Target Analytes	Field Samples	Replicates[1]	Total No. of Samples
SVES/SSDS Effluent Sampling	TO-15 for VOCs	4	1	5
Soil Backfill (Import or On-Site Reuse)[2]	TCL VOCs +10	-	-	-
	TCL SVOCs +20 +1,4-Dioxane	-	-	-
	TCL Pesticides	-	-	-
	TCL Herbicides	-	-	-
	TCL PCBs	-	-	-
	TAL Metals + Hex/Trivalent Cr + Hg	-	-	-
	Total Cyanide	-	-	-
	PFAS	-	-	-

Totals are estimated based on scope of work as written, actual sample quantities may vary based on field conditions.

[1] Based on 1 per 20 samples or 1 per Sample Delivery Group (5 days max)

[2] The total number of backfill samples, if any, is unknown at this time and will be determined during the RAWP.

QA/QC samples are not required for backfill samples.

Cr - Chromium
Hg - Mercury
SVOCs - Semivolatile Organic Compounds
PCBs - Polychlorinated Biphenyls
PFAS - Per- and Polyfluoroalkyl Substances
TAL - USEPA Contract Laboratory Program Target Analyte List
TCL - USEPA Contract Laboratory Program Target Compound List
USEPA - United States Environmental Protection Agency
VOCs - Volatile Organic Compounds

Table 3. Sample Preservation, Holding Times, and Containers Summary

Analysis	Matrix	Bottle Type	Preservation(a)	Holding Time(b)
TAL Metals (total) SW-846 6020B/7471B/7470A	Soil	8 oz glass	Cool 4 ± 2°C	180 days, Hg 28 days
PFAA via USEPA 537.1(M)-LCMSMS Isotope Dilution (SOIL)	Soil	4 or 8 oz HDPE bottle	Cool 0-6°C	14 days to extraction, 40 days from extraction to analysis
Total Cyanide SW-846 9012B	Soil	8 oz glass	Cool 4 ± 2°C	14 days from sample collection
1,4-Dioxane via 8270E SIM	Soil	8 oz glass	Cool 4 ± 2°C	14 days to extract, 40 from extraction days to analysis
VOCs via USEPA TO-15	Air	1-liter Summa canister (grab sample)	None	14 days from sample collection
<u>Target Compound List (TCL)</u>				
TCL Volatile Organic Compounds (VOCs) SW-846 8260D	Soil	Three 5 gram Encores	Cool 4 ± 2°C	48 hours from sample collection, 14 days if frozen to -7°C or extruded into methanol
TCL Semivolatile Organic Compounds (SVOCs) SW-846 8270E	Soil	8 oz glass	Cool 4 ± 2°C	14 days to extract, 40 from extraction days to analysis
TCL Pesticides SW-846 8081B	Soil	8 oz glass	Cool 4 ± 2°C	14 days to extract, 40 from extraction days to analysis
TCL Herbicides SW-846 8151A	Soil	8 oz glass	Cool 4 ± 2°C	14 days to extract, 40 days from extraction to analysis
TCL Polychlorinated biphenyls (PCBs) SW-846 8082A	Soil	8 oz glass	Cool 4 ± 2°C	14 days to extract, 40 days from extraction to analysis

[a] All soil and groundwater samples to be preserved in ice during collection and transport
[b] Days from date of sample collection.
HDPE - High Density Polyethylene
TAL - Target Analyte List
TCL - USEPA Contract Laboratory Program Target Compound List
USEPA - United States Environmental Protection Agency

ATTACHMENTS

1. Professional Profiles
2. NYSDEC June 2021 PFAS Guidance
3. Laboratory Standard Operating Procedures and Certifications
4. Roux Standard Operating Procedures
5. Laboratory Chains of Custody

ATTACHMENT 1

Professional Profiles

ROUX

PROFESSIONAL PROFILE

Joseph Duminuco, P.G.

Executive Vice President/Principal Hydrogeologist
Director of Site Investigation and Remediation Services

TECHNICAL SPECIALTIES

Mr. Duminuco provides environmental consulting services and strategic planning, focusing on the use of innovative solutions. He is Roux's Director of Site Investigation and Remediation Services, encompassing focused efforts within the Brownfields Redevelopment, Industrial Services, and Petroleum-Energy practice areas. He specializes in investigation and remediation of soil, groundwater, and vapor at commercial and industrial sites, including Brownfield Redevelopment projects.

EXPERIENCE SUMMARY

Over thirty-five years of experience: Director of Site Investigation and Remediation Services, Executive Vice President, Brownfields Practice Area Leader, Vice President, Office Manager, Principal, Senior, and Project Hydrogeologist at Roux; Staff Hydrogeologist at Geraghty & Miller; and Geologist at Mueser Rutledge Consulting Engineers.

CREDENTIALS

M.S. in Geology, Wright State University, 1990

B.S. in Geology, Hofstra University, 1983

Licensed Professional Geologist, NY (License No. 000119)

NYCOER Turbo Training Certified Professional

Advisory Council Hofstra University NSF GEOPaths Grant

PRESENTATIONS

Incentives: Programs and Lessons. 2018 Environmental Law Forum – New Jersey State Bar Association; Cape May, NJ; June 2018.

Environmental Law in Real Estate Transactions – Working with Technical Professionals. Hofstra University Law School; January 13, 2013.

Duminuco J., Coyle F., Property Redevelopment and Brownfield Sites. Proceedings of the 11th Annual Environmental Law Conference; ISBA Conference; May 2012.

Transactions and the Environment: Contaminated Property Issues in Real Estate and Corporate Matters. New York State Bar Association; Tarrytown, NY; June 2006.

KEY PROJECTS

- Principal-in-Charge of the 45-acre development of a state-of-the-art sports arena and commercial/retail complex at an existing sports venue on Long Island, NY. Responsibilities include Phase I and Phase II ESAs, EIS support, Waste Characterization sampling design, implementation and oversight of all soil disposal/reuse activities.

- Principal-in-Charge of the redevelopment of an entire city block into a mix of public and private open space with community gardens, 655 mixed-income residential units, and community services containing three multi-use buildings in Harlem, NY. The buildings will be certified to Passive House standards. Responsibilities include: Phase I and II ESAs, RAPs, waste characterization sampling design, and reporting to the NYCDEP. Subsequently, the project was entered as two separate NYSDEC BCP sites. Activities have included BCP Application, preparation and implementation of a RIWP, preparation and implementation of an IRM Work Plan, preparation of a combined RIR/RAWP, and implementation of CAMP and soil/fill excavation oversight and management and preparation of an SMP and FER to obtain a COC.

- Project Executive of a Design-Build RFP process for a NYC-sponsored project. Our DB team was shortlisted, and Roux is handling all environmental aspects of the final RFP response of a heavily contaminated redevelopment. Roux's role includes extensive waste characterization and soil disposal bidding support, oversight and monitoring of all soil, fill and demolition debris excavations, noise, air and dust monitoring, protection of the surrounding community, preparation of all workplans and reports and evaluating the potential for ACM and radioactive waste throughout the site.

- Principal-in-Charge of the redevelopment of a waterfront site that includes two high-rise mixed-use affordable/senior living residential towers in Queens, NY. Additionally, the development includes ground floor retail, community facility public spaces and two piers extending into the East River. The two towers were entered as separate NYSDEC BCP sites and are immediately adjacent to the Newtown Creek Federal Superfund Site. Activities have included BCP Application, preparation and implementation of a RIWP, preparation of a combined RIR/RAWP, and implementation of CAMP and soil/fill excavation oversight and management, and preparation of an SMP and FER to obtain a COC.

- Principal-in-Charge of the redevelopment of a former garage and auto repair operation and a manufacturing facility on two adjacent lots into a multi-story single-family residence in lower Manhattan, NY. The Site contains an E-Designation and as such is going through the NYCOER VCP. Roux completed a Phase I ESA, an RI, a RAWP, a waste characterization plan, and is providing oversight of waste management, UST removals, and CAMP.

- Principal-in-Charge of a NYSDEC BCP redevelopment of a property adjacent to a dry-cleaning solvent distribution facility in Brooklyn, New York. The Site was a former freight railyard, and offloading spillage on-site and migration from the off-site solvent facility resulted in significant soil, groundwater, and vapor contamination with chlorinated VOCs. The Site was developed into multifamily units with first floor retail use and the remedy consisted of soil hot spot removal, a physical barrier to limit on-site migration, a permeable reactive wall to eliminate off-site migration, hot-spot in situ injections, and a sub-slab depressurization system. The Site contained an E-Designation which was satisfied through the NYCOER simultaneously with the BCP process. Roux was awarded the Big Apple Brownfield Award for Innovation based on our successful cleanup approach.

- Principal-in-Charge of a NYSDEC BCP redevelopment project that also required a RCRA-compliant facility closure. The Site is a former paint factory located in Queens, NY. Historical site operations adversely impacted the subsurface including a LNAPL plume, in addition to petroleum hydrocarbon impacts to the soil and groundwater. Roux completed a RI at the Site which characterized the nature and extent of the impacts. The remedial action included a large excavation that required SOE and was completed under a tent due to odor concerns, multiple ISCO injections, UST removal/abandonment, installation of a LNAPL recovery system, and installation of an SSDS. Additionally, Roux provided oversight of RCRA closure activities at the Site, which included emptying, cleaning, and scrapping 65 ASTs/vessels; decontaminating the ceilings, walls, and floors of the Paint Factory Building; and collection of compliance samples.

- Principal-in-Charge of multiple dry cleaner remediation project takeovers in NYC, Long Island, New Jersey, and Connecticut.

  Sites included a mixed use multifamily affordable housing neighborhood retail complex, a healthcare facility, a light manufacturing facility, and several retail shopping centers. Impacts included soil, groundwater (bedrock and overburden), surface water, soil vapor, indoor air, and building material contamination from chlorinated VOCs from the former dry cleaner operations. Activities included historical research, re-delineation of contaminant source areas, negotiations with regulatory agencies, and remediation including hot spot soil removal, SVE, in situ groundwater treatment, and negative pressure approaches (SSDS) for vapor mitigation in the existing buildings.

- Principal-in-Charge of a NYSDEC VCP redevelopment of a former MGP site into a Big Box retail site in Brooklyn, NY. The project consisted of negotiations with the NYSDEC and Roux limited remediation to former gasholders filled with coal tar, soil hot spots with mobile coal tar, and perimeter containment of coal tar. All the remaining soil at the Site was impacted with MGP waste and most of the Site was underlain by liquid coal tar. Roux negotiated use of institutional/engineering controls to allow significant contamination to remain in place. A sub-slab depressurization system and vapor barrier was installed to address the mobile coal tar left below the retail building.

- Principal-in-Charge for a NYSDEC BCP redevelopment project at a site in White Plains, NY, which consists of 16 separate parcels spanning 4.5 acres and had a variety of former uses including automotive service/repair and multiple dry cleaners. The Site has both chlorinated and petroleum hydrocarbon impacts to the soil and groundwater. The remedy will consist of a site cover system, soil hot spot removals, in situ chemical oxidation for groundwater contamination, and installation of a sub-slab depressurization system.

- Principal-in-Charge of a former wire and conduit manufacturer (former NYS Inactive Hazardous Waste Site) remediation on Long Island, NY. The Site was accepted into the NYSDEC BCP to support additional remediation and future redevelopment. Activities completed included compiling, reviewing, extracting, and summarizing numerous historical environmental reports prepared for the Site; interacting with the NYSDEC, USEPA, and NCDOH; completing a supplemental soil investigation (including extensive use of XRF Technology as metals are the compound of concern); and a groundwater investigation (water is over 100 feet deep). Subsequently an RI was performed and an RIR/RAWP was submitted. The approved remedy is a site cover system.

- Principal-in-Charge for a NYSDEC BCP redevelopment in Staten Island, NY of a former retail service station site. There is soil, groundwater, and vapor contamination from petroleum-related constituents in the vicinity of the former gasoline piping and pump island (the petroleum source area), as well as historic fill across the entire Site. The remedy, described in the Remedial Action Work Plan prepared by Roux, will consist of a sheet pile containment wall around the petroleum source area, a Site Cover System across the entire Site comprised of concrete building slab/walkways, asphalt parking areas and limited landscaped areas, and site-wide a sub-slab depressurization system to prevent vapor intrusion into the proposed retail building and off-site migration of impacted soil vapor.

- Principal-in-Charge of a mixed-use (public school and residential) Brownfield redevelopment in lower Manhattan, NY. Project consisted of a Phase I and a Phase II ESA to satisfy NYCDEP requirements. Due to the presence of contaminated historic fill, Roux performed in situ waste characterization to assist in the development of NYCDEP-required plans. In addition, Roux provided oversight of the waste removal, completion of waste manifests, and full-time CAMP during all soil moving activities. Roux provided support to the excavation contractor when two previously unknown USTs were discovered during excavation activities.

- Principal-in-Charge of a multi-phased NYSDEC VCP redevelopment of a former Defense Site to waterfront, upscale housing in Long Island, NY. This investigation included determining the nature and extent of chlorinated VOCs in soil, groundwater, and vapor- phase contamination on-site and off-site. Utilized a risk assessment to argue the level of residual contamination allowed to remain on-site with an intended residential future use. Remedial alternatives were selected in accordance with future development plans and institutional/engineering controls were proposed to limit cleanup costs. Successfully argued the technical impracticability of remediation of the heavily contaminated deeper aquifer beneath the site and off-site.

- Principal-in-Charge of a retail/commercial redevelopment in the Bronx, NY. The Site contained a NYCDEP E-Designation due to a previous on-site service station UST release. In addition, a previous Phase I and Phase II ESA identified a former dry cleaner with a chlorinated VOC release. Roux performed a focused Phase II ESA at the dry cleaner and determined the chlorinated solvent release was not a hazard. Roux obtained closure under the NYSDEC Spills group, and the Site was redeveloped with a restaurant, a pharmacy, and reuse of a former supermarket.
- Principal-in-Charge of the redevelopment and expansion of an automobile dealer/service center in New York, NY into the US Flagship dealer for a major European luxury car manufacturer. Supported the client and legal team during lease negotiations. Worked closely with the NYCOER to address NYCDEP "E" designation. Coordination with the NYCOER to implement remedial investigation and develop a Site Materials Management Plan as part of the expansion. Also, worked closely with the NYSDEC to address an on-site spill, as well as coordinate efforts to evaluate whether a 19,000-gallon dielectric fluid release by others impacted the Site.
- Principal-in-Charge for the completion of Phase I and Phase II Environmental Site Assessment activities associated with a proposed mixed-use redevelopment located in Westchester, NY waterfront. Work included management of subsurface investigation activities to characterize soil conditions, and working closely with the client's architects and construction contractors to integrate the proposed site remediation into the project development plan (including evaluating multiple potential disposal scenarios). Site contaminants included hydrocarbons (including free-product plume from former USTs) and historic fill constituents.
- Principal-in-Charge of an 80-acre redevelopment in Yonkers, NY. Work included Phase I and Phase II investigations, asbestos surveys and abatement support, and response to a free product impact form an adjacent landowner. Coordinated with the NYSDEC and responsible party to address contamination issue and not impact the client's construction schedule.
- Principal-in-Charge for the redevelopment of a property in Brooklyn, NY into supportive housing. Worked closely with the NYCOER to address the NYCDEP "E" designation. Coordination with the NYCOER to implement remedial investigation and develop RAP/CHASP as part of the NYC VCP.
- Principal-in-Charge for the redevelopment of a property in the Bronx, New York into supportive housing. Worked closely with NYCDEP to address "E" designation. Coordination with NYCDEP to implement remedial investigation and develop RAP/CHASP as part of the redevelopment. Also performed an ASTM VEC to address vapor concerns.
- Principal-in-Charge of a Brownfield Redevelopment for a large vacant parcel (460 acres) on Long Island, NY. The project involved an extensive investigation, UST, and PCB remediation; removal and proper disposal of numerous tanks, drums, abandoned vehicles and transformers; and participation in contentious public meetings. The Site was redeveloped into a golf course and a senior care facility.
- Principal-in-Charge for a property transfer support project at a heavily contaminated (chlorinated volatile organic compounds from an adjacent dry cleaner and on-site MGP waste) distribution facility in the Bronx, NY. The Site was a former MGP being handled under the VCP, in addition to an open petroleum spill under the regional spills group. Roux performed a Phase I for the buyer, a Phase II and remedial cost estimate for the owner, and negotiated with the buyer's consultant and the NYSDEC to limit the scope of the investigation and cleanup.
- Principal-in-Charge of investigation and remediation of a catastrophic heating oil release for a commercial office building in Brooklyn, NY. All work was performed under the oversight of the NYSDEC Spills Group and time was of the essence for the initial response as the heating season was fast approaching. Roux performed free product delineation and remediation and indoor air monitoring at adjacent buildings. Site closure was obtained from the NYSDEC.
- Principal-in-Charge of a mixed use (residential, retail, commercial) Brownfield redevelopment in the Bronx, NY. Project consisted of a Phase I and Phase II ESA to satisfy NYCDEP requirements. The media investigated included soil, groundwater, soil vapor, and building materials. During the Phase II ESA, Roux performed preliminary in situ waste characterization.
- Principal-in-Charge of an interior Brownfield Redevelopment of a PCB, metals, and hydrocarbon-contaminated wire manufacturing facility in Westchester County, NY into use as a movie studio. Activities included delineation and characterization of building

surfaces, design of a remediation program, and interim cleanups to allow studio use as the project progressed.

- Principal-in-Charge of multiple phases of Brownfield project for construction of a cogeneration facility in Brooklyn, NY. The project consisted of construction oversight; environmental compliance monitoring; asbestos and lead paint abatement oversight; data evaluation and report preparation; soil, offshore sediment, and sewer effluent sampling; PCB-contaminated material remediation; preparation of a waste handling and disposal plan; and permitting.
- Principal-in-Charge of multiple retail developments in Harlem, NY. Work included Phase I and Phase II investigations to satisfy the NYCDEP and lender requirements. Lead-based paint and asbestos surveys were performed as part of due diligence. Extensive asbestos issues were identified in building materials and soil backfill. Worked with asbestos contractors to determine best abatement approaches for the redevelopments.
- Project Coordinator of multi-year environmental consulting contracts with Amtrak and New Jersey Transit. Responsibilities include contract negotiations, workload/resource distribution, compliance with contract requirements including utilization of M/WBE contractors, client-staff liaison, adherence to budgets and schedules, and overall quality assurance. The remedy will likely consist of hot spot removals, a site cover system and a sub-slab depressurization system.
- Principal-in-Charge of a multi-phase RI/FS at a PCB and diesel fuel-contaminated railroad yard in New York City. The Site is on the State Superfund list because PCBs were detected in soil, groundwater, hydrocarbon plume, sewer water, and sewer sediment. Responsibilities included preparation of work plans; delineation of PCB hot spots with immunoassays; sewer investigation including pump outs, monitoring, flow measurements, and video surveys prior to abandonment; investigation and remediation of numerous USTs including gasoline, solvents, and fuel oils; support of construction activities; report preparation; negotiations with the NYSDEC and NYSDOH; participation in public meetings; and implementation of interim remedial measures to mitigate the PCB-contaminated hydrocarbon plume; interim remedial measures to mitigate PCB, PAH, and lead-contaminated soil hot spots; and agency acceptance of alternate cleanup levels for site soils that resulted in savings of over $80 million.
- Principal-in-Charge of a project to support the construction of a high-speed rail program. Performed Phase I and II Environmental Site Assessments as part of due diligence at three major railyards. Prepared reports and presentations regarding environmental conditions to regulatory agencies and the design-build consortium. Performed pre-construction sampling and hot spot remediation programs. Also, prepared environmental contingency plans for construction contractors to follow.
- Principal-in-Charge of an investigation at a PCB and solvent-contaminated transformer manufacturing/repair facility in North Carolina. Responsibilities included preparation of a work plan and oversight of the project which consists of soil borings and sampling, immunoassay testing, monitoring well installation, groundwater sampling, report preparation, and remedial alternatives evaluation.
- Principal-in-Charge of a multi-year quarterly monitoring and reporting program at a municipal landfill complex on Long Island, NY. The complex consists of multiple landfills, leachate containment systems, and leachate holding tanks. The project involves the collection of water level and water quality data from dozens of monitoring wells, sampling of leachate containment systems, coordination with contract laboratory, data validation, data evaluation, and report preparation.
- Project Director of all UST investigative and remedial work performed at service station sites in New England for a major oil company. Responsibilities included preparation and negotiation of work orders; coordination of monitoring and sampling; communication with client, regulator, and site owner contacts; management of technical aspects of all projects; strategy evaluation with client; administration of all contracts; and operation and maintenance of remediation systems to mitigate UST releases which included groundwater pump and treat, product recovery, and soil venting systems.
- Principal-in-Charge of an NPL Superfund Site in Delaware. Responsibilities include ongoing performance monitoring of a groundwater extraction system. The remedial system was installed to capture a chlorinated solvent plume emanating from a former PVC manufacturing facility. In addition, prepared and implemented an RI work plan for a USEPA-required off-site investigation of adjacent chemical manufacturing facilities and a large petroleum refinery. Also included DNAPL investigation and deep aquifer study.
- Principal-in-Charge of a NJDEP-ECRA and ISRA investigation and cleanup involving groundwater and soil contamination at a pesticide formulation and distribution facility in New Jersey. Responsibilities include delineating the nature and extent of the off-site contaminant plume; determining groundwater flow patterns in a two-aquifer system; using a three-dimensional computer model to determine proper location for extraction and injection wells; and preparing work plans and summary reports for NJDEP-required additional delineation of the nature and extent of on-site soil contamination.

ROUX

PROFESSIONAL PROFILE

Noelle M. Clarke, P.E.

Principal Engineer

TECHNICAL SPECIALTIES

Feasibility studies, pilot testing, remedial design, implementation, construction management, and startup evaluations for remediation of soil, groundwater, soil vapor and sediment. Phase I/Phase II Environmental Site Assessments (ESA). Extensive experience at brownfields redevelopment sites, former industrial facilities, and public works facilities. Evaluation and design of storm water drainage systems. Evaluation, design, and construction management for new and existing wastewater treatment processes.

EXPERIENCE SUMMARY

Thirty-one years' experience: Principal Engineer/Senior Engineer at Remedial Engineering, P.C./Roux Associates; Project Engineer at Camp Dresser & McKee.

CREDENTIALS

B.S. – Civil Engineering, Manhattan College, 1991
M.E. – Environmental Engineering, Manhattan College, 1994
Professional Engineer in New York.

PAPERS AND PRESENTATIONS

Sparging Targets Submerged Residual Saturation Contamination, written with D. Bennett and L. Buchanan. Presented at the 66th New York Water Environment Federation Association Annual Meeting, New York, New York, February 1994.

Suffolk County Wetlands – Flow Augmentation Needs Study, written with M. A. Taylor and R. Southard. In Proceedings of the Annual Meeting, Hydrology and Hydrogeology of Urban and Urbanizing Areas. American Institute of Hydrology, April 1996.

KEY PROJECTS

- Principal Engineer providing due diligence support for real estate transactions on multiple projects in the New York metropolitan area. Projects have included multi-family housing (both affordable and market rate), retail/ commercial, community services and industrial properties. Services have included Phase I and Phase II ESAs.

- Principal Engineer for a Brownfield redevelopment of a property adjacent to a dry cleaning solvent distribution facility in Brooklyn, New York under the NYSDEC BCP. The site was previously a warehouse built on a former freight railyard that serviced the dry cleaning solvent facility. Offloading spillage on site and migration from the offsite facility resulted in significant soil, groundwater, and vapor contamination with chlorinated VOCs. The site was developed into multifamily housing with first floor retail use. Pre-remediation and posts-remediation Phase I ESAs were prepared by Roux Associates. The remedy, as summarized in the Remedial Action Work Plan (RAWP), consisted of soil hot spot removal, a physical barrier to limit on site migration, a permeable reactive wall to mitigate offsite migration, and a sub slab depressurization system. Roux Associates, under the direction of Ms. Clarke provided full time oversight of the remediation and prepared the Final Engineering Report and Site management Plan. The Certificate of Completion for the Site was obtained in October 2015 and Roux Associates is currently providing post-remediation monitoring services.

- Principal Engineer for a Brownfield redevelopment in Brooklyn, New York at a mixed-use multifamily housing/neighborhood retail complex with a former onsite dry cleaner under the NYSDEC BCP. There is soil, groundwater, and vapor contamination from chlorinated VOCs from the former onsite dry cleaner, as well as groundwater contamination from offsite dry cleaners. The remedy, described in the Remedial Action Work Plan prepared by Roux, consisted of hot spot soil removal, *in situ* groundwater treatment and a sub slab depressurization system for vapor mitigation in the existing buildings. The NYSDEC accepted the Final Engineering Report prepared by Roux Associates and the Site received a Certificate of Completion from NYSDEC in 2016.

- Principal Engineer for a complex dredging project for a major petroleum company on the Allegheny River in New York. The goal of the project is to remove 1,000 tons petroleum impacted sediments from the river. Work includes Site investigation, remedial investigation, alternatives evaluation, remedial design, planning and extensive regulatory permitting with multiple federal, state and local agencies.

- Principal Engineer for the alternatives evaluation, remedy selection, regulatory negotiation, preparation of design documents (drawings, specifications and permit applications) and permitting for all remedial components in support of redevelopment at a former metals manufacturing site in Staten Island, New York under the NYSDEC Voluntary Cleanup Program (VCP). The remedy included dredging and onsite disposal of stream sediments; consolidation and capping of fill material across the site; in-place abandonment of the Site's former sewer system; installation of drainage swales for storm water management; and wetland bank stabilization and mitigation/restoration. The work included a significant permitting component from multiple federal, state, and New York City regulatory agencies, including USACE, National Marine Fisheries, NYSDEC, NYSDOS, New York City Department of Environmental Protection, and Department of City Planning.

- Principal Engineer for the design, bidding, contractor selection, and remedial construction phase at a former metals manufacturing facility in Staten Island under the NYSDEC VCP. Responsibilities included finalizing biddable construction documents, issuing to bidders, preparing addenda and evaluating bids for presentation to the client. Following contractor selection Roux was heavily involved in coordinating with the client, regulators and contractor for mobilization to the site in late 2006. During the construction Ms. Clarke provided support to the onsite construction manager regarding field changes, design revisions to account for unexpected conditions and contractor questions. The Final Engineering Report summarizing the construction activities was accepted by NYSDEC.

- Principal engineer for permitting of remedial activities at a metals manufacturing site in Staten Island, New York under the NYSDEC VCP. Required permits and regulatory approvals for the project included a Joint Permit from the USACE and NYSDEC for dredging of Mill Creek, bank stabilization and construction activities in the wetlands; a NYSDEC SPDES equivalency permit for discharge of treated water to the Arthur Kill, a New York State Department of State Coastal Management Program (CMP) Federal Consistency Assessment; a New York City Waterfront Revitalization Program Consistency Assessment, a modification of topography authorization from New York City Department of City Planning; and a New York City Department of Environmental Protection permit for temporary discharge to a combined sewer. Also required by the USACE and National Marine Fisheries, was preparation of an Essential Fish Habitat Study, in support of the Joint Permit application. Permitting activities included preparation of the various permit applications, forms and supporting documentation, as well as follow up meetings and correspondence to finalize the authorizations.
- Principal-in-Charge of an investigation and remediation project at a former petroleum refinery and current distribution facility located in Buffalo, New York. The site entered the NYSDEC BCP in 2006. Roux Associates completed the BCP application and supported the application process. The work included assessing and remediating the potential environmental impacts associated with historical Site operations. These activities have included preparing multiple work plans and directing the activities of another consultant performing the fieldwork and preparing reports of results for field investigations including soil boring and sampling, well installation and groundwater sampling, aquifer pump testing, and groundwater/separate phase modeling. An *in situ* chemical oxidation system was designed, installed and was operated as an IRM to remediate and area of free product and impacted groundwater discharging to the Buffalo River in OU-4.
- For the same petroleum Site in Buffalo, New York, multiple Alternatives Analysis Reports (to document analysis of engineering options and remedy recommendation), Remedial Action Work Plans and remedial design documents have been prepared to address the environmental impacts associated with the five Operable Units (OU) on the Site. Remedial construction for OU-1 was completed in 2007 and included excavation and disposal of impacted soil. The Final Construction Certification Report for OU-1 was accepted by the NYSDEC. The Alternatives Analysis Report and Remedial Design for OU-4 were submitted and approved by NYSDEC. The remedy for OU-4 included excavation and onsite consolidation of river sediments and site soil, stabilization of 1,400 linear feet of river embankment using tiered slopes, rip rap, and reinforced bioengineering, slurry wall groundwater containment, low permeability capping, a stormwater collection system and constructed wetland treatment for stormwater. Various vegetative measures were incorporated into the design in order to promote vegetative growth and enhance wildlife habitats. The remedial construction was completed in 2013 and 2014 and preparation of the Final Construction Completion Report was competed in 2015. The Alternatives Analysis Reports for OU-2 and OU-3 were submitted to NYSDEC. For OU-2, bench scale studies of stabilization/solidification agents were completed and evaluated for treatment of lead and petroleum impacted soil. In addition, field pilot studies of multiple options to treat petroleum impacted soils were completed and evaluated. Design of a stormwater collection system for portions of OU-2 and OU-3 was completed in 2010 and construction was completed in 2014 under the direction of Ms. Clarke.
- For the same petroleum terminal in Buffalo, New York, the work also included performing activities related to the operation of the remediation systems at the Site. These activities have included preparing a feasibility study work plan for improving water management systems at the site; preparing a work plan, directing the field work and preparing an evaluation summary report for startup and testing of a portion of the groundwater extraction system at the Site; and assisting in preparation of plans to upgrade the existing treatment facilities at the Site.
- For the same petroleum terminal in Buffalo, New York, the work also included preparation of design documents and a completion report for in-place closure of the site's former in-ground oil water separator. In addition, a vapor enhanced extraction pilot study work plan was prepared and implemented at the site for recovery of separate-phase product in one portion of the site located adjacent to the Buffalo River. The results of the VER pilot testing, along with the results of chemical oxidation pilot testing conducted at the site, have been summarized in a Remedial Action Selection report, which recommended implementation of chemical oxidation in this portion of the site. A conceptual plan for implementation of chemical oxidation was submitted with the selection document. The work also included maintaining contact with regulatory agencies regarding the status of activities at the Terminal; preparing compliance monitoring reports for submittal to

the regulatory agencies; overall project coordination; and budget management and tracking.

- Principal Engineer for the investigation, design, and implementation of a soil remediation project at a 4-acre former oil terminal in Cold Spring Harbor, New York under the NYSDEC spills program. The remedy completed included excavation and offsite disposal of approximately 20,000 tons of petroleum contaminated and/or hazardous lead contaminated soil in accordance with the future use of the site under an Environmental Easement. Additional activities completed by Roux at the site included asbestos remediation followed by building demolition, UST removal, and cesspool remediation. Roux prepared a Final Engineering Report, which was accepted by NYSDEC and resulted in the closure of the spill number for the Site.

- Principal Engineer for the investigation, design, and implementation of a soil remediation project at a portion of a former oil terminal in Sag Harbor, New York. The remedy completed included excavation and offsite disposal of approximately 2,000 tons of petroleum contaminated soil from beneath an active public roadway under the NYSDEC spills program. The remedy included extensive traffic control and coordination with Village of Sag Harbor officials, dewatering, water treatment, temporary water discharge of treated water to Sag Harbor and restoration of the public roadway in accordance with the Village of Sag Harbor Department of Public Works requirements. Roux prepared a Final Engineering Report, which was accepted by NYSDEC and resulted in the closure of the spill number for the Site. Project Manager for preparation of a work plan, direction the field activities and preparation of a summary report for investigation of the storm-water collection system at a petroleum terminal in Buffalo, New York. The objectives of the storm sewer investigation were to: prepare a detailed map of the Site's sewer system; re-establish connections that may have become blocked by debris; investigate the structural integrity of the storm sewers; locate areas of groundwater infiltration and assess infiltration rate and quality; assess wet and dry-weather flow and quality; and identify areas contributing surface water to the collection system, including hydrologic modeling using TR-55. Based on the results of the investigation, several improvements to the sewer system were recommended, including eliminating inlets to the system in areas of the site where no active operations currently take place and rehabilitation and/or installation of new sewers to restore flow by gravity to the treatment system.

- Principal Engineer for the investigation, remedial design, construction oversight and operation and maintenance of a bioventing and soil vapor extraction system at the Site of a diesel UST failure in Brooklyn. A free product recovery system was also designed, installed, and operated by Roux. Investigation activities included the use of the sonic drilling technique to advance twelve wells to 85 feet below grade through cobbles and boulders for delineation of separate phase product, soil and groundwater impacts. Eight wells were converted to combination biovent/SVE wells. Design included specification of SVE and biovent blowers, piping, valves, and an automatic control system. Product only pumps were also designed and installed in three wells. Approximately 2,000 gallons of product were recovered to by the two systems and the spill was closed by NYSDEC in 2011.

- Principal Engineer for a Brownfield redevelopment in Staten Island, New York of a former retail service station site under the NYSDEC BCP. There is soil, groundwater and vapor contamination from petroleum-related constituents in the vicinity of the former gasoline piping and pump island (the petroleum source area), as well as historic fill across the entire site. The remedy, described in the Remedial Action Work Plan prepared by Roux, will consist of a sheet pile containment wall around the petroleum source area, a Site Cover System across the entire site, comprised of concrete building slab/walkways, asphalt parking areas and limited landscaped areas and site-wide a sub-slab depressurization system to prevent vapor intrusion into the proposed retail building and offsite migration of impacted soil vapor. A certificate of completion from NYSDEC was obtained in 2020.

- Project Manager for the remedial design at a Superfund Site in Nanuet, New York for the New York State Department of Environmental Conservation. The work included preparation of a preliminary design report, which evaluated two alternatives for handling hazardous soils and sediments at the site contaminated with volatile organic compounds. Each alternative was evaluated on the basis of technical feasibility, cost and schedule for implementation. Based upon this evaluation, off-site disposal was recommended over on-site treatment. The report presented a site-wide conceptual plan for remediation, including soil/sediment excavation, staging and sampling; stream diversion; excavation dewatering; temporary on-site groundwater treatment; and long term monitoring. Duties also included managing and tracking all project budgets and serving as the main client contact.

- Principal Engineer for the design and specification of a large-scale (750 scfm) soil vapor extraction (SVE) pilot system with thermal oxidation off-gas treatment for a client in Brazil. Responsibilities included equipment sizing and specification, selection of materials of construction, SVE well and equipment layout, description of general startup procedures and preparation of a pilot test work plan. The pilot test work plan included a description of the pilot test operating procedures to be followed, operating parameters to be monitored and data to be collected and analyzed. The work also included conducting the pilot test activities and generating a report that included plans for expanding the SVE system across the Site. The work currently also included technical support for evaluating and optimizing system performance.

- Project Manager for a storm sewer study at the former metals manufacturing facility in Staten Island, New York as part of the Voluntary Cleanup Program for the Site to identify contaminated infiltration sources, provide an accurate site drainage map, and verify contributing areas to each outfall. The investigation included field inspections, surveying, dye testing, and sampling during varying tidal conditions. The storm sewer map prepared was used for future sewer closure and site redevelopment planning.
- Principal engineer for the design of a new storm water collection system for a metals manufacturing site in Staten Island, New York under the NYSDEC VCP. The design included evaluation and hydrologic modeling of the system using the U.S.g Soil Conservation Service TR-55 hydrologic analysis model, inlet structure and pipe sizing and layout, outfall design and specification of materials and methods of construction for all system components.
- Principal-in-Charge of the operation, maintenance, monitoring and reporting activities at multiple active and former petroleum storage and distribution terminals located in New York for a large petroleum company. The work includes operation, maintenance, and performance/compliance monitoring services at the sites that currently have active remediation system installed and monitoring, sampling, and reporting services at sites without systems. The remediation systems include groundwater extraction and treatment, free product recovery, bio-sparging, and soil vapor extraction/air sparging. At these sites, Roux Associates is responsible for: maintaining and troubleshooting the various system components to reduce downtime to the extent possible; repairing and/or replacing equipment as needed; coordinating the upgrading of the electrical systems, as needed, to meet current building code requirements; expanding systems to meet regulatory requirements, as needed; optimizing system performance; collecting performance monitoring samples and data to track the efficiency of the treatment systems; and collecting compliance monitoring data.
- Principal Engineer for at multiple petroleum terminals in New York State for groundwater quality and surface water quality sampling and monitoring well gauging as required by the New York State Department of Environmental Conservation, as well as quarterly reporting for all sites. The work has also included collection of soil quality data at several sites and performance of an electromagnetic survey to support the divestiture and redevelopment of one of these sites. Based on these results, soil removal activities were performed at one of the former terminals in order to obtain regulatory closure of the site. Roux Associates successfully completed the remedial activities to the satisfaction of the regulator and received closure for the client of the open spill number. Regulatory closure of another of these former terminals was obtained based upon the results of ongoing groundwater monitoring and reporting.
- Project Engineer for design of a 2.6-mgd groundwater treatment system at the Fireman's Training Center for Nassau County Department of Public Works on Long Island. The work included design of air strippers, exhaust stacks, liquid-phase GAC treatment units, and all chemical feed and storage facilities, including unit sizing, selection of materials of construction, equipment layout, and coordination with other disciplines. The work also included development of the "mass balance" for the facility.
- Task leader in charge of overseeing a bioventing pilot study conducted by a subconsultant, to treat contaminated vadose zone soils at the Fireman's Training Center site in Nassau County, New York. The work included development of a preliminary design report for the full-scale implementation of bioventing at the site based upon the results of the pilot study.
- Project Engineer for the design, specification, construction and operation of an air sparging and soil vapor extraction pilot at the Long Island terminal of a large petrochemical distributor. The pilot was designed to treat contaminated ground water and vadose zone soils resulting from a one-million-gallon gasoline spill at the site. The work included development of the field sampling program and sampling and evaluation of various parameters to determine the pilot's radius of influence and effectiveness. The work also included performing data analysis and preparation of the pilot study report, which recommended full scale implementation of air sparging at the site. The site-wide implementation of air sparging and expansion of the site's existing vapor extraction system at the same Long Island petrochemical terminal was also part of the work. Responsibilities included design, specification, and layout of all mechanical equipment, vapor extraction, and air sparging wells and new vapor extraction/air sparging piping.
- Task leader responsible for investigating alternatives for the treatment of gasoline contaminated off-gas from air stripping operations a Long Island petrochemical terminal. Based on this evaluation, biofiltration was selected for piloting. Responsibilities included design of a pilot unit; development of sampling and data collection procedures; construction oversight and "troubleshooting" for the unit; coordination of data collection activities; and compilation and analysis of the pilot data.

- Project Engineer for the design of a 0.50-mgd groundwater treatment facility a Long Island petrochemical terminal. Responsibilities included the design, specification, and layout of mechanical equipment, including the air stripping tower, vapor phase granular activated carbon off-gas treatment, centrifugal blowers, ductwork, influent pump, and concrete wet well. Responsible for shop drawing review during the construction phase.
- Project Manager for an investigation at a gasoline service station with soil and groundwater contamination. Responsible for reviewing and evaluating the work of another consultant that performed the soil and groundwater sampling and conducted remedial activities at the site including: investigation summary reports; remedial designs; remediation progress reports; correspondence with regulators; and plans for future work at the Site. The work also included mapping the groundwater flow patterns in the area of the service station and mapping the areal and vertical extent of the groundwater contamination. Responsible for project coordination and budget management and tracking.
- Project Manager for the field investigation, feasibility evaluation, and remedial design at Superfund Site in Spring Valley, New York for the New York State Department of Environmental Conservation. The work included development of a work plan and site operations plan. The field investigations included Geoprobe soil borings; groundwater monitoring well installation; groundwater sampling; aquifer pump testing; and vapor extraction pilot testing. Work also included conducting the field operations for the vapor extraction pilot and producing a summary report of the field investigation results. The report presented an evaluation of the cost and feasibility of several alternatives for remediation of the site. It recommended reducing the level of effort of the remediation presented in the Record of Decision, based on lower levels of contamination encountered during the investigation. Duties also included project coordination; budget management and tracking; and development of subcontract agreements.
- Project Engineer for upgrades to the Spring Creek Auxiliary Water Pollution Control Plant for the City of New York. The work included the evaluation, design, and specification of a two-stage odor control system, chemical storage and feed facilities and new effluent disinfection system.
- Project Engineer responsible for preparation of design documents for the replacement of the sodium hypochlorite pumps and piping at the Mamaroneck Wastewater Treatment Plant for Westchester County Department of Environmental Facilities in New York.
- Project Engineer for design of upgrades to the New Rochelle Wastewater Treatment Facility for Westchester County Department of Environmental Facilities in New York. Designed upgrades to the main influent pump station, including rehabilitation of the existing influent pumps and replacement of the magnetic drives with new variable frequency drives. Responsibilities also included design of a submersible automatic duplex sump pump system, new primary sludge pumps and piping and new primary and secondary settling tank equipment. The work also included assisting the County during the bidding and contractor selection phase and preparing addenda to the contract documents.
- Project Manager for the construction of upgrades to the New Rochelle Wastewater Treatment Facility. Responsibilities included overseeing the shop drawing logging and distribution process; reviewing mechanical equipment shop drawings; addressing contractor questions regarding the contract documents; and coordinating with the resident engineer in the field and the electrical and general contractors.
- Project Engineer for the performance evaluation of the Harriman Wastewater Treatment Plant for the Orange County Department of Environmental Facilities and Services. Responsibilities included documentation of the existing conditions at the plant and evaluation of the historical and current performance of the plant with respect to its potential for expansion. A summary report was prepared, which included evaluations of the existing plant processes with respect to standard design criteria, typical design practices and receiving water considerations. This summary report served as the basis for the facilities plan prepared as the next phase of the project.
- Project Engineer for the facilities plan for the upgrade of the Harriman Wastewater Treatment Plant. Responsibilities included evaluation of alternatives for expanding the plant's treatment capacity. A report was prepared, which recommended the conversion of the existing oxidation ditches to sequencing batch reactors (SBR) in order to increase the plant's treatment capacity to 6.0 mgd within the limited space available on the site.
- Project Engineer for the Gates-Chili-Ogden Pump Station and Force main design for Monroe County, New York. The design consisted of a new 36 mgd wet pit/dry pit pump station, influent sewer and force main. Responsibilities included evaluating influent pumping conditions, and design of the influent sewer, manual influent bar racks and a duplex automatic submersible sump pump system for the station.

Levi Curnutte

Senior Scientist

TECHNICAL SPECIALTIES

Design, implementation, and management of Remedial Investigations and Remedial Actions for sites in regulatory programs including New York State Brownfields Cleanup Program (BCP), New York City Office of Environmental Remediation (NYCOER) E-Designation and Voluntary Cleanup Programs, NYC Department of Environmental Protection (NYCDEP), and New York State Spills Program; Management of due diligence Phase I & II Environmental Site Assessments; Management of large-scale soil excavation projects including soil waste characterization implementation and construction located primarily in the tri-state and surrounding areas. Additional technical skills include waterproofing, vapor barrier, sub-slab depressurization system (SSDS) installation inspections.

EXPERIENCE SUMMARY

Eight years of experience: Staff Scientist, Project Scientist, and Senior Scientist, Roux Environmental Engineering and Geology, D.P.C., Islandia, New York.

CREDENTIALS

B.S. Marine Science, Coastal Carolina University, 2011
M.S. Environmental Studies, College of Charleston, 2013
OSHA 40-hour HAZWOPER Training, 2014
OSHA NYC Site Safety Training (SST)-certified
OSHA 8-hour HAZWOPER Refresher Training, Certificate Current
NYCOER Gold Certified Professional
ExxonMobil Loss Prevention System-certified

PUBLICATIONS

Climate Change and Bemisia tabaci (Hemiptera: Aleyrodidae): Impacts of Temperature and Carbon Dioxide on Life History. Curnutte, L., Simmons, A. M., and S. Abd-Rabou. Ann. Ent. Soc. Amer. 107(5): 933-943. 2014.

KEY PROJECTS

- Project Manager for a large on-going redevelopment project in Brooklyn, New York, including the Barclay's Center and the relocation of a nine-acre 100-year old active rail yard. Project includes management of four buildings with NYCDEP "E" designations and the implementation of Remedial Action Work Plans, *in situ* soil characterization sampling, soil disposal, NYSDEC spill remediation at multiple sites, and Site Management Plan (SMP) O&M task implementation. Achieved an NYCOER Notice of Satisfaction for one property within the OER VCP. Agency support for NYSDEC, NYCDEP, NYCOER, MTA (LIRR/NYCT), and ESDC.

- Project Manager providing support for all soil and groundwater disturbances during development of a large 12.5-acre college campus located on Roosevelt Island, New York, New York. Management tasks include Agency support for NYCDEP and NYSDEC, CAMP and SWPPP implementation, soil characterization for reuse and disposal, UST removal adhering to NYSDEC regulations, asbestos abatement coordination, and submission of a NYCDEP Remedial Closure Report. Received NYCDEP letters of completion for all remedial activity requirements set forth for the site.

- Project Manager for remediation of a 1-acre parcel in the Sunset Industrial Park section of Brooklyn, New York under the NYSDEC BCP and navigating through USEPA RCRA Consent Decree violations. This project included preparation of BCP Application submission, due-diligence environmental assessment and investigation, and development of NYSDEC-approved Remedial Investigation Work Plans and Interim Remedial Measures and will feature construction of a large parking garage for use as commercial vehicle fleet storage and maintenance.

- Project Manager for on-going SMP O&M tasks and Field Manager for RAWP implementation at a NYSDEC BCP site in the Williamsburg neighborhood of Brooklyn, New York, completing extensive remediation of chlorinated VOC-impacted soil and groundwater to accommodate development of a mix-used building and underground parking garage. Primary contaminants of concern were PCE and TCE. Project responsibilities include management of zero-valent iron injections (ZVI) for a permeable reactive barrier (PRB), installation of SSDS, waterproofing/vapor barrier inspections, groundwater monitoring and sampling, CAMP, coordination and tracking of hazardous and non-hazardous waste, and providing contractor work zone health and safety recommendations/oversight in accordance with OSHA guidance. Key contributor in the submissions of the Periodic, Annual, and Final Engineering Reports submitted to NYSDEC leading to Certificate of Completion. Project received by the NYC Brownfield Partnership's 2017 Big Apple Brownfield Award for Innovation.

- Project Manager for remediation of two parcels in Queens, New York as part of NYSDEC BCP containing petroleum compounds and hazardous concentrations of heavy metals. This project included preparation of BCP Application submission, due-diligence environmental assessment and investigation, *in situ* waste characterization design and implementation, development of NYSDEC-approved Remedial Investigation Work Plans and Remedial Action Work Plans, and future remediation during construction of two mixed-use, affordable housing developments. Also required coordination with NYCHPD and NYCDEP to meet regulatory requirements for funding.

- Project Manager for an affordable housing redevelopment site in NYSDEC BCP in Brooklyn, New York also under NYCDEP oversight. The site was formally used by Brooklyn Water Works and an automobile repair facility and contaminants of concern are petroleum compounds in soil and chlorinated solvents in soil gas. Project management roles include BCP Application submission, due-diligence assessment and investigation activities, *in situ* waste characterization design and implementation, development of NYCDEP- and NYSDEC-approved Remedial Investigation and Remedial Action Work Plans. A conditional Track 1 Cleanup is intended for the site.

- Project Manager for former Manufactured Gas Plant (MGP) site in Gowanus neighborhood of Brooklyn, New York. Under NYSDEC regulation, O&M responsibilities include coordination of monitoring of recovery wells known to be former and current producers of coal tar (DNAPL) and DNAPL recovery and disposal and associated reporting.
- Project Manager for an 85-acre commercial site within the NYCOER Voluntary Cleanup Program (VCP) undergoing a 500K sq. ft. mall expansion. Project involved the construction of an adjacent building to the existing mall and a new above-grade parking structure. Manager for Remedial Action Work Plan implementation and production of multiple Remedial Action Reports leading to one NYCOER Notice of Satisfaction for the client to date.
- Project Manager for six separate sites with NYCDEP "E" designations that are part of a large 21-acre affordable redevelopment project in Brownsville neighborhood of Brooklyn, New York. All sites are under NYCOER regulation with one site enrolled in the VCP. Project management includes NYCOER enrollment, design and implementation of remedial investigations and assessments, design and implementation of Remedial Action Work Plans, *in situ* soil characterization sampling and soil removal (including hazardous soil), opening of a NYSDEC Spill and closure, and UST removal adhering to NYSDEC regulations.
- Project Manager for remedial investigation of a previously abandoned oil-water separator located at a NYSDEC-regulated 175-acre former petroleum refinery and terminal in Brooklyn, New York to delineate residual contamination. Responsibilities included the management of all field tasks, site management, property owner and tenant coordination, and investigation report.
- Project Manager for ongoing long-term O&M support and Field Manager for RAWP implementation at a NYSDEC BCP site in the Brownsville neighborhood of Brooklyn, New York. Previous use as a dry cleaner left residual contamination of PCE and TCE in soil and groundwater. Field management of remediation of chlorinated VOC-impacted soil and groundwater including source excavation and tracking of hazardous and non-hazardous waste, potassium permanganate (KMnO4) injections for groundwater treatment, installation of soil vapor extraction wells, groundwater monitoring and sampling, and CAMP.
- Field Manager of subset of field operations for a large-scale, high profile investigation of 500 residential and sensitive-use properties located throughout Los Angeles County. As a result of lengthy aerial depositions of emissions originating from a former battery recycling facility in Vernon, California, soil was analyzed *in situ* for lead contamination on a real-time basis through the use of X-ray fluorescence (XRF) instruments. Helped coordinate and perform the rapid assessment of soils by multiple teams while under heavy scrutiny by the press, regulators, and homeowners.

Brooke Hildebrand
Staff Scientist

TECHNICAL SPECIALTIES

Remedial construction and soil excavation oversight; Hazardous and non-hazardous waste disposal oversight; Soil import oversight, Waste characterization and delineation oversight; Environmental site assessments focusing on soil, groundwater, and soil vapor investigations using multiple sampling techniques; Drilling oversight; Implementation of Community Air Monitoring Programs (CAMP); Insurance litigation support.

EXPERIENCE SUMMARY

One and a half years of professional experience: Staff Scientist, Roux Environmental Engineering and Geology D.P.C., Islandia, New York

CREDENTIALS

B.S. Environmental Science, Minor in Engineering, Binghamton University, 2019
A.S. Environmental Science, Suffolk County Community College, 2017
OSHA 40-Hour HAZWOPER Training, 2019
OSHA 30-hour Construction Safety Training, 2019
OSHA 8-hour Refresher Training, 2019-2021
OSHA 8-hour Fall Protection Training, 2020
OSHA 2-hour Drug & Alcohol Awareness Training, 2020
NYSDEC 4-Hour Erosion & Sediment Control Training, 2021
Loss Prevention System (LPS) 8-Hour Certified, 2019
First Aid and CPR Certified, 2021

KEY PROJECTS

- Staff on an insurance litigation case regarding the evaluation of past and future costs for the investigation and remediation of a site with past railroad, wood treating, and drum reconditioning operations. Responsibilities included the review and organization of over 20,000 documents, past cost categorization, and report writing assistance.
- Field manager for the implementation of the On-Site Environmental Monitoring (OEM) Program at a 43-acre redevelopment project in Belmont, New York. Responsibilities included ensuring environmental compliance with regards to air, stormwater, noise, traffic, and other relevant environmental concerns during the performance of any construction-related activity across the Site.
- Field manager for a site in Sleepy Hollow, New York performing soil importation and fill operation activities. Responsibilities include implementation of CAMP; management of soil importation; preparation of daily progress reports submitted to the NYSDEC; onsite soil tracking; and oversight of fill operations using onsite and imported fill.
- Field Staff for groundwater and soil vapor sampling monitoring programs at a former petroleum refinery and terminal in Brooklyn, New York. This work was done to monitor the largest subsurface free-product plume in North America. Field work responsibilities included the sampling of over fifty wells and monitoring points for petroleum contaminated groundwater and soil vapor using multiple sampling methods.
- Field Manager responsible for the implementation of groundwater sampling activities at multiple locations including a high-end shopping mall site in Norwalk, Connecticut, and a Site in Brooklyn, New York.
- Field manager for NYSDEC BCP Site located in Gowanus neighborhood in Brooklyn, NY. Industrial Site history and proximity to Superfund Site Gowanus Canal requires a USEPA-approved remediation. Responsibilities included construction oversight, CAMP implementation, SWPPP, and groundwater sampling.
- Field manager responsible for air monitoring to collect interior air quality data during construction activities at a site in Hudson Yards, New York enrolled the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP). Roux implemented monitoring by utilizing 13 stationary 5-gas meters with telemetry and 2 roaming 5-gas meters, capable of measuring the following air quality parameters: oxygen, carbon monoxide, hydrogen sulfide, methane (as LEL) and organic vapors (VOCs). Responsibilities also included construction oversight, analyzing air monitoring data and preparing associated reporting daily.
- Field Manager responsible for environmental oversight of geotechnical work at a generating station in Astoria, New York. Responsibilities included monitoring and enforcing the subcontractor's adherence to specific procedures to prevent vertical migration of NAPL, logging and screening soil with a photo ionization detector (PID), recording lithology of soil cores, and confirming depths of clay layers and bedrock.
- Field Manager responsible for the implementation of CAMP during excavation, disposal, and import activities at multiple locations in Queens, Brooklyn and Upstate, New York. Monitored airborne dust and VOCs that are potentially generated by remedial action work activities, reviewing the collected data for exceedances of the New York State Department of Health (NYSDOH) guidelines.
- Site Safety Officer for various remedial investigation sites. Responsibilities include preparation of health and safety plans (HASPs); development and review of job safety analysis (JSA) documents; on-site safety meeting management; safety document preparation (Lessons Learned, Near Loss, Field Audits, etc.); and planning/ execution of corrective actions.

ROUX

PROFESSIONAL PROFILE

Jessica L. Taylor, P.G.

Principal Hydrogeologist

TECHNICAL SPECIALTIES

Project Management and Field Management for large-scale soil excavation and remediation projects, including site assessment, remediation implementation, and construction activities. Negotiation with NYSDEC Brownfield Cleanup Program (BCP) and NYCOER E-Designation/Voluntary Cleanup Program. Coordination and management of large-scale demolition and renovation support. Performance of sampling and direction of field sampling teams for the following media: soil, groundwater, surface water, soil vapor, sludge, and sediment. Excavation sampling and oversight and waste tracking.

EXPERIENCE SUMMARY

Fifteen years of experience: Principal, Senior, Project, and Staff Hydrogeologist, Roux Environmental Engineering and Geology, D.P.C., Islandia, New York; Staff Hydrogeologist and Intern at GSC|Kleinfelder.

CREDENTIALS

B.S. Geology, Binghamton University, 2005
Professional Geologist, New York, 2017
OSHA 40-Hour HAZWOPER Training, 2005
OSHA 10-Hour Construction Safety Training, 2008

KEY PROJECTS

- Project Principal for a large on-going redevelopment project in Brooklyn, New York, including four buildings with E-Designations. The project encompasses 22 acres including the Barclays Center. Project includes coordination and oversight of *in situ* waste characterization sampling, excavation, and proper disposal of soil. Coordination of pre-demolition asbestos and hazardous materials surveys. Construction management and support for excavation of 500,000 CY of soil; environmental support for demolition and relocating of an active nine-acre 100-year old rail yard. Responsible for implementing and managing remediation work at several NYSDEC spill sites within the project footprint, including *in situ* chemical oxidation, UST removal, and soil excavation. Agency support for NYSDEC, NYCDEP, NYCOER, MTA (LIRR/NYCT), and ESDC.

- Project Principal for remediation of two parcels in Queens, New York as part of NYSDEC Brownfield Cleanup Program. This project included due-diligence environmental assessment and investigation, development of NYSDEC-approved Remedial Investigation Work Plan and Remedial Action Work Plan, and remediation during construction of two mixed-use, affordable housing developments. Also required coordination with NYCHPD and NYCDEP to meet regulatory requirements for funding.

- Project Principal for remediation of a 0.66-acre parcel in Brooklyn, New York as part of NYSDEC Brownfield Cleanup Program. This project included due-diligence environmental assessment and investigation, development of NYSDEC-approved RIWP and RAWP including an active sub-slab depressurization system, and remediation during construction of a mixed-use affordable housing developments including full cellar. Also required coordination with NYCHPD and NYCDEP to meet regulatory requirements for funding.

- Project Principal for management of E-Designation during excavation and construction of a hotel/residential building in Manhattanville, including management of waste characterization and disposal of 16,000 CY of soil.

- Project Principal for redevelopment of four properties in Brooklyn, with NYCOER to address NYCDEP E-Designations. Coordination with NYCOER to implement remedial investigation and develop RAP as part of the NYC VCP.

- Senior Project Manager for the environmental management of asbestos remediation during the renovation of Nassau Coliseum, Uniondale, New York. Responsible for coordinating inspections and delineation of ACM, preparing budgetary estimates, and bid support for full abatement. Also includes management of decommissioning and replacement of existing emergency generator UST.

- Project Manager for commercial redevelopment site in the Bronx, including *in situ* waste characterization, management and coordination of excavation, community air monitoring, and development of NYCDEP-approved RAP.

- Client liaison and full-time onsite construction manager at redevelopment site in Rego Park, New York. Collection of 500 *in situ* waste characterization soil samples, oversight of 250,000 cubic yards of soil excavation and remediation, development of post-remediation sampling plan, organization of waste manifests and hazardous waste documents to ensure proper disposal. Coordination of daily site activities with multiple construction contractors and other involved parties on behalf of client. Oversight and confirmatory soil sampling for on-site treatment of 75,000 cubic yards of hazardous lead contaminated soil.

- Project and Field Manager for multiple Phase I and Phase II ESAs of retail gasoline stations in New York and New Jersey. This includes drilling and sampling oversight and health and safety management, as well as writing Phase II ESA reports for over 40 sites.

Personnel Resume

Melissa Haas
Senior Project Manager

Qualifications Summary

Ms. Haas began her career in the environmental laboratory industry in 1997. Her experience includes project management, inorganic chemistry department management, LIMS implementation, human resources and data reporting. She has a proven ability to handle multiple projects and tasks and a passion for the highest achievable level of quality and customer services.

Professional Experience

Project Manager – Eurofins TestAmerica – 2012 to Present

Ms. Haas coordinates and manages clients' projects through all phases of the laboratory operations, ensuring fulfillment of TestAmerica's commitments to client requirements and on-time delivery. She maintains communications with clients and account executives and serves as a liaison between clients and laboratory operations to meet clients' needs. She reviews contractual documents and Quality Assurance Project Plans (QAPPs) to ensure certification and laboratory analytical requirements. Ms. Haas assists clients in identifying project requirements and manages project setup on behalf of the laboratory. She also develops business relationships with clients to further enhance client service and sales. She ensures accuracy and on-time delivery of client reports.

Laboratory Information Management (LIMS) Implementer – 2011 to 2012

Inorganic Operations Manager – 2010 to 2011

Human Resources Coordinator – 2007 to 2010

Reporting Analyst – Inorganic Chemistry – 2005 to 2010

Department Manager – Classical Chemistry – 2001 to 2005

Classical Chemistry Laboratory Analyst/Data Manager – 1997 to 2001

Veterinary Technician – Mobile Veterinary Clinic, Trumbull, CT – 1994 to 1997

Campus Organizer – NJ Public Interest Research Group – 1990 to 1993

Education

- ♦ BS in Biology – Rutgers University – New Brunswick, NJ – 1990

JUDY V. HARRY
P. O. Box 208
120 Cobble Creek Rd.
North Creek, NY 12853

Occupation:	Data Validator/Environmental Technical Consultant
Years Experience:	45
Education:	B.S., Chemistry, Magna cum laude, 1976, Phi Beta Kappa
Certifications:	New York State Woman-Owned Business Enterprise (WBE)

Relevant Work History:

Data Validation Services: September 1989 - present

Sole proprietor of Data Validation Services, a woman-owned small business registered with SAM, providing consultation/validation services to regulatory and commercial clients.

These services include the review of analytical laboratory data for compliance with respect to specific protocols, accuracy and defensibility of data, verification of reported values, and evaluation of quality parameters for analytical usability of results. Approved by USEPA, NYSDEC, NJDEP, NYSERDA, and NYCDEP as a data validator for projects, including USEPA Superfund, Brownfield, and lead sites, and those contracted through the NYSDEC Division of Hazardous Waste Remediation, Division of Solid Waste, and Division of Water Quality.

Performed validation for compliance with laboratory analytical protocols including USEPA OLM, USEPA OLC, USEPA ILM, USEPA DFLM, USEPA SOW3/90, USEPA SOW 7/87 CLP, USEPA SOW 2/88 CLP, USEPA SW846, RCRA, AFCEE, NYS 6 NYCRR Part 360, 40 CFR, Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, including TO-15, 1989/1991/1995/2000/2005 NYSDEC ASPs, and 1987 NYSDEC CLP.

Performed validation according to the USEPA National and Regional SOPs and Functional Guidelines, AFCEE requirements, NYSDEC Validation Scope of Work, NYS DUSR, and NJDEP Division of Hazardous Site Mitigation/Publicly Funded Site Remediation SOPs.

Performed validation for USEPA Superfund Sites including Salem Acres, York Oil, Port Washington L-4 Landfill, Bridgeport Rental and Oil Services, GE-MRFA, MMR/ OTIS AFB, LCP, and Peter Cooper site; and for USEPA lead sites including SJ&J Piconne, Maska, Bowe System, Jones Sanitation, and Syossett Landfill, involving CLP, RAS, and SAS protocols.

Contracted for NYSDEC Superfund Standby Contracts with LMS Engineers/HDR, CDM Smith, Malcolm-Pirnie/ARCADIS, Ecology & Environment, Shaw Environmental/APTIM, CG&I, O'Brien & Gere Engineers, and EC Jordan, involving samples collected at NYS Superfund Sites and analyzed under the NYSDEC ASP.

Performed validation services for NYSDEC Phase II remedial investigations, RI/FS projects, Brownfield sites, and PRP over-site projects for hazardous waste sites.

Performed validation services for clients conducting RI/FS activities involving samples of many matrices, including waste, air, sludges, leachates, solids/sediments, aqueous, and biota.

Clients have included AECOM, ARCADIS, Barton & Loguidice, Benchmark Engineering, Bergmann Associates, Blasland, Bouck & Lee, Brown and Caldwell, CDM Smith, CB&I Shaw Environmental, C&S Consulting Engineers, Chazen Companies, Clough Harbour & Associates, Columbia Analytical Services, C.T. Male, Dames & Moore, Day Engineering, EA Engineering, EcolSciences, Ecology & Environment, Ecosystems, EC Jordan, Environmental Chemical Corporation, EHRT, ENSR Consulting, ELM, ERM-Northeast, Fagan Engineers, Fanning Phillips & Molnar, FluorDaniel GTI, Frontier, Foster Wheeler Environmental Corp, Frontier Technical, Galson Consultants, GEI, GE&R, Geomatrix Consultants, GZA Environmental, Handex of N, Hazard Evaluations, H2M Group, HDR, HRP, IT Corp, Jacques Whitford, JTM Associates, JMT, Labella Associates, Langan Engineers, Leader Environmental, Lockwood, Kessler & Bartlett, LMS Engineers, Malcolm-Pirnie, Metcalf & Eddy, NWEC&C, O'Brien & Gere Engineers, Pace, Parsons Engineering-Science, Plumley Engineering, Prescott Environmental, P. W. Grosser, Rizzo Associates, Roux Associates, Sear Brown Group, SECOR, Shaw Environmental, Stantec, ThermoRemediation Inc., TRC Environmental, Turnkey Environmental Restoration, TVGA Engineering, URS Consultants, Wehran Emcon, Weston, Wittman Geosciences, YEC, and private firms.

Provided consultation services to laboratories regarding analytical procedures and protocol interpretation, and to law firms for litigation support.

Provided services to firms involving audits of environmental analytical laboratories to determine analytical capability, particularly for compliance with NYSDEC ASP and AFCEE requirements.

Guest speaker on a panel discussing Data Review/Compliance and Usability, for an analysis workshop for the New York Association of Approved Environmental Laboratories, 1993.

Adirondack Environmental Services: June 1987 - August 1989

Senior mass spectroscopist for AES. Responsible for GC/MS analyses of environmental samples by USEPA and NYSDEC protocols, development of the GC/MS laboratory, initiating the instrumental and computer operations from the point of installation, and for implementing the procedures and methodologies for Contract Laboratory Protocol.

CompuChem Laboratories: May 1982 - January 1987

Managed a GC/MS production laboratory; developed, implemented, and supervised QA/QC criteria at three different levels of review; and was responsible for the development and production of the analysis of environmental and clinical samples. Directed a staff of 23 technical and clerical personnel, and managed the extraction and GC/MS labs and data review operations.

Research Triangle Institute (RTI): December 1979 - May 1982

Worked as an analytical research chemist responsible for development of analytical methods for the EPA Federal Register at RTI. This involved analysis of biological and environmental samples for priority pollutants, primarily relating to wastewaters and to human sampling studies. Method development included modification and interfacing of the initially developed Tekmar volatile purge apparatus to GC/MS, development and refinement of methods for entrapment and concentration of the air medium for subsequent volatile analysis, and the analysis and resolution/ identification of individual PCB congeners within Aroclor mixtures by capillary column and mass spectra.

Guardsman Chemical Company: February 1977 - November 1979

Performed all quality control functions for the manufacturing plant. Performed research and development on coatings and dyes.

Almay Cosmetics: May 1976 - December 1976

Product evaluation chemist. Responsible for analytical QC of manufactured products.

Publication

Pellizzzari, E.D., Moseley, M.A., Cooper, S.D., Harry, J.V., Demian, B., & Mullin, M. D. (1985). Recent Advances in the Analysis of Polychlorinated Biphenyls in Environmental and Biological Media. *Journal of Chromatography*, 334(3) 277-314.

ATTACHMENT 2

NYSDEC June 2021 PFAS Guidance

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

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

Under NYSDEC's Part 375 Remedial Programs

June 2021

www.dec.ny.gov

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June 2021

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

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
Water Sample Results Page 9	"In addition, further assessment of water may be warranted if either of the following screening levels are met: a. any other individual PFAS (not PFOA or PFOS) is detected in water at or above 100 ng/L; or b. total concentration of PFAS (including PFOA and PFOS) is detected in water at or above 500 ng/L"	Deleted	6/15/2021

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

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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.

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

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[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.

page ______ of ______

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.

ATTACHMENT 3

Laboratory Standard Operating Procedures and Certifications

Title: Per- and Poly-fluorinated Substances (PFAS) in Water, Soils, Sediments and Tissue

[Method 537 (Modified), PFAS by LCMSMS]

Approvals (Signature/Date):

09/28/2020
Don Dawicki — Date
Laboratory Director

09/28/2020
Ryan Hammond — Date
Operations Manager / EHS Coordinator

09/28/2020
Kristine Dusablon — Date
Quality Assurance Manager / Technical Manager

09/28/2020
Mark Fausel — Date
Department Supervisor

DRAFT

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Facility Distribution No. Electronic **Distributed To: Facility Intranet**

1.0 Scope and Application

This SOP describes the laboratory procedure for the preparation and analysis of per- and polyfluorinated substances using liquid chromatography/tandem mass spectrometry (LC/MS/MS).

Program specific requirements are not included in this SOP. The details of program specific requirements are specified in other laboratory work instructions relevant to the program.

1.1 Analytes, Matrices, and Reporting Limits

This procedure is amenable with water, soil, sediment and tissue sample matrices.
The list of target compounds that may be determined from this procedure is provided below. Table 1 presents the compounds along with their associated reporting limits (RL).

Compound Name	Abbreviation	CAS #
Perfluoroalkylcarboxylic acids (PFCAs)		
Perfluoro-n-butanoic acid (Perfluoro-n-butyric acid)	PFBA	375-22-4
Perfluoro-n-pentanoic acid	PFPeA	2706-90-3
Perfluoro-n-hexanoic acid	PFHxA	307-24-4
Perfluoro-n-heptanoic acid	PFHpA	375-85-9
Perfluoro-n-octanoic acid	PFOA	335-67-1
Perfluoro-n-nonanoic acid	PFNA	375-95-1
Perfluoro-n-decanoic acid	PFDA	335-76-2
Perfluoro-n-undecanoic acid	PFUdA (PFUnA)	2058-94-8
Perfluoro-n-dodecanoic acid	PFDoA	307-55-1
Perfluoro-n-tridecanoic acid	PFTrDA	72629-94-8
Perfluoro-n-tetradecanoic acid	PFTeDA (PFTA)	376-06-7
Perfluoro-n-hexadecanoic acid	PFHxDA	67905-19-5
Perfluoro-n-octadecanoic acid	PFODA	16517-11-6
Perfluorinated sulfonic acids (PFSAs)		
Perfluoro-1-butanesulfonic acid	PFBS	375-73-5
* Perfluoro-1-pentanesulfonic acid	PFPeS	2706-91-4
Perfluoro-1-hexanesulfonic acid	PFHxS	355-46-4
Perfluoro-1-heptanesulfonic acid	PFHpS	375-92-8
Perfluoro-1-octanesulfonic acid	PFOS	1763-23-1
* Perfluoro-1-nonanesulfonic acid	PFNS	68259-12-1
Perfluoro-1-decanesulfonic acid	PFDS	335-77-3
Perfluorododecanesulfonic acid	PFDoS	79780-39-5
Perfluorinated sulfonamides (FOSA)		
Perfluoro-1-octanesulfonamide	FOSA	754-91-6
Perfluorinated sulfonamidoacetic acids (FOSAA)		
N-ethylperfluoro-1-octanesulfonamidoacetic acid	EtFOSAA	2991-50-6
N-methylperfluoro-1-octanesulfonamidoacetic acid	MeFOSAA	2355-31-9
Fluorotelomer sulfonates (FTS)		
* 1H,1H,2H,2H-perfluorohexanesulfonic acid *(4:2)*	4:2 FTS	757124-72-4
1H,1H,2H,2H-perfluorooctanesulfonic acid *(6:2)*	6:2 FTS	27619-97-2

1H,1H,2H,2H-perfluorodecanesulfonic acid *(8:2)*	8:2 FTS	39108-34-4
1H,1H,2H,2H-perfluorododecane sulfonic acid (10:2)	10:2 FTS	120226-60-0
Fluorinated Replacement Chemicals		
Hexafluoropropylene oxide dimer acid	HFPO-DA	13252-13-6
4,8-dioxa-3H-perfluorononanoic acid	DONA	919005-14-4
9-chlorohexadecafluoro-3-oxanonane-1-sulfonic acid	F53B Major (9Cl-PF3ONS)	756426-58-1
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid	F53B Minor (11Cl-PF3OUdS)	763051-58-1

Abbreviations in parenthesis are the abbreviations listed in Method 537, where they differ from the abbreviation used by the laboratory's LIMS.
***Indicates the analyte is not certified in any state or program.**
Note: Analytes with secondary certification in NJDEP can be found in Appendix D and samples collected in New Jersey are only approved for non-potable water.

The working range of the method is listed below. The linear range can be extended by diluting the extracts.

Matrix	Nominal Sample Size	Reporting Limit	Working Range
Water	250 mL	2.0 ng/L - 5 ng/L	2.0 ng/L - 400 ng/L
Soil/Sediment	5 g	0.2 µg/Kg–0.5 µg/Kg	0.2 µg/Kg-40 µgKg
Tissue	1 g	1.0 µg/Kg–10 µg/Kg	1.0 µg/Kg–200 µg/Kg

On occasion clients may request modifications to this SOP. These modifications are handled following the procedures outlined in the Quality Assurance Manual.

2.0 Summary of Method

Water Samples: Water samples are extracted using a solid phase extraction (SPE) cartridge. PFAS are eluted from the cartridge with an [redacted] solution.

Soil/sediment/tissue samples are extracted with a [redacted] solution using a TCLP tumbler operating at [redacted]. The mixture is centrifuged to reduce the amount of solid transferred when decanting the solvent. The solvent extract is exchanged to water using nitrogen blowdown, then the aqueous extract is extracted using a solid phase extraction (SPE) cartridge. PFAS are eluted from the cartridge with an ammonium hydroxide/methanol solution.

The final [redacted] extracts are analyzed by LC/MS/MS operated in electrospray (ESI) negative ion mode. PFAS are separated from other components on a C18 column with a solvent gradient program [redacted] and methanol.

An isotope dilution technique is employed with this method for the compounds of interest. The isotope dilution analytes (IDAs) consist of carbon-13 labeled analogs, oxygen-18 labeled analogs, or deuterated analogs of the compound of interest, and they are spiked into the samples at the time of extraction. This technique allows for the correction for analytical bias encountered when analyzing more chemically complex environmental samples. The isotopically labeled compounds are chemically similar to the compounds of concern and are therefore affected by sample-related interferences to the same extent as the compounds of concern. Compounds that do not have an identically labeled analog are quantified by the IDA method using a closely related labeled analog.

Quantitation by the internal standard method is employed for the IDA analytes/recoveries. Peak response is measured as the area of the peak.

This SOP is based on the following reference methods:

- US EPA, “Method 537 - Determination of Selected Perfluorinated alkyl acids in Drinking Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometery (LC/MS/MS)”, Version 1.1, September 2009.
- Method ISO 25101, “Water quality – Determination of perfluorooctanesulfonate (PFOS) and perfluorooctanoate (PFOA) – Method for unfiltered samples using solid phase extraction and liquid chromatography/mass spectrometry”, First Edition, 2009-03-01, International Organization for Standardization, Technical Committee ISO/TC 147, Water Quality, Subcommittee SC 2, Physical, chemical and biochemical methods.

If the laboratory’s SOP is modified from the reference method, a list of method modifications along with technical justification may be found in Section 16. Modifications to this SOP may be applied on a project specific basis to meet project data quality objectives. Project specific modifications are documented in the project record.

3.0 Definitions

Refer to the Laboratory’s Quality Assurance Manual (QAM) for the Glossary of Terms, Definitions and Acronyms except as follows.

Definitions of terms used in this SOP may be found in Appendix A.

4.0 Interferences

PFAS have been used in a wide variety of manufacturing processes, and laboratory supplies should be considered potentially contaminated until they have been tested and shown to be otherwise. The materials and supplies used during the method validation process have been tested and shown to be clean. These items are listed below in Section 6.

To avoid contamination of samples, standards are prepared in a ventilation hood in an area separate from where samples are extracted.

PTFE products can be a source of PFOA contamination. The use of PTFE in the procedure should be avoided or at least thoroughly tested before use. Polypropylene (PP) or polyethylene (PE, HDPE) products may be used in place of PTFE products to minimize PFOA contamination.

Standards and samples are injected from polypropylene autosampler vials with polyethylene screw caps once. Multiple injections may be performed on Primers when conditioning the instrument for analysis.

Random evaporation losses have been observed with the polyethylene caps causing high IDA recovery after the vial was punctured and sample re-injected. For this reason, it is best to inject standards and samples once in the analytical sequence.

Teflon-lined screw caps have detected PFAS at low concentrations. Repeated injection from the same Teflon-lined screw cap have detected PFNA at increasing concentration as each repeated injection was performed, therefore, it is best to use polyethylene screw caps.

Volumetric glassware and syringes are difficult to clean after being used for solutions containing high levels of PFAS. These items should be labeled for use only with similarly concentrated solutions or verified clean prior to re-use. To the extent possible, disposable labware is used.

Both branched and linear isomers of PFOS, PFOA, PFHxS, PFBS, EtFOSAA and MeFOSAA can potentially be found in the environment, based upon scientific literature. If multiple isomers are present for one of these PFAS, these adjacent peaks are either completely resolved or not resolved but with a profound deflection that can be resolved during peak integration. The later of the peaks matches the retention time of the single labeled PFAS peak. In general, earlier peaks are branched isomers and are not a result of peak splitting, and all the chromatographic peaks observed in the standard and/or sample must be integrated and the areas included.

When reference standards of technical mixtures of specific PFAS area available, they should be used to ensure that all appropriate peaks are included during peak integration (at this time, only PFOS, PFOA, PFHxS, EtFOSAA and MeFOSAA are available as technical mixtures). Refer to Section 7, Reagents, for the available technical mixtures utilized by this SOP.

In an attempt to reduce PFOS bias, it is required that m/z 449>80 transition be used as the quantitation transition.

Per the Certificate of Analysis for labeled perfluorohexadecanoic acid (13C2-PFHxDA) produced by Wellington Laboratories, the stock standard contains roughly 0.3% of native perfluorohexadecanoic acid. The laboratory utilizes a weighted linear regression that is not forced through the origin for the calibration of native perfluorohexadecanoic acid to account for this contribution from its labeled IDA.

5.0 Safety

Employees must abide by the policies and procedures in the NDSC Eurofins TestAmerica Laboratories Environmental Health and Safety Manual (CW-E-M-001), and this document. This procedure may involve hazardous material, operations and equipment. This SOP does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of the method to follow appropriate safety, waste disposal and health practices under the assumption that all samples and reagents are potentially hazardous. Safety glasses, gloves, lab coats and closed-toe, nonabsorbent shoes are a minimum.

5.1 Specific Safety Concerns or Requirements

Preliminary toxicity studies indicate that PFAS could have significant toxic effects. In the interest of keeping exposure levels as low as reasonably achievable, PFAS must be handled in the laboratory as hazardous and toxic chemicals.

Exercise caution when using syringes with attached filter disc assemblies. Application of excessive force has, upon occasion, caused a filter disc to burst during the process.

Laboratory procedures such as the use of pipets and transferring of extracts represent a significant potential for repetitive motion or other ergonomic injuries. Laboratory associates performing these procedures are in the best position to realize when they are at risk for these types of injuries. Whenever a situation is found in which an employee is performing the same repetitive motion, the employee shall immediately bring this to the attention of their supervisor, manager or the EH&S staff. The task will be analyzed to determine a better means of accomplishing it.

Eye protection that satisfies ANSI Z87.1 (as per the Eurofins TestAmerica Corporate Safety Manual), a laboratory coat and nitrile gloves must be worn while handling samples, standards, solvents and reagents. Disposable gloves that have been contaminated will be removed and discarded; other gloves will be cleaned immediately.

Perfluorocarboxylic acids are acids and are not compatible with strong bases.

The use of vacuum systems presents the risk of imploding glassware. All glassware used during vacuum operations must be thoroughly inspected prior to each use. Glass that is chipped, scratched, cracked, rubbed or marred in any manner must not be used under vacuum. It must be removed from service and replaced.

The HPLC and MS/MS have areas of high voltage. Depending on the type of work involved, the instrument should be turned off or disconnected from its source of power prior to extensive maintenance.

5.2 Primary Materials Used

Table 2 lists those materials used in this procedure that have a serious or significant hazard rating along with the exposure limits and primary hazards associated with that material as identified in the SDS. **NOTE: This list does not include all materials used in the method.** A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the SDS for each material before using it for the first time or when there are major changes to the SDS.

6.0 Equipment and Supplies

Catalog numbers listed in this SOP are subject to change at the discretion of the vendor. Analysts are cautioned to be sure equipment used meets the specification of this SOP.

6.1 Miscellaneous

- 15 mL polypropylene test tubes with screw caps, Fisherbrand 05-539-5 or equivalent.
- 250-mL HDPE wide-mouth bottles with screw caps (ESS 0250-1901-).
- Analytical balance capable of weighing to the nearest 0.01g, and checked for accuracy each day it is used in accordance with BR-GT-008.
- SPE Vacuum manifold, 24-port, [redacted] or equivalent.
- 1/8” OD Poly siphon lines, 30” long for sample loading.
- SPE Adaptor Caps for 1, 3, and 6 mL SPE Tubes, Polyethylene, [redacted] or equivalent.
- SPE Stopcocks, Polyethylene and Polypropylene, [redacted] or equivalent.
- Stainless steel solvent guide needles, [redacted], or equivalent.
- Heavy-Wall filter flask, Fisherbrand 4000mL, [redacted] or equivalent.
- TCLP tumbler, [redacted] for extraction of soil, sediment and tissue samples.
- Glass-Col ZipVap 24-port extract concentrator.

- Polypropylene Syringe, 10 mL with luer-lok or luer slip tips, [redacted] or equivalent.
- Volumetric Syringes, Class “A” (25µL, 50µL 100µL, and 500µL), Hamilton or equivalent.
- Automatic Pipettor, Finnpette, 1-5mL.
- Polypropylene autosampler vials, 300µL, 700µL and 2mL with polyethylene screw caps.
- Waters Oasis [redacted] or equivalent, for the extraction of PFAS from aqueous samples.
- Waters Oasis [redacted] or equivalent, for the cleanup of soils.
- 250mL Poly bottles containing 1.25g of Trizma Pre-Set Crystals, used for batch QC for samples received with Trizma preservation.
- 50mL graduated polypropylene centrifuge tubes. [redacted] or equivalent.
- 500ml Polyethylene wash bottle
- 4, 6, and 12ml Class A Volumetric Pipette
- Graphitized carbon (Envi-Carb^{TM} or equivalent)
- Miscellaneous laboratory apparatus (beakers, test tubes, volumetric flasks, pipettes, etc). These should be disposable wherever possible, or marked and segregated for high-level versus low-level use.

6.2 Analytical System

Liquid Chromatography/Tandem Mass Spectrometer (LC/MS/MS)-as described below. The use of a column heater is required to maintain a stable temperature throughout the analytical run. Data is processed using Chrom Peak Review, version 2.1 or equivalent.

- SCIEX LC/MS/MS

  This system consists of a [redacted] HPLC interfaced with a [redacted] The instrument control and data acquisition software is [redacted] equivalent.

  [redacted] HPLC equipped with [redacted] and one [redacted] or equivalent. [redacted] Column Oven.

  [redacted] or equivalent.

  PFAS Isolator column. [redacted]. These are plumbed between the pump’s mixing valve and the autosampler to minimized the HPLC-based PFAS background from injection-based PFAS.

7.0 Reagents and Standards

7.1 Reagents

All reagents must follow traceability guidelines found in SOP BR-QA-002.

- Ammonium acetate Stock Solution, [redacted]
- [redacted] ammonium acetate eluent.. [redacted]

- Ammonium hydroxide, concentrated, JT Baker or equivalent.
- Ammonium hydroxide (NH_4OH) [redacted] of Methanol. Volume prepared may be adjusted based on usage/need.
- Potassium hydroxide pellets, 87% purity, JT Baker P250-1 or equivalent.
- Potassium hydroxide (KOH), [redacted]
- Reagent Water, house reverse-osmosis reagent water (“PFAS-Free” via in-house testing).
- Hexane, Ultra-Resi Analyzed, JT Baker or equivalent.
- Methanol, HPLC JT Baker or equivalent.
- Sodium hydroxide, pellets, JT Baker or equivalent.
- Sodium hydroxide (NaOH), [redacted]
- Acetonitrile, Optima Grade, Fisherbrand or equivalent.

7.2 Standards

Purchase high purity, technical grade solids (96% or greater) or certified solutions from commercial vendors. Standard materials are verified compared to a second source material at the time of initial calibration. The solid stock material is stored at room temperature or as specified by the manufacturer or vendor. If solid material is used for preparing a standard, stock standard solutions are prepared from the solids and are stored at 4 ± 2°C. Stock standard solutions should be brought to room temperature before using. Standards are monitored for signs of degradation or evaporation. Standard solutions must be replaced at least annually from the date of preparation.

Per the Certificate of Analysis for labeled perfluorohexadecanoic acid (13C2-PFHxDA) produced by Wellington Laboratories, the stock standard contains ~0.3% of native PFHxDA. This equates to roughly 0.30 ng/L or 0.015 ug/Kg of PFHxDA expected in all samples and blanks.

As of this writing, only PFOS, PFOA, PFHxS, MeFOSAA and EtFOSAA are commercially available as technical mixtures. These reference standards of the technical mixtures for these specific PFAS are used to ensure that all appropriate peaks are included during peak integration.

PFBS, PFHxS, PFHpS, PFOS, PFDS, and many other PFAS are not available in the acid form, but rather as their corresponding salts, such as sodium or potassium. The standards are prepared and corrected for their salt content according to the equation below.

$$\text{Mass}_{acid} = \text{Measured Mass}_{salt} \times \text{MW}_{acid} / \text{MW}_{salt}$$

Where: MW_{acid} is the molecular weight of PFAA

MW_{salt} is the molecular weight of the purchased salt.

For example, the molecular weight of PFOS is 500.1295 and the molecular weight of NaPFOS is 523.1193. Therefore, the amount of NaPFOS used must be multiplied by a factor of 0.956 to account for the amount of PFOS in the final solution.

While PFAS standards commercially purchased are supplied in glass ampoules, all subsequent transfers or dilutions performed by the analyst must be prepared and stored in polypropylene or HDPE containers.

Prepare calibration and working standards by diluting a known volume of stock standard in an appropriate solvent to the final volume needed to achieve the desired concentration. The recommended formulation for each standard used in this procedure is provided in Appendix B along with the recommended source materials, expiration dates and storage conditions.

A technical (qualitative) grade PFOA standard is analyzed initially, then after initial calibration when a new column is installed or when significant changes are made to the HPLC parameters. This solution is used as a reference for the PFOA isomers (branched and linear) retention times.

A second source solution for PFAS is purchased from the same vendor; the PFC-MXB contains most of the target analytes in this mixture and is used as an ICV. For those compounds not available in this mixture or are not available from another vendor, a second analyst may prepare a second source standard from the same source as the ICAL to produce an ICV. The recommended concentration of the ICV standard should be in the mid-range of the calibration curve. The concentration may be adjusted if the initial calibration levels are changed or altered. The IDA and ISTD are added at a fixed concentration (2.5 ng/mL in extract).

7.3 Extraction Spiking Solutions

PFAS LCS/Matrix Spike Solution, 400 ng/mL

The PFAS spike solution is prepared by diluting all PFAS to produce a solution containing each PFAS at a concentration of 400 ng/mL in methanol.

PFAS High Level LCS Solution, 1000 ng/mL

The PFAS spike solution is prepared by diluting all PFAS to produce a solution containing each PFAS at a concentration of 1000 ng/mL in methanol.

PFAS Isotope Dilution Analyte Solution, 500 ng/mL

The PFAS-IDA solution is prepared by diluting all labeled PFAS to produce a solution containing each IDA compound at a concentration of 1000 ng/mL in methanol.

Internal Standard Solution, $^{13}C_2$-PFOA, 1250 ng/mL

The internal standard solution is prepared by diluting the stock 50 µg/mL $^{13}C_2$-PFOA 20-fold in methanol.

See Appendix B for analyte lists and concentrations.

8.0 Sample Collection, Preservation, Shipment and Storage

The laboratory does not perform sample collection so these procedures are not included in this SOP, sampling requirements may be found in the published reference method.

Sample container, preservation techniques and holding times may vary and are dependent on sample matrix, method of choice, regulatory compliance, and/or specific contract or client requests. Listed below are the holding times and the references that include preservation requirements.

Matrix	Sample Container	Minimum Sample Size	Preservation	Holding Time[1]	Reference
Water	250 mL HDPE Bottle	250 mL	0-6°C, Trizma (5g/L) (if from a known	14 days from collection	Method 537

			chlorinated source)		
Soil/Sediment	4/8 oz HDPE wide-mouth container	100 g	0-6°C	14 days from collection	SW-846 Organic Methods
Extract	700 µL Polypropylene (PP) Vial with HDPE Screw cap	NA	0-6°C	40 days from extraction (28 days from extraction for samples collected in NJ)	NJDEP guidance

[1] *Extraction holding time is calculated from date of collection. Analytical holding time is determined from date of extraction.*

Unless otherwise specified by client or regulatory program, after analysis, samples and extracts are retained for a minimum of 30 days after provision of the project report and then disposed of in accordance with applicable regulations.

9.0 Quality Control

Sample QC

When samples contain the preservative Trizma, all associated QC must be treated with the same preservative.

Initial Demonstration of Capability (IDOC) and Method Detection Limit (MDL) studies described in Section 12 must be acceptable before analysis of samples may begin.

Batches are defined at the sample preparation step. Batches should be kept together through the whole analytical process as far as possible, but it is not mandatory to analyze prepared extracts on the same instrument or in the same sequence.

The laboratory prepares the following sample QC for each extraction batch (an extraction batch is limited to a maximum of 20 field samples of the same matrix processed using the same procedure and reagents within the same time period):

QC Item	Frequency	Acceptance Criteria
Method Blank (MB)	1 per extraction batch	See Table 3
Laboratory Control Sample (LCS)	1 per extraction batch (Spiking Level rotates between Low, Medium and High on a batch-by-batch basis)	See Table 3
LCS Duplicate (LCSD)	1 per extraction batch whenever insufficient sample is available for an MS/MSD/DU	See Table 3
*Matrix Spike (MS/MSD)	1 per extraction batch (if sufficient sample is available)	See Table 3
*Sample Duplicate (SD)	DW-1 per extraction batch (if sufficient sample is available); Non-DW matrices- client request	See Table 3

	if sufficient sample is available	
Field Reagent Blank, FRB	Per client set of samples	See Table 3

*An NCM must be applied if there is insufficient volume for a MS/MSD or duplicate.

Instrument QC

The following instrument QC is performed:

QC Item	Frequency	Acceptance Criteria
Initial Calibration (ICAL)	Initially, when CCV fails and after major instrument maintenance	See Table 3
Initial Calibration Blank (ICB)	Immediately after ICAL	See Table 3
Second Source Verification (ICV)	Immediately after ICB	See Table 3
Continuing Calibration Verification (CCV)	Beginning, end and after every 10 field samples. Alternate between ICAL Levels 4 and 5 (in order) throughout sequence	See Table 3
Continuing Calibration Verification Low (CCVL)	Immediately prior to Level 4 CCV at beginning of every non-ICAL analytical sequence	See Table 3
Isotope Dilution Analytes (IDA)	Added to Every injection (Standards, QC and Field Samples) at the same concentration	See Table 3

10.0 Procedure

One-time procedural variations are allowed only if deemed necessary in the professional judgment of a supervisor to accommodate variation in sample matrix, chemistry, sample size, or other parameters. Any variation in procedure shall be completely documented using a Non-Conformance Memo (NCM). The NCM process is described in more detail in SOP BR-QA-016. The NCM shall be filed in the project file and addressed in the case narrative. ***Any deviations from this procedure identified after the work has been completed must be documented in an NCM, with a cause and corrective action described.***

10.1 Water Sample Preparation

Visually inspect samples for the presence of settled and/or suspended sediment. If the amount of sediment is so great that the SPE cartridge will clog before the majority of the sample has eluted, filter the water sample through a glass fiber filter [redacted] or equivalent). Gravity or vacuum can be used to pass the sample through the filter. Prepare a filtration blank and LCS with any samples requiring filtration. File an NCM noting the need for filtration.

> Warning: The use of a vacuum system creates the risk of glassware implosion. Inspect all glassware prior to use. Glassware with chips, scratches, rub marks or cracks must not be used.

Due to the high surface activity of the analytes, filtration should be regarded as a last resort. All samples will be spiked with IDA prior to filtration (if enough sample is available, perform an MS on each sample); this will allow any losses caused by filtration to be monitored and corrected for.

NOTE: for samples which full volume extraction is not possible, care MUST be taken to ensure the actual sample volume that is both spiked and extracted are documented in the sample worksheet notes.

Prepare two 250 mL aliquots of HPLC-grade water for the method blank and LCS.

Rotate the LCS concentration with each batch.

-Low Level LCS (50-150 %R), spike with 0.50 mL of PFAS LOQV solution. This will result in sample concentrations at the method Reporting Limit.

-Medium Level LCS (70-130 %R), spike with 0.025 mL (25 µL) of the PFAS LCS/Matrix Spike solution (Section 7.2). This will result in a sample concentration of 40 ng/L.

-High level LCS (70-130 %R), spike at 0.05mL (50uL) of the PFAS High Level LCS Spike solution (Section 7.2). This will result in a sample concentration of 200 ng/L.

Spike the MS/MSD (if available volume) with 0.025 mL (25 µL) of the PFAS LCS/Matrix Spike solution (Section 7.2). This will result in a sample concentration of 40 ng/L. NCM if there is insufficient volume to perform the MS/MSD.

Add [redacted] of the PFAS-IDA solution (Section 7.2) into each sample and QC sample, for a fixed concentration of 1.25 ng/mL in extract.

Due to the surface active nature of the PFAS analytes, it is necessary to extract the entire sample as well as the container walls to maximize recovery. It is therefore ideal to receive full 250 mL HDPE bottles for each sample (and MS/MSD if sufficient volume is received) so the entire sample can be processed from that container.

Weigh each container to determine its pre-extraction mass (Gross Weight). Spike each container in the batch with PFAS-IDA solution. Spike the LCS and LCSD (or MS/MSD, if available volume) with PFAS LCS/Matrix solution. Shake to mix the contents. After the extraction has been completed, allow the container to completely dry (uncapped). Replace the cap and reweigh the container to determine the container mass (Tare Weight). The sample volume extracted can be determined by subtracting the Tare Weight from the Gross Weight. These calculations are captured in the PFAS water sample prep module (TALS Method 3535_IVWT and 25101_2009_SPE).

10.1.1 Solid Phase Extraction (SPE) of Aqueous Samples

Condition the SPE cartridges [redacted] by passing the following without drying the column.

WARNING: The use of a vacuum system creates the risk of glassware implosion. Inspect all glassware prior to use. Glassware with chips, scratches, rub marks or cracks must not be used.

Wash with 5.0 mL of [redacted]

Wash with 5.0 mL of [redacted] Close valve when ~ 1 mL remains on top to keep column wet. After this step, the columns should not go dry until the completion of loading and rinsing samples.

Appropriately label the SPE cartridges.

Add a poly siphon line to an adapter which has been firmly inserted into the SPE cartridge and place the other end of the line into the corresponding sample container.

Turn on the vacuum and pull the entire sample volume (minimum of 250 mL) through the cartridge at rate of approximately [redacted]

Stop the sample elution when ~0.1 mL remains. Add ~5 mL of water to the SPE column and restart the elution to complete the loading process. The added water volume ensures there are no small sample droplets remaining that may be clinging to the wall of the SPE cartridge.

After the sample and water rinse has passed through the cartridge, allow the cartridge to completely dry with vacuum (this could take up to 90 minutes). The cartridge should return to a uniform color. NOTE: Remove and replace each cartridge during the drying process to ensure any water droplets that may be in the flow path are eliminated.

10.1.2 SPE Column Wash of Aqueous Samples with Hexane

Add [redacted] to each SPE column and let the column become fully saturated with solvent. Close the stopcock and allow the column to soak for five minutes, then elute to waste.

Load a second [redacted] and elute to waste (without a soaking period).

Allow the column to dry with vacuum for 5 to 10 minutes. Columns must be dried thoroughly before continuing. The cartridge should return to a uniform color. Wipe any remaining water droplets from the bottom of the stainless steel guide needles using a fresh Kimwipe for each needle prior to proceeding to the next step.

10.1.3 SPE Elution of Aqueous Samples

Note: The use of glass should be avoided where able. However, disposable glass pipettes have a much narrower opening, which is necessary to reduce spillage during the following transfer steps.

Place labeled 15 mL polypropylene test tubes containing [redacted] of Reagent Water as receiving tubes in the SPE manifold.

Rinse the dried sample bottles with [redacted] and transfer to the corresponding SPE cartridge using a disposable glass pipet (NOTE: the sample container has molded ridges in the neck that can trap up to 0.5mL of the solvent rinsate; make sure to tip the container slightly to draw the rinsate out of the ridges). Allow the solution to soak the cartridge for 5 minutes and then elute into the 15 mL collection tube.

Repeat the sample bottle rinse to cartridge elution process with a [redacted] (without the soaking period). The total collection should be approximately 10 mL. Adjust to 10 mL with methanol.

10.1.4 Sample Cleanup with Graphitized Carbon (Optional)

Note: If this step is to be performed, do not add the [redacted] to the receiving tubes prior to extract collection. Add [redacted] of graphitized carbon to each sample extract and QC extracts to aid in the removal of organic interferences. Shake vigorously and then let sit for 10 minutes. Centrifuge each sample for 2 minutes at 1000 rpm. Decant the solvent layer into a new 15mL centrifuge tube containing 2 mL of Reagent Water and swirl to mix. Adjust the volume to 10 mL with methanol.

10.1.5 Internal Standard Addition

Add [redacted] internal standard to each extract and vortex to mix well.

Transfer a portion of the extract to a labeled 300µL polypropylene autosampler vial (6 drops or approximately 60µL). Archive the rest of the extract in the event the sample needs re-injection and/or dilution.

Seal the vials with polyethylene screw caps. Note: Teflon lined caps may not be used due to detection of low level concentration of PFAS.

10.2 Soil Sample Preparation

Visually inspect soil samples for homogeneity. Weigh a representative 5 g aliquot of soil, sediment or 1 g of tissue sample into a 50 mL centrifuge tube. Weigh additional sample amounts for the matrix spike and matrix spike duplicate analyses if they are requested and enough sample mass is available. Weigh 5 g aliquots of Ottawa sand or 0.1 g of oil for the MB and LCS samples.

Spike the LCS and MS/MSD (if requested) with 25 µL LCS/Matrix Spike Solution. This will result in a sample concentration of 2.0 ng/g (1.0 ng/mL ext).

Add [redacted] of IDA PFC Spiking Solution into each sample and QC sample, for a fixed concentration of 1.25 ng/mL in the final sample vial.

Cap the sample tubes and allow the spikes to settle into the sample matrix. Gently shake the bottles to mix the spike into the matrix.

Add [redacted] to each sample. Cap each sample and shake lightly to confirm container is sealed.

Place all samples in the prep batch into the TCLP tumbler and tumble for 3 hours.

After removing the samples from the tumbler, gently shake each container to confirm the solid material has settled to the bottom of the centrifuge tube, then place in a sonic bath for 12 hours.

Centrifuge each sample at 3500 rpm for 15 minutes.

Transfer the supernate (solvent) to a second, labeled 50 mL centrifuge tube containing 2 mL of Reagent Water.

Slowly add [redacted] to original 50 mL extraction tube. Pour the 2 mL of solvent rinse into the second labeled tube to complete the quantitative transfer.

Place extracts in the ZipVap set to 60 C for ~3 hours with nitrogen flow just strong enough to gently ripple the surface of the extracts. The concentration step is complete when the final volume either gets below 2 mL or maintains at the same level after consecutive checks a 5 minute intervals (this may be due to sample-based moisture contributing to the amount of water in the extract). Remove the sample from the ZipVap when the concentration has completed and allow the extracts to cool.

Adjust the volume of each sample's extract to 15 mL with Reagent Water and add 75 uL of Glacial Acetic Acid to neutralize the solution to pH 6-8. If the extracts contain suspended solids, centrifuge them at 3500 rpm for 15 minutes.

10.2.1 Solid Extract Cleanup by SPE

Condition the SPE cartridges [redacted] by passing the following without drying the column.

Wash with [redacted] with [redacted] Wash with a second [redacted] followed by a second [redacted] Close valve when ~ 0.5 mL remains on top to keep column wet. After this step, the columns should not go dry until the completion of loading and rinsing samples.

Appropriately label the SPE cartridges.

Pour each aqueous sample extract into its corresponding SPE cartridge until it is filled. Turn on the vacuum and open the stopcock to load the sample onto the cartridge. Add the remaining extract to the cartridge before it goes dry and stop the flow just before all of the sample has been drawn into the media. [redacted] 50 mL centrifuge tube to rinse the tube and complete the quantitative transfer. Pour this rinse into the SPE cartridge and open the stopcock to load the rest of the rinsate onto the cartridge. The added water volume ensures there are no small sample droplets remaining that may be clinging to the wall of the SPE cartridge. Set the centrifuge tubes aside and allow them to completely dry.

After the sample and water rinse has passed through the cartridge, allow the cartridge to completely dry with vacuum (this could take up to 30 minutes). The cartridge should return to a uniform color. NOTE: Remove and replace each cartridge during the drying process to ensure any water droplets that may be in the flow path are eliminated.

10.2.2 SPE Column Wash of Solid Extracts with Hexane

Add [redacted] of hexane to each SPE column and let the column become fully saturated with solvent. Close the stopcock and allow the column to soak for five minutes, then elute to waste.

Load a second [redacted] of hexane and elute to waste (without a soaking period).

Allow the column to dry with vacuum for 5 to 10 minutes. Columns must be dried thoroughly before continuing. The cartridge should return to a uniform color. Wipe any remaining water droplets from the bottom of the stainless steel guide needles using a fresh Kimwipe for each needle prior to proceeding to the next step.

10.2.3 SPE Elution of Solid Extracts

Place labeled 15 mL polypropylene test tubes containing [redacted] as receiving tubes in the SPE manifold.

Rinse the dried sample tubes [redacted] and transfer to the corresponding SPE cartridge. Allow the solution to soak the cartridge for 5 minutes and then elute into the 15 mL collection tube.

Repeat sample bottle rinse to cartridge elution process with [redacted] (without the soaking period) The total collection should be approximately 10 mL. Adjust to 10 mL with methanol.

10.2.4 Sample Cleanup with Graphitized Carbon (Optional)

Note: If this step is to be performed, do not add the [redacted] to the receiving tubes prior to extract collection. Add [redacted] of graphitized carbon to each sample extract and QC extracts to aid in the removal of organic interferences. Shake vigorously and then let sit for 10 minutes. Centrifuge each sample for 2 minutes at 1000 rpm. Decant the solvent layer into a new 15mL centrifuge tube containing 2 mL of Reagent Water and swirl to mix. Adjust the volume to 10 mL with methanol.

10.2.5 Internal Standard Addition

Add [redacted] internal standard to each extract and vortex to mix well.

Transfer a portion of the extract to a labeled 300µL polypropylene autosampler vial (6 drops or approximately 60µL). Archive the rest of the extract in the event the sample needs re-injection and/or dilution.

Seal the vials with polyethylene screw caps. Note: Teflon lined caps may not be used due to detection of low level concentration of PFAS.

10.3 Instrument Operating Conditions

Suggested operating conditions are listed below for the [redacted] LCMS system:

Recommended Instrument Operating Conditions					
HPLC Conditions (Shimadzu HPLC)					
Column (Column temp = 45°C)	Phenomenex Gemini C18 3um, 3.0mm x 100mm				
Mobile Phase Composition	A=20mM Ammonium Acetate (90/10 water/methanol) B=Methanol				
Gradient Program	**Time**	**%A**	**%B**	**Curve**	**Flow Rate mL/min.**
	[redacted]	[redacted]	[redacted]	6	0.60
	[redacted]	[redacted]	[redacted]	6	0.60
	[redacted]	[redacted]	[redacted]	6	0.60
	[redacted]	[redacted]	[redacted]	6	0.60
	[redacted]	[redacted]	[redacted]	6	0.60
	[redacted]	[redacted]	[redacted]	6	0.60
	Maximum pressure limit = 5,000 psi				
Injection Size	[redacted]				
Run Time	[redacted]				

Mass Spectrometer Interface Settings (Sciex 5500 QQQ)	
MS Interface Mode	[redacted]
Ionspray (volts)	[redacted]
Declustering Potential-DP (volts)	[redacted]
Entrance Potential-EP (volts)	[redacted]

Source Temp (TEM)	[redacted]
Curtain Gas (CUR)	[redacted]
Collision Gas (CAD)	[redacted]
Ion Source Gas 1 (GS1)	[redacted]
Ion Source Gas 2 (GS2)	[redacted]
Collision Energy-CE (volts)	[redacted]
Collision Cell Exit Potential-CXP (volts)	[redacted]

Recommended Instrument Operating Conditions

Mass Spectrometer Scan Settings [redacted]

Compound	Comments	Reaction (MRM)	Dwell (sec)	DP(v)	EP(v)	CE(v)	CXP(v)
PFBA	Native analyte	212.9 > 169.0	0.011	[redacted]	[redacted]	[redacted]	[redacted]
13C4 PFBA	IDA	217.0 > 172.0	0.011	[redacted]	[redacted]	[redacted]	[redacted]
PFPeA	Native analyte	262.9 > 219.0	0.011	[redacted]	[redacted]	[redacted]	[redacted]
13C5 PFPeA	IDA	267.9 > 223.0	0.011	[redacted]	[redacted]	[redacted]	[redacted]
PFBS	Native analyte	298.9 > 80.0	0.011	[redacted]	[redacted]	[redacted]	[redacted]
PFBS_2	Native analyte	298.9 > 99.0	0.011	[redacted]	[redacted]	[redacted]	[redacted]
13C3 PFBS	IDA	301.9 > 80.0	0.011	[redacted]	[redacted]	[redacted]	[redacted]
PFHxA	Native analyte	313.0 > 269.0	0.011	[redacted]	[redacted]	[redacted]	[redacted]
PFHxA_2	Native analyte	313.0 > 119.0	0.011	[redacted]	[redacted]	[redacted]	[redacted]
13C2 PFHxA	IDA	315.0 > 270.0	0.011	[redacted]	[redacted]	[redacted]	[redacted]
4:2FTS	Native analyte	327.0 > 307.0	0.011	[redacted]	[redacted]	[redacted]	[redacted]
M2-4:2FTS	IDA	329.0 > 81.0	0.011	[redacted]	[redacted]	[redacted]	[redacted]
PFPeS	Native analyte	349.0 > 80.0	0.011	[redacted]	[redacted]	[redacted]	[redacted]
PFPeS_2	Native analyte	349 > 99.0	0.011	[redacted]	[redacted]	[redacted]	[redacted]
HFPO-DA	Native analyte	329.1 > 285	0.011	[redacted]	[redacted]	[redacted]	[redacted]
13C3 HFPO-DA	IDA	332.1 > 287	0.011	[redacted]	[redacted]	[redacted]	[redacted]
PFHpA	Native analyte	363.0 > 319.0	0.011	[redacted]	[redacted]	[redacted]	[redacted]
PFHpA_2	Native analyte	363.0 > 169.0	0.011	[redacted]	[redacted]	[redacted]	[redacted]
13C4 PFHpA	IDA	367.0 > 322.0	0.011	[redacted]	[redacted]	[redacted]	[redacted]
PFHxS	Native analyte	399.0 > 80.0	0.011	[redacted]	[redacted]	[redacted]	[redacted]
PFHxS_2	Native analyte	399.0 > 99.0	0.011	[redacted]	[redacted]	[redacted]	[redacted]
18O2 PFHxS	IDA	403.0 > 84.0	0.011	[redacted]	[redacted]	[redacted]	[redacted]
DONA	Native analyte	377 > 251	0.011	[redacted]	[redacted]	[redacted]	[redacted]
DONA_2	Native analyte	377 > 85	0.011	[redacted]	[redacted]	[redacted]	[redacted]
PFOA	Native analyte	413.0 > 369.0	0.011	[redacted]	[redacted]	[redacted]	[redacted]
PFOA_2	Native analyte	413.0 > 169.0	0.011	[redacted]	[redacted]	[redacted]	[redacted]
13C2 PFOA	Internal Std	415.0 > 370.0	0.011	[redacted]	[redacted]	[redacted]	[redacted]
13C4 PFOA	IDA	417.0 > 372.0	0.011	[redacted]	[redacted]	[redacted]	[redacted]
6:2FTS	Native analyte	427.0 > 407.0	0.011	[redacted]	[redacted]	[redacted]	[redacted]
M2-6:2FTS	IDA	429.0 > 81.0	0.011	[redacted]	[redacted]	[redacted]	[redacted]
PFHpS	Native analyte	449.0 > 80.0	0.011	[redacted]	[redacted]	[redacted]	[redacted]
PFHpS_2	Native analyte	449.0 > 99.0	0.011	[redacted]	[redacted]	[redacted]	[redacted]
PFNA	Native analyte	463.0 > 419.0	0.011	[redacted]	[redacted]	[redacted]	[redacted]
PFNA_2	Native analyte	463.0 > 169.0	0.011	[redacted]	[redacted]	[redacted]	[redacted]

13C5 PFNA	IDA	468.0 > 423.0	0.011	[redacted]	[redacted]	[redacted]	[redacted]
PFOS	Native analyte	499.0 > 80.0	0.011	[redacted]	[redacted]	[redacted]	[redacted]
PFOS_2	Native analyte	499.0 > 99.0	0.011	[redacted]	[redacted]	[redacted]	[redacted]
9Cl-PF3ONS	Native analyte	531 > 351	0.011	[redacted]	[redacted]	[redacted]	[redacted]
13C4 PFOS	IDA	503.0 > 80.0	0.011	[redacted]	[redacted]	[redacted]	[redacted]
PFDA	Native analyte	513.0 > 469.0	0.011	[redacted]	[redacted]	[redacted]	[redacted]
PFDA_2	Native analyte	513.0 > 169.0	0.011	[redacted]	[redacted]	[redacted]	[redacted]
13C2 PFDA	IDA	515.0 > 470.0	0.011	[redacted]	[redacted]	[redacted]	[redacted]
8:2FTS	Native analyte	527.0 > 507.0	0.011	[redacted]	[redacted]	[redacted]	[redacted]
M2-8:2FTS	IDA	529.0 > 81.0	0.011	[redacted]	[redacted]	[redacted]	[redacted]
PFNS	Native analyte	549.0 > 80.0	0.011	[redacted]	[redacted]	[redacted]	[redacted]
PFNS_2	Native analyte	549.0 > 99.0	0.011	[redacted]	[redacted]	[redacted]	[redacted]
MeFOSAA	Native analyte	570 > 419.0	0.011	[redacted]	[redacted]	[redacted]	[redacted]
d3-MeFOSAA	IDA	573.0 > 419.0	0.011	[redacted]	[redacted]	[redacted]	[redacted]
11Cl-PF3OUdS	Native analyte	631 > 451	0.011	[redacted]	[redacted]	[redacted]	[redacted]
FOSA	Native analyte	498.0 > 78.0	0.011	[redacted]	[redacted]	[redacted]	[redacted]
13C8 FOSA	IDA	506.0 > 78.0	0.011	[redacted]	[redacted]	[redacted]	[redacted]
PFUdA	Native analyte	563.0 > 519.0	0.011	[redacted]	[redacted]	[redacted]	[redacted]
PFUdA_2	Native analyte	563.0 > 169.0	0.011	[redacted]	[redacted]	[redacted]	[redacted]
13C2 PFUdA	IDA	565.0 > 520.0	0.011	[redacted]	[redacted]	[redacted]	[redacted]
EtFOSAA	Native analyte	584.0 > 419.0	0.011	[redacted]	[redacted]	[redacted]	[redacted]
d5-EtFOSAA	IDA	589.0 > 419.0	0.011	[redacted]	[redacted]	[redacted]	[redacted]
PFDS	Native analyte	599.0 > 80.0	0.011	[redacted]	[redacted]	[redacted]	[redacted]
PFDS_2	Native analyte	599.0 > 99.0	0.011	[redacted]	[redacted]	[redacted]	[redacted]
PFDoA	Native analyte	613.0 > 569.0	0.011	[redacted]	[redacted]	[redacted]	[redacted]
PFDoA_2	Native analyte	613.0 > 169.0	0.011	[redacted]	[redacted]	[redacted]	[redacted]
13C2 PFDoA	IDA	615.0 > 570.0	0.011	[redacted]	[redacted]	[redacted]	[redacted]
10:2FTS	Native analyte	627 > 607	0.011	[redacted]	[redacted]	[redacted]	[redacted]
PFDoS	Native analyte	699 > 80	0.011	[redacted]	[redacted]	[redacted]	[redacted]
PFDoS_2	Native analyte	699 > 99	0.011	[redacted]	[redacted]	[redacted]	[redacted]
PFTrDA	Native analyte	663.0 > 619.0	0.011	[redacted]	[redacted]	[redacted]	[redacted]
PFTrDA_2	Native analyte	663.0 > 169.0	0.011	[redacted]	[redacted]	[redacted]	[redacted]
PFTeDA	Native analyte	713.0 > 669.0	0.011	[redacted]	[redacted]	[redacted]	[redacted]
PFTeDA_2	Native analyte	713.0 > 169.0	0.011	[redacted]	[redacted]	[redacted]	[redacted]
13C2 PFTeDA	IDA	715.0 > 670.0	0.011	[redacted]	[redacted]	[redacted]	[redacted]
PFHxDA	Native analyte	813 > 769	0.011	[redacted]	[redacted]	[redacted]	[redacted]
PFHxDA_2	Native analyte	813 > 169	0.011	[redacted]	[redacted]	[redacted]	[redacted]
13C2 PFHxDA	IDA	815 > 770	0.011	[redacted]	[redacted]	[redacted]	[redacted]
PFODA	Native analyte	913 > 869	0.011	[redacted]	[redacted]	[redacted]	[redacted]
PFODA_2	Native analyte	913 > 169	0.011	[redacted]	[redacted]	[redacted]	[redacted]

Recommended Instrument Operating Conditions

Retention Times & Quantitation [redacted]

Native Compounds	Typical Native RT (minutes)	IS analog	Typical IDA RT (minutes)	Quantitation Method
PFBA	[redacted]	13C4 PFBA	[redacted]	Isotope Dilution
PFPeA	[redacted]	13C5 PFPeA	[redacted]	Isotope Dilution
PFBS	[redacted]	13C3 PFBS	[redacted]	Isotope Dilution
4:2FTS	[redacted]	M2-4:2FTS	[redacted]	Internal Standard
PFHxA	[redacted]	13C2 PFHxA	[redacted]	Isotope Dilution
PFPeS	[redacted]	13C3 PFBS	[redacted]	Internal Standard
HFPO-DA	[redacted]	13C3 HFPO-DA	[redacted]	Isotope Dilution
PFHpA	[redacted]	13C4 PFHpA	[redacted]	Isotope Dilution
PFHxS	[redacted]	18O2 PFHxS	[redacted]	Isotope Dilution
DONA	[redacted]	13C4 PFOS	[redacted]	Internal Standard
6:2FTS	[redacted]	M2-6:2FTS	[redacted]	Isotope Dilution
PFOA	[redacted]	13C4 PFOA	[redacted]	Isotope Dilution
PFHpS	[redacted]	13C4 PFOS	[redacted]	Internal Standard
PFNA	[redacted]	13C5 PFNA	[redacted]	Isotope Dilution
PFOS	[redacted]	13C4 PFOS	[redacted]	Isotope Dilution
9Cl-PF3ONS	[redacted]	13C4 PFOS	[redacted]	Internal Standard
8:2FTS	[redacted]	M2-8:2FTS	[redacted]	Isotope Dilution
PFDA	[redacted]	13C2 PFDA	[redacted]	Isotope Dilution
PFNS	[redacted]	13C4 PFOS	[redacted]	Internal Standard
MeFOSAA	[redacted]	d3-MeFOSAA	[redacted]	Isotope Dilution
11Cl-PF3OUdS	[redacted]	13C4 PFOS	[redacted]	Internal Standard
EtFOSAA	[redacted]	d5-EtFOSAA	[redacted]	Isotope Dilution
PFDS	[redacted]	13C4 PFOS	[redacted]	Internal Standard
PFUdA	[redacted]	13C2 PFUdA	[redacted]	Isotope Dilution
FOSA	[redacted]	13C8 FOSA	[redacted]	Isotope Dilution
PFDoA	[redacted]	13C2 PFDoA	[redacted]	Isotope Dilution
10:2FTS	[redacted]	M2-8:2FTS	[redacted]	Internal Standard
PFDoS	[redacted]	13C4 PFOS	[redacted]	Internal Standard
PFTrDA	[redacted]	13C2 PFTeDA	[redacted]	Internal Standard
PFTeDA	[redacted]	13C2 PFTeDA	[redacted]	Isotope Dilution
PFHxDA	[redacted]	13C2 PFHxDA	[redacted]	Isotope Dilution
PFODA	[redacted]	13C2 PFHxDA	[redacted]	Internal Standard

Note: clients must be notified when the quantitation of an analyte is performed using an Internal standard. Changes to these IDA/ISTD associations may be necessary when sources of IDAs are updated: this may include additions as new IDAs become available, or subtractions if IDAs are unavailable.

10.4 Instrument Tuning

Instrument tuning is done initially when the method is first developed and thereafter as needed to maintain the sensitivity and selectivity of the method. Tuning is done by infusing each individual compound (native and IDA) into the MS/MS electrospray probe. The responses for the parent and daughter ions for each compound are observed and optimized for sensitivity and resolution. Mass assignments are reviewed and calibrated if necessary. The mass assignments must be within ± 0.5 amu of the values shown in the table above.

10.5 Instrument Calibration

Perform initial calibration with a minimum of five calibration standards before any sample analysis (initial method set-up), whenever a new column is installed, when significant instrument maintenance has been performed, and when the CCV does not meet acceptance criteria. Significant instrument maintenance includes installing a new column, changing the proportioning valve, or changing components of the MS/MS system. A new calibration is not required following minor maintenance.

With the exception of the circumstances delineated in policy CA-Q-P-003, it is not acceptable to remove points from a calibration curve. In any event, at least five points must be included in the calibration curve. Average Response Factor and linear fit calibrations require five points, whereas Quadratic (second order) calibrations require six points. The same injection volume must be used for all injections (standards and extracts).

Calibration is by average response factor, linear fit, or by quadratic fit. Quadratic fit is used for the analyte if the response is non-linear; it's use requires a minimum of 6 calibration standards.

For average response factor (RFa), the relative standard deviation (RSD) for all compounds quantitated by isotope dilution must be < 20% for the curve to be valid.

For average response factor (RFa), the relative standard deviation (RSD) for all compounds quantitated by internal standard (i.e. those compounds that do not have corresponding isotopically labeled analogs) must be < 25% for the curve to be valid.

For linear fit, the intercept of the line must be less than ½ the reporting limit, and the coefficient of determination (r2) must be greater than or equal to 0.990 for the curve to be considered valid (or the correlation coefficient (r) > 0.995).

Evaluation of Calibration Curves

The following requirements must be met for any calibration to be used:

-Response must increase with increasing concentration.

-The absolute value of the intercept of a regression line (linear or non-linear) at zero response must be less than the reporting limit.

-There should be no carryover at or above 1/2 MRL after a high CAL standard.

-The low cal. point must recover to within 50-150%, and all others must recover to within 70-130%.

If these criteria are not met, instrument conditions and standards will be checked, and the ICAL successfully repeated before continuing.

Weighting of Calibration Points

In linear and quadratic calibration fits, the points at the lower end of the calibration curve have less absolute variance than points at the high concentration end of the curve. This can cause severe errors in quantitation at the low end of the calibration. Because accuracy at the low end of the curve is very important for this analysis, it is preferable to increase the weighting of the lower concentration points. 1/concentration or 1/x weighting is encouraged. Visual inspection of the line fitted to the data is important in selecting the best fit.

10.6 Initial Calibration

Prepare the working calibration standards using the recommended formulations given in Appendix B ensuring the lowest calibration standard for each analyte is equal to or below the established RL. Unless otherwise specified on a project basis, use calibration levels 1 to 6 to establish the calibration curve for each analyte.

Prime the instrument by analyzing a minimum of 4 “primer” solutions consisting of 80/20 methanol/water. In general, an HPLC contains components made from PTFE, which enable the pumps to work with many types of organic solvents. Despite efforts to remove as much PTFE as possible, certain components cannot be replaced and contribute PFAS. The longer the system remains idle, the more PFAS that is yielded. Therefore these primers serve to reduce and stabilize the amount of PFAS that are contributed. Immediately following the primers is a Blank, the ICAL sequence (run in ascending order of Level 1 to Level 6), the ICB, the ICV and the first analytical window of extracts (up to 10 field samples). The data is acquired using Sciex’s Analyst 1.6.

The Chrom Review data system generates calibration data by generating relative response factors (RRFs) based on the response of the target analyte and its corresponding Isotope Dilution Analyte (or Internal Standard) as well as their injection concentrations to ultimately generate Mean Response Factors. All analytes calibrated using IDA must have RSD values < 20%, all analytes calibrated using ISTD must have RSD values < 25%. The IDA compounds are also calibrated using an external RF model using response and concentration. The IDA RSD must be < 50%. Alternatively, a linear regression curve of concentration vs. peak area for each analyte relative to their corresponding IDA/ISTD and their concentrations calculates the correlation coefficient with 1/concentration weighting. The calibration must have a correlation coefficient (r) ≥ 0.995 ($r^2 \geq 0.990$). If criteria are not met, correct the problem and repeat calibration. Further analysis may not proceed without valid calibration.

10.7 Initial Calibration Blank (ICB)

Immediately following the ICAL, a calibration blank is analyzed that consists of an injection of [redacted] fortified with IDA solution at 50 ng/mL

The result for the calibration blank must be less than the reporting limit.

If the ICB is greater than the reporting limit then the source of contamination must be identified and any necessary cleaning completed, and then the instrument should be recalibrated.

10.8 Second Source Calibration Verification (ICV)

Following the ICAL and the ICB, an ICV standard obtained from a different source or vendor than the ICAL standards is analyzed. This ICV standard is a mid-range standard.

The recovery for the ICV must meet the appropriate following criteria:

The native analyte must be within or equal to 70-130% for all native analytes quantitated by isotope dilution.

The native analyte must be within or equal to 70-130% for all native analytes quantitated by internal standard (i.e. those compounds that do not have corresponding isotopically labeled analogs).

The IDA recovery must be within or equal to 50-150%.

See Table 3 for corrective actions in the event that the ICV does not meet the criteria above.

10.9 Continuing Calibration Verification (CCV)

Analyze a CCV at the beginning of a run, the end of a run, and after every 10 samples to determine if the calibration is still valid. The exception is after an acceptable curve and ICV are run 10 samples can be analyzed before a CCV is required. The CCVs are usually at the mid-level range of the curve and should vary throughout the run. The curve and ICV do not need to be run every day. To start an analytical run a CCV can be analyzed and if it meets acceptance criteria a run can be started. In addition, the low standard in the curve must be analyzed and must be within ± 50% of the expected value.

The recovery for the CCV standards must be equal to or within 70-130% (50-150% for low level standards) for all natives quantitated by isotope dilution and for all natives quantitated by internal standard. The recovery for the IDA must be within or equal to 70-130% of the true value.

If this is not achieved, the instrument has drifted outside the calibration limits. If the CCV fails again following minor maintenance, the instrument must be recalibrated.

10.10 Isotope Dilution Analytes (IDA)

The IDA solution is added to each field and QC sample at the time of extraction, as described in Section 10.1. As described in Section 7, this solution consists of isotopically labeled analogs of the analytes of interest.

IDA recoveries are flagged if they are outside of the acceptance limits. Quantitation by isotope dilution generally precludes any adverse effect on data quality due to IDA recoveries being outside of the acceptance limits as long as the signal-to-noise ratio is greater than 10:1.

> Evaluate data quality for usability, flag and submit a non-conformance memo for any analytes outside of the recovery criteria, and report if data is deemed not adversely effected.
>
> Re-extraction of samples should be performed if the signal-to-noise for any IDA is less than 10:1 or if the IDA recoveries fall below 10%.
>
> Re-extraction may be necessary under other circumstances when data quality has been determined to be adversely affected.

10.11 Troubleshooting:

Check the following items in case of calibration failures:

Evaluate the failure to determine whether it affects all of the compounds in the ICAL equally. If one ICAL point appears low or high, reprep the curve and rerun, as the error was most likely prep-based. If only a subset of the analytes are affected, check the integration and chromatography to see if there are anomalies; if justifiable, correct the integration so it is consistent with the other ICAL levels.

If there are no peaks for all compounds or no peaks after a specific retention time, ensure that the HPLC pump is pumping properly; it may have shut down due to overpressure or has a leak. If the pump has shut down, confirm it is primed and replace the in-line filter. If the pressure climbs above expected levels, changing the guard column and even analytical column may be necessary. It’s best to chase high pressure sources from the pump forward (ie the post-pump in-line filter, isolator column, post-autosampler in-line filter, guard column, analytical column and MSMS inlet. If the pump is still pumping, check the system pressure. If it is lower than expected, check for leaks. Start with all connections, then move on to pump seals, especially if there are wide variations in pressure when pumping the same solvents at the same flow rates. If the pump is still pumping and the pressure is normal, check to make sure the MSMS is still functioning properly. Most issues with the MSMS system will be noted by the instrument software.

If there are peaks for all analytes, evaluate the peak shapes by comparing them to the ICAL chromatography. If the peaks have changed (shorter and wider), a new guard column may improve peak shape and bring the system back into compliance. If a new column is necessary, a new ICAL will be needed.

Preventive and routine maintenance is described in the table below

HPLC/MS/MS Preventative Maintenance
As Needed: Change pump seals. Change in-line filters in autosampler (HPLC). Check/replace in-line frit if excessive pressure or poor performance. Replace column if no change following in-line frit change. Replace fused silica tube in ESI interface. Clean lenses. Clean skimmer. Ballast rough pump 30 minutes.
Daily (When in use) Check solvent reservoirs for sufficient level of solvent. Verify that pump is primed, operating pulse free. Check needle wash reservoir for sufficient solvent. Verify capillary heater temperature functioning. Verify vaporizer heater temperature. Verify rough pump oil levels. Verify turbo-pump functioning. Verify nitrogen pressure for auxiliary and sheath gasses. Verify that multiplier is functioning.

10.12 Sample Analysis

Place the field and QC samples in a sequence that begins with the calibration standards followed by the analysis of QC samples, field samples and continuing calibration verification standards (CCVs).

An example analytical sequence that includes initial calibration (ICAL) is provided below.

Injection Number	Lab Description
1	Primer 1
2	Primer 2
3	Primer 3

Injection Number	Lab Description
4	Primer 4
5	Blank
6	Calibration Level 1
7	Calibration Level 2
8	Calibration Level 3
9	Calibration Level 4 (ICIS)
10	Calibration Level 5
11	Calibration Level 6
12	ICB
13	ICV
14	T-PFOA
15	MB
16	LCS
17-26	(up to) 10 Field samples
27	CCV L4
28-37	(up to) 10 Field samples
38	MS
39	MSD
40	CCV L5
41	MB
42	LCS
43-52	(up to) 10 Field samples
53	CCV L4
54-63	(up to) 10 Field samples
65	MS
66	MSD
67	CCV L5

An example analytical sequence without ICAL:

Injection Number	Lab Description
1	Primer 1
2	Primer 2
3	Primer 3
4	Primer 4
5	CCB
6	CCVL (LOQV)
7	CCVIS (L4)
8	MB
9	LCS
10-19	(up to) 10 Field samples
20	CCV L5
21-30	(up to) 10 Field samples
31	MS
32	MSD
33	CCV L4
34	MB
35	LCS

36-45	(up to) 10 Field samples
46	CCV L5
47-56	(up to) 10 Field samples
57	MS
58	MSD
59	CCV L4

Enter the sample ID's into the data acquisition program in the order the samples were placed in the autosampler and initiate the analytical sequence.

11.0 Corrective Action

When an out-of-control situation occurs that is not delineated in this corrective action table or the corrective actions listed do not adequately address the circumstances, a Corrective Action Report (CAR) (NCM), etc., must be developed (see SOP BR-QA-016) and the analyst must use his/her best analytical judgment and available resources to determine the corrective action to be taken. The out-of-control situation may be caused by more than one variable. The analyst should seek the assistance of his/her immediate supervisor, QA manager or other experienced staff if they are uncertain of the cause of the out-of-control situation. The analysis must not be resumed until the source of the problem and an in-control status is re-established. All samples associated with the out-of-control situation must be reanalyzed after in-control status has been re-established or if authorization is received from the supervisor or QA Manager for release with data qualification.

12.0 Calculations / Data Reduction

12.1 Qualitative Identification

The data processing system identifies the target analytes by comparing the retention time of the peaks to the retention times of the initial calibration standards. The retention times of PFAS with labeled standards must be the same as that of the labeled IDA's to within 0.05 min. For PFAS with no labeled standards, the RT must be within ± 0.3 minutes of the CCVIS standards. *Note: The IS RT and native RT may be offset by 0.02 to 0.04 minutes.*

12.2 Quantitative Identification

The ICAL established in Section 10.10 is used to calculate concentrations for the extracts. The data processing system determines on-column concentration. Final results are calculated by the laboratory's LIMS information system (TALS).

Dilute and reanalyze samples whose results exceed the calibration range. The diluted analysis should result in a determination within the upper half of the calibration curve.

Check the results of samples analyzed immediately after high concentration samples (those with results above calibration range) for signs of carry-over. Reanalyze all samples suspected of carry-over.

12.3 Calculations

See Appendix C.

12.4 Data Review

Refer to laboratory SOP BR-QA-019 for additional instruction on the requirements for data review. The following sections summarize the general procedure as described in the data review SOP.

12.5 Primary Review

Review the chromatography and quantitation in the data processing system to confirm quantitative and qualitative identification of each target analyte. Perform and document manual integrations only if needed per the instructions in corporate policy CA-Q-S-002, Acceptable Manual Integration Practices.

Upload the data files to TALS and process the batch. Enter job information into the batch editor and add the standards and reagent additions to the worksheet, if necessary. Review the results against acceptance criteria. If acceptance criteria are not met, perform corrective action or make arrangements for corrective action with another analyst.

Set results to primary, secondary, acceptable or rejected. Set results to be reported to a status of primary and secondary. Set results that meet criteria but will not be reported to acceptable. Set results that do not meet criteria to rejected, to prevent inadvertent reporting of data.

Verify that all appropriate QC were performed and acceptable. If insufficient volume is received (MS, MSD, FRB, etc…) document in an NCM. Record all instances where acceptance criteria are not met in a nonconformance memo (NCM).

Verify that all project requirements or program specific requirements were followed. If not, immediately notify the project manager to determine an appropriate course of action. Record decisions made in the data review checklist.

Set the batch to 1st level review. Complete the data review checklist and make arrangements for secondary review by a peer analyst.

12.6 Secondary Data Review (Performed by Peer Analyst)

Record review using the data review checklist.

Verify that all project requirements or program specific requirements were followed. If not, consult with the primary analyst to determine cause. Any decisions made should be recorded on the data review checklist and retained as part of the analytical record.

Review the TALS batch editor to verify ancillary information for the work performed is filled in.

Verify that that the procedures in this SOP were followed. If discrepancy between the SOP and the analytical record is found, consult with the primary analyst to determine the source of the discrepancy. Resolve the discrepancy and verify any modifications to the SOP are properly documented and were approved by laboratory management. Record all SOP deviations in an NCM.

Spot-check ~15% of samples in the batch to verify quantitative and qualitative identification.

If manual integrations were performed:

- Review each manual integration to verify that the integration is consistent and compliant with the requirements specified in SOP CA-Q-S-002.

- Check to ensure an appropriate technical reason code is provided for each manual integration. Acceptable technical reason codes are provided in SOP CA-Q-S-002.

- If an error is suspected, the reviewer must consult with the analyst that performed the integration to determine if a correction is necessary. Input from the Technical Manager (TM), Department Manager (DM), or QA Manager (QAM) may be sought as necessary. **The reviewer may not reintegrate except in those circumstances approved by laboratory management**, such as when the analyst that performed the integration is on vacation. If re-integration is performed by the reviewer, the reviewer is now considered the "primary analyst" and the re-integration is subject to the same review and documentation requirements as the original integration.

Verify acceptance criteria were met. If not, verify that corrective actions were performed and the nonconformance was documented with an NCM. Review the NCM to verify the form is filled out and the requisite information has been included in the internal comments tab. If corrective action was not performed and the failure not documented, consult with the primary analyst to determine cause. Consult with the primary analyst and department management to determine what actions should be taken, then follow-through with the decision made.

Run the QC checker and fix any problems found. Run and review the deliverable for gross error such as missing data. Fix any problems found.

When review is complete set the method chain to lab complete. Complete the data review checklist and forward associated paperwork to report/project management.

12.7 Data Reporting & Record Retention

The specifications for data reporting are set by the project manager and are performed by TALS using the formatter selected by the PM. The type of deliverable is also set by the PM based on various deliverable options in the TALS system. The formatters and deliverables are programmed into TALS by corporate IT staff and cannot be modified locally.

The following sections describe the default reporting scheme set for this method in TALS:

Data is retained, managed and archived as specified in laboratory SOP BR-QA-014 Laboratory Records.

13.0 Method Performance

13.1 Method Detection Limit Study (MDL)

The method detection limit (MDL) is the lowest concentration that can be detected for a given analytical method and sample matrix with 99% confidence that the analyte is present. MDLs reflect a calculated (statistical) value determined under ideal laboratory conditions in a clean matrix, and may not be achievable in all environmental matrices. An initial method detection limit study is performed in accordance with SOP BR-QA-005. The laboratory maintains MDL studies for analyses performed; these are verified at least annually unless method or program requirements require a greater frequency.

13.2 Demonstration of Capabilities

All personnel are required to perform an initial demonstration of proficiency (IDOC) on the instrument they will be using for analysis prior to testing samples. On-going proficiency must be demonstrated annually. IDOCs and on-going proficiency demonstrations are conducted as follows.

13.2.1 Four aliquots of the QC check sample are analyzed using the same procedures used to analyze samples, including sample preparation. The concentration of the QC check sample may be equivalent to a mid- level calibration.

13.2.2 Calculate the average recovery and standard deviation of the recovery for each analyte of interest.

13.2.3 If any analyte does not meet the acceptance criteria, the test must be repeated. Only those analytes that did not meet criteria in the first test need to be evaluated. TNI 2016 requires consecutive passing results. Repeated failure for any analyte indicates the need for the laboratory to evaluate the analytical procedure and take corrective action.

13.2.4 Until the IDOC is approved by the QA Manager (or designee); the trainer and trainee must be identified in the batch record.

13.3 Training Requirements

The Group Leader is responsible for ensuring that this procedure is performed by an associate who has been properly trained in its use and has the required experience. A new analyst must be working under documented supervision prior to approval of the IDOC. Documentation that a new analyst is performing under supervision must be entered into the batch record (View Batch Information) until that analyst’s IDOC has been approved by the QA Manager (or designee). See requirements for demonstration of analyst proficiency in SOP BR-QA-011.

14.0 Pollution Control

Employees must abide by the policies and procedures in the NDSC Eurofins TestAmerica Laboratories Environmental Health and Safety Manual (CW-E-M-001), Radiation Safety Manual and this document. This procedure may involve hazardous material, operations and equipment. This SOP does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of the method to follow appropriate safety, waste disposal and health practices under the assumption that all samples and reagents are potentially hazardous. Safety glasses, gloves, lab coats and closed-toe, nonabsorbent shoes are a minimum.

15.0 Waste Management

Waste management practices are conducted consistent with all applicable rules and regulations. Excess reagents, samples and method process wastes are disposed of in an accepted manner. Waste description rules and land disposal restrictions are followed. Waste disposal procedures are incorporated by reference to BR-EH-001. The following waste streams are produced when this method is carried out.

- Vials containing sample extracts: Satellite Container: 30 gallon poly barrel located under GC-Semi prep hood.
- Solvent Waste: Satellite Container: 5 gallon poly carboy located under LCMSMS.

16.0 References / Cross References

- Cheryl Moody, Wai Chi Kwan, Johnathan W. Martin, Derek C. G. Muir, Scott A. Mabury, “Determination of Perfluorinated Surfactants in Surface Water Samples by Two Independent Analytical Techniques: Liquid Chromatography/Tandem Mass Spectrometry and 19FNMR,” Analytical Chemistry 2001, 73, 2200-2206.
- John Giesy et al., “Accumulation of Perfluorooctane Sulfonate in Marine Mammals”, Environmental Science & Technology, 2001 Vol. 35, No. 8, pages 1593-1598.
- U.S. EPA, “Residue Chemistry Test Guidelines, OPPTS 860.1340, Residue Analytical Method”, EPA 712-C-95-174, August 1995.
- STL Denver White Paper DEN-W-LC-002, “Method Validation Study for Analysis of Ammonium Perfluorooctanoate in Soil Matrices by High Performance Liquid Chromatography/Mass Spectrometry (HPLC/MS/MS)”, Mark Dymerski, September 5, 2003.
- STL Denver White Paper DEN-W-LC-003, “Addendum A to Method Validation Study for Analysis of Ammonium Perfluorooctanoate in Soil Matrices by High Performance Liquid Chromatography/Mass Spectrometry (HPLC/MS/MS)”, Mark Dymerski, August 6, 2003.
- STL Denver White Paper DEN-W-LC-004, “Method Validation Study for Analysis of Perfluorooctanoic Acid in Waters by High Performance Liquid Chromatography/Tandem Mass Spectrometry (HPLC/MS/MS)”, Mark Dymerski, January 26, 2005.
- Waters application note; “Acquity UPLC System for Quantifying Trace Levels of Perfluorinated Compounds with an Acquity PFC Analysis Kit”, Peter J. Lee, Evan T. Bernier, Gordon T. Fujimoto, Jeremy Shia, Michael S. Young, and Alice J. Di Gloia, Waters Corporation, Milford, MA. USA.
- Method ISO 25101, “Water quality – Determination of perfluorooctanesulfonate (PFOS) and perfluorooctanoate (PFOA) – Method for unfiltered samples using solid phase extraction and liquid chromatography/mass spectrometry”, First Edition, 2009-03-01, International Organization for Standardization, Technical Committee ISO/TC 147, Water Quality, Subcommittee SC 2, Physical, chemical and biochemical methods.
- US EPA, “Method 537 - Determination of Selected Perfluorinated alkyl acids in Drinking Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometery (LC/MS/MS)”, Version 1.1, September 2009, J.A. Shoemaker, P.E. Grimmett, B.K. Boutin, EPA Document #: EPA/600/R-08/092.
- Laboratory SOP BR-QA-005 *Procedures for the Determination of Limits of Detection (LOD), Limits of Quantitation (LOQ) and Reporting Limits (RL).*
- Laboratory SOP BR-QA-011 *Employee Training*
- Laboratory SOP BR-EH-001 *Hazardous Waste*
- Laboratory SOP BR-QA-014 *Laboratory Records*

- Laboratory SOP BR-QA-006 *Procedures & Documentation Requirements for Manual Integration*
- Laboratory Quality Assurance Manual (QAM)
- Corporate TestAmerica SOP CA-Q-S-002 *Manual Integrations*.

17.0 Method Modifications

Modification Number	Method Reference	Modification & Technical Justification
1	Section 7.2	Method 25101 specifies that the values reported for PFOA and PFOS shall be the linear isomer only. In keeping with the dictates of USEPA 537 and other US conventions, the laboratory reports both the branched (when present) and linear isomers as a single value for these compounds.
2	Section 10.1	A different SPE cartridge, Waters OASIS WAX, is used for the extraction process. As a result, solvents and elution procedures are different.
3	Section 10.1	The samples are fortified with a greater number of labeled analytes (most analytes have labeled versions) prior to extraction.
4	Section 10.5	The HPLC Column, Eluents and gradient conditions have changed.
5	Section 10.5	For non-drinking water matrices, the analyte list has expanded. The number of labeled analytes has also expanded to improve quantitation.
6	Table 1	The reporting limits have changed to a consistent value.
7	Appendix B	Calibration levels have been changed so all levels have the same analyte concentration.

18.0 Attachments

- Table 1: Routine Compound List and LOQ
- Table 2: Primary Materials Used
- Table 3: QC Summary & Recommended Corrective Action
- Table 4: Control Limits
- Appendix A: Terms and Definitions
- Appendix B: Standard Preparation Tables
- Appendix C: Equations

19.0 Revision History (all revision history must be retained in this SOP)

Revision 6.1: Date effective 09/28/2020

- Updated cover page dates and signatories
- Section 1.1: Updated reporting limit ranges to reflect current practice. Added clarification for non-potable samples are only analyzed in NJ.

- Section 7.3: Updated standard preparation solutions for IDA solution from 1000 ng/mL to 500 ng/mL and Internal standard solution from 2500 ng/mL to 1250 ng/mL to reflect current practice.
- Section 8.0: Added 28 day holding time specific to samples collected in NJ.
- Section 10.1: Changed IDA solution to have a fixed concentration of 1.25 ng/mL
- Sections 10.1.5 and 10.2.5.: Updated Internal standard used from 2500 ng/mL to 1250 ng/mL to reflect current practice.
- Sections 5.0 and 11.0: Update to standard language as required by corporate NDSC.
- Section 19.0: Added effective dates.
- Table 1: Updated reporting limits to reflect current practice.
- Table 3: Added NJ specific requirement.
- Appendix B: Updated information to for IDA and Internal Standard formulations to reflect current practice.

Revision 6.0: Date effective 04/24/2020

- Updated cover page dates, copyright information, and signatories
- Throughout: Added support for soil, sediment and tissue matrices.
- Throughout: Removed reference to analysis using Waters instrumentation.
- Throughout: Removed reference to final extract concentration for aqueous samples.
- Section 1.1: Update Fluorotelomer sulfonates (FTS) to report acid forms
- Section 11.0: Added corrective action requirement as it is a corporate requirement to include.

Revision 5.0: Date effective 10/11/2019

- Updated cover page dates, copyright information, and signatories
- Throughout: removed references to drinking water. Will add back if adopted.
- Throughout: removed solid extraction/analysis verbiage missed in previous revision.
- Throughout: revised formatting to be consistent
- Throughout: added PFHxDA, PFODA, PFDoS, 10:2FTS, HFPO_DA, DONA, F53BMajor, and F53B Minor as additional analytes and IDAs
- Section 4.0: added interference information about $^{13}C_2$-PFHxDA
- Section 6.1: updated to include additional laboratory apparatus information
- Section 6.2: updated to include additional instrument and more detail for existing instrument
- Section 7.1: added more detail to reagent information and the addition of Ammonium acetate and Ammonium hydroxide
- Section 7.2: added PFHpS and PFDS as other PFAS not available in the acid form. Added the IDA and ISTD are added at a fixed concentration and removed the low level reference
- Section 9.1 added a NCM must be added for MS/MSD
- Section 10.1: removed the low level spike reference and added the PFAS-IDA solution is added to each sample and QC sample in concentrated extract and non-concentrated extracts
- Section 10.2: In the previous version of this SOP, the "Note" was removed and replaced with "Warning: The use of a vacuum system creates the risk of glassware implosion. Inspect All glassware prior to use. Glassware with chips, scratches, rub marks or cracks must not be used."
- Section 10.2: changed wording to clarify addition of poly siphon line into the SPE cartridge

- Section 10.3: removed to keep test tube as keep and added "Note: If the extracts will note be concentrated, [redacted] for the second bottle rinse so the final volume is approximately 8mL."
- Section 10.5: added sample cleanup with graphitized carbon section
- Section 10.6: added wording to have [redacted] of reagent water to the 10mL extract at this time
- Section 10.7: updated wording
- Section 10.8: added operating system for new instrument and added more detail for existing instrument
- Section 10.17: updated sample analysis to include calibration currently in use
- Table 1 and Table 4: updated to include additional analytes and IDAs
- Appendix A: updated terms and definitions from body of SOP
- Appendix B: updated to include additional analytes and IDAs

Revision 4.0: Date effective 04/12/2019

- Updated cover page dates, copyright information, and signatories
- Headers: removed TestAmerica logo and added Eurofins logo
- Throughout: removed references to drinking water. Will add back if adopted.
- Throughout: revised formatting to be consistent
- Section 1.1: added note about addition of Appendix D, removed NJDEP as PAB
- Section 10.1.3: added note about the use of glass pipettes
- Section 10.3: In a previous version of this SOP, Table "Recommended Instrument Operating Conditions" incorrectly referenced PFTrDA as Isotope Dilution, so this was corrected to Internal Standard and added note to contact clients for ISTD quantitation.
- Removed verbiage regarding soil LOQ from Note on Table 1.
- Added Appendix D: NJDEP secondary certified analytes list

Revision 3.0: Date effect 12/12/2018

- Updated cover page dates and signatories
- Section 10.1: added note for handling incomplete volume extraction process
- Section 18: added previous revision history back into SOP
- Throughout: updated QC criteria from EPA 537 r1.1 that was missed in previous revision
- Throughout: removed solid extraction/analysis verbiage missed in previous revision.
- Throughout: updated calibration to include criteria from EPA 537 r1.1 and to include the 9 calibration points currently in use.
- Throughout: minor formatting updates

Rev 2.1: Date effective 10/11/2018

- Updated cover page dates and signatories
- Section 8: added preservation requirements for DW samples.
- Throughout: updated QC criteria to match EPA537 rev1.1
- Throughout: removed references to solid and tissue extraction/analysis.

Rev 2.0: Date effective 07/31/2018

- Updated cover page and signatories
- Section 8: added preservation requirements for DW samples.
- Throughout: included verbiage that Non-drinking water matrices are not certified under PAB.
- Throughout: separated DW and non-DW limits and QC requirements.

- Throughout: minor formatting and typographical corrections.
- Tables 3 & 4: updated limit to meet EPA 537 criteria.
- Appendix A: updated terms and definitions from body of SOP

Rev 1.0: Date effective 01/19/2018

- Extended analyte list to 21 native compounds and 18 IDAs.
- Altered concentration step in extract preparation by employing a reagent water keeper instead of concentrating to dryness.
- Incorporated use of internal standard for IDA recovery calculation.

Revision 0.0: Date effective 05/19/2017

- New SOP based on USEPA method 537

Previous revisions are retained by the QA department.

Table 1: Routine Compound List & Limit of Quantitation (LOQ)

Compound Name	Abbreviation	CAS #	Water (ng/L)	Soil/ Sediment (ug/Kg)	Tissue (ug/Kg)
Perfluoroalkylcarboxylic acids (PFCAs)					
Perfluoro-n-butanoic acid	PFBA	375-22-4	5.0	0.50	1.0
Perfluoro-n-pentanoic acid	PFPeA	2706-90-3	2.0	0.20	1.0
Perfluoro-n-hexanoic acid	PFHxA	307-24-4	2.0	0.20	1.0
Perfluoro-n-heptanoic acid	PFHpA	375-85-9	2.0	0.20	1.0
Perfluoro-n-octanoic acid	PFOA	335-67-1	2.0	0.20	1.0
Perfluoro-n-nonanoic acid	PFNA	375-95-1	2.0	0.20	1.0
Perfluoro-n-decanoic acid	PFDA	335-76-2	2.0	0.20	1.0
Perfluoro-n-undecanoic acid	PFUdA	2058-94-8	2.0	0.20	1.0
Perfluoro-n-dodecanoic acid	PFDoA	307-55-1	2.0	0.20	1.0
Perfluoro-n-tridecanoic acid	PFTrDA	72629-94-8	2.0	0.20	1.0
Perfluoro-n-tetradecanoic acid	PFTeDA	376-06-7	2.0	0.20	1.0
Perfluoro-n-hexadecanoic acid	PFHxDA	67905-19-5	2.0	0.20	1.0
Perfluoro-n-octadecanoic acid	PFODA	16517-11-6	2.0	0.20	1.0
Perfluorinated sulfonic acids (PFSAs)					
Perfluoro-1-butanesulfonic acid	PFBS	375-73-5	2.0	0.20	1.0
Perfluoro-1-pentanesulfonic acid	PFPeS	2706-91-4	2.0	0.20	1.0
Perfluoro-1-hexanesulfonic acid	PFHxS	355-46-4	2.0	0.20	1.0
Perfluoro-1-heptanesulfonic acid	PFHpS	375-92-8	2.0	0.20	1.0
Perfluoro-1-octanesulfonic acid	PFOS	1763-23-1	2.0	0.20	1.0
Perfluoro-1-nonanesulfonic acid	PFNS	68259-12-1	2.0	0.20	1.0
Perfluoro-1-decanesulfonic acid	PFDS	335-77-3	2.0	0.20	1.0
Perfluoro-1-dodecanesulfonic acid	PFDoS	79780-39-5	2.0	0.20	1.0
Perfluorinated sulfonamides (FOSA)					
Perfluoro-1-octanesulfonamide	FOSA	754-91-6	2.0	0.20	1.0
Perfluorinated sulfonamidoacetic acids (FOSAA)					
N-ethylperfluoro-1-octanesulfonamidoacetic acid	EtFOSAA	2991-50-6	5.0	2.0	10.0
N-methylperfluoro-1-octanesulfonamidoacetic acid	MeFOSAA	2355-31-9	5.0	2.0	10.0
Fluorotelomer sulfonates (FTS)					
1H,1H,2H,2H-perfluorohexane sulfonate *(4:2)*	4:2 FTS	757124-72-4	2.0	2.0	10.0
1H,1H,2H,2H-perfluorooctane sulfonate *(6:2)*	6:2 FTS	27619-97-2	5.0	2.0	10.0
1H,1H,2H,2H-perfluorodecane sulfonate *(8:2)*	8:2 FTS	39108-34-4	2.0	2.0	10.0
1H,1H,2H,2H-perfluorododecane sulfonate*(10:2)*	10:2 FTS	120226-60-0	2.0	2.0	10.0
Fluorinated Replacement Chemicals					
Hexafluoropropylene oxide dimer acid	HFPO-DA	13252-13-6	4.0	0.40	2.0
4,8-dioxa-3H-perfluorononanoic acid	DONA	919005-14-4	2.0	0.20	1.0
9-chlorohexadecafluoro-3-oxanonane-1-sulfonic acid	F53B Major (9Cl-PF3ONS)	756426-58-1	2.0	0.20	1.0
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid	F53B Minor (11Cl-PF3OUdS)	763051-58-1	2.0	0.20	1.0

NOTE: The LOQ values may vary. The Water LOQ is based on a 250mL nominal sample volume.

Table 2: Primary Materials Used

Material[1]	Hazards	Exposure Limit[2]	Signs and Symptoms of Exposure
Acetic Acid (3-2-1)	Corrosive Poison Flammable	10 ppm-TWA 15 ppm-STEL	Contact with concentrated solution may cause serious damage to the skin and eyes. Inhalation of concentrated vapors may cause serious damage to the lining of the nose, throat, and lungs. Breathing difficulties may occur.
Ammonium Hydroxide (3-0-0)	Corrosive Poison	50 ppm-TWA	Severe irritant. Effects from inhalation of dust or mist vary from mild irritation to serious damage to the upper respiratory tract. Symptoms may include sneezing, sore throat or runny nose. Contact with skin can cause irritation or severe burns and scarring with greater exposures. Causes irritation of eyes, and with greater exposures it can cause burns that may result in permanent damage, including blindness. Brief exposure to 5000 PPM can be fatal.
Hexane (2-3-0)	Flammable Irritant	500 ppm-TWA	Inhalation of vapors irritates the respiratory tract. Overexposure may cause lightheadedness, nausea, headache, and blurred vision. Vapors may cause irritation to the skin and eyes.
Hydrochloric Acid (3-0-1)	Corrosive Poison	5 ppm (Ceiling)	Can cause pain and severe burns upon inhalation, ingestion, eye or skin contact. Exposure to concentrated solutions may cause deep ulcerations to skin, permanent eye damage, circulatory failure and swallowing may be fatal.
Methanol (2-3-0)	Flammable Poison Irritant	200 ppm (TWA)	A slight irritant to the mucous membranes. Toxic effects exerted upon nervous system, particularly the optic nerve. Symptoms of overexposure may include headache, drowsiness and dizziness. Methyl alcohol is a defatting agent and may cause skin to become dry and cracked. Skin absorption can occur; symptoms may parallel inhalation exposure. Irritant to the eyes.
Potassium Hydroxide (3-0-1)	Corrosive Poison		Severe irritant. Can cause severe burns upon inhalation, ingestion, eye or skin contact. Exposure to concentrated solutions may cause severe scarring of tissue, blindness, and may be fatal if swallowed.
Potassium Persulfate (2-0-1-OX)	Oxidizer	None	Causes irritation to the respiratory tract. Symptoms may include coughing, shortness of breath. Causes irritation to skin and eyes. Symptoms include redness, itching, and pain. May cause dermatitis, burns, and moderate skin necrosis.

[1] Always add acid to water to prevent violent reactions.
[2] Exposure limit refers to the OSHA regulatory exposure limit.

Table 3: QC Summary, Acceptance Criteria and Recommended Corrective Action (EPA537)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action
6-Point Calibration (5 point minimum for CF and Linear Regression) (ICAL)	Before sample analysis, when CCVs indicate calibration is no longer valid; after major instrument maintenance	CF = RSD ≤ 20% (compounds calibrated via IDA) CF = RSD ≤ 25% (compounds calibrated using "near-IDA" compounds) CF = RSD ≤ 50% (IDA standards using ISTD) Each cal pt. = +/-30%Rec. (+/-50%Rec for cal low pt.) Linear Regression: $r^2 \geq 0.990$	Correct problem and repeat initial calibration.
IDA Response	Every injection contains the IDA analytes	Non-DW matrices (for samples collected in NJ – see below): Standards: 50-150% recovery Field samples: 50-150% recovery (poor responding IDAs: 25-150%) (reportable if >10x S/N ratio and >10% ICAL RF)	Standard failures must be investigated to determine the cause of the failure. Recalibration may be required. Samples with recoveries outside acceptance limits must be evaluated for data usability. Re-extraction may be necessary if data quality has been adversely affected.
IDA Response	Every injection contains the IDA analytes	Non-Potable samples collected in NJ: Standards: 50-150% recovery Field samples: 50-150% recovery (reportable if >10x S/N ratio and >10% ICAL RF)	Standard failures must be investigated to determine the cause of the failure. Recalibration may be required. Samples with recoveries outside acceptance limits must be evaluated for data usability. Re-extraction may be necessary if data quality has been adversely affected.
IS Response	Every injection contains the IS analyte	ICAL Standards: Area of individual points must not deviate by more than 50% of ICAL mean area response Samples following ICAL: 50-150% of ICAL mean response Ongoing CCV: 50-150% of ICAL mean response Post-CCV Samples: Area must be within 50-150% of most recent CCVIS (daily opening CCV)	Standard failures must be investigated to determine the cause of the failure. Recalibration may be required. Sample failures may be matrix related and should be evaluated to determine if the data quality has been adversely affected.
Initial Calibration Blank (ICB)	Immediately following the ICAL	Non-DW: < RL for all target analytes	Determine source of interference/contamination, eliminate it and recalibrate.
Second Source Standard Verification (ICV)	Prior to the analysis of samples. Generally immediately after the ICB.	+/-30 for analytes, IS, and SUR.	Correct problem and verify second source standard. If that fails, repeat calibration.
Continuing Calibration Verification (CCV)	Beginning of each analytical sequence, every ten field samples and at the end of each analytical sequence. Alternate between levels 3, 4 and 5.	+/-30%	Rerun any samples analyzed before and after the failing CCV. Take corrective action; if subsequent CCV analyses fail, recalibrate instrument.
Continuing Calibration Verification-Low (CCVL)	Beginning of each analytical sequence that is not preceded by an ICAL to show LOQ is still valid.	CF = 50-150% (ISTD targets) IDA 50-150%	Stop sample acquisition. Take corrective action; if subsequent CCV analyses fail, recalibrate instrument.

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action
Method Blank	One per extraction batch of 20 or fewer samples	Non-DW: < RL for all target analytes	Reprocess MB and associated samples if any target analyte in the MB is at or above the RL, greater than 1/10 the amount detected in any sample or 1/10 the regulatory limit, whichever is greater. If the target is not greater than the RL in the samples associated with an unacceptable method blank, the data may be reported with appropriate qualifiers. If insufficient sample is available to reprocess, report data with appropriate qualifiers.
Laboratory Control Sample	One per extraction batch of 20 or fewer samples (rotate between Low, Med, High)	%R within control limits. See Table 4	Reprep and reanalyze samples for failed analytes. If reanalysis is not possible due to insufficient sample volume, report data with appropriate data qualifiers.
Matrix Spike / Matrix Spike Duplicate	One set per extraction batch when sufficient sample volume is provided	%R within control limits. See Table 4	Evaluate to determine if there is a matrix effect or analytical error. If analytical error, reanalyze or reprocess as appropriate.
Sample Duplicate	One per extraction batch of 20 or fewer samples	RPD within control limits. See Table 4	Evaluate data to determine source for error. If analytical error is suspected, reanalyze or reprocess as appropriate.
Field Reagent Blank	Per client sample set	Non-DW: < RL for all target analytes	Analysis only required if samples contain target analytes at or above the RL. If analytes are present in the FRB at >1/3 RL, all samples must be recollected and re-analyzed.

Table 4: LCS and MS/MSD Control Limits*

Analyte	Water (Low Level) %R	Water (Med-High Level) %R	RPD
Perfluorobutanoic acid (PFBA)	50-150	70-130	20
Perfluoropentanoic acid (PFPeA)	50-150	70-130	20
Perfluorobutanesulfonic acid (PFBS)	50-150	70-130	20
Perfluorohexanoic acid (PFHxA)	50-150	70-130	20
Perfluoropentanesulfonic acid (PFPeS)	50-150	70-130	20
Perfluoroheptanoic acid (PFHpA)	50-150	70-130	20
Perfluorohexanesulfonic acid (PFHxS)	50-150	70-130	20
Perfluorooctanoic acid (PFOA)	50-150	70-130	20
Perfluoroheptanesulfonic acid (PFHpS)	50-150	70-130	20
Perfluorononanoic acid (PFNA)	50-150	70-130	20
Perfluorooctanesulfonic acid (PFOS)	50-150	70-130	20
Perfluorodecanoic acid (PFDA)	50-150	70-130	20
Perfluorononanesulfonic acid (PFNS)	50-150	70-130	20
Perfluoroundecanoic acid (PFUdA)	50-150	70-130	20
Perfluorodecanesulfonic acid (PFDS)	50-150	70-130	20
Perfluorooctanesulfonamide (FOSA)	50-150	70-130	20
Perfluorododecanoic acid (PFDoA)	50-150	70-130	20
Perfluorododecanesulfonic acid (PFDoS)	50-150	70-130	20
Perfluorotridecanoic acid (PFTrDA)	50-150	70-130	20
Perfluorotetradecanoic acid (PFTeDA)	50-150	70-130	20
Perfluorohexadecanoic acid (PFHxDA)	50-150	70-130	20
Perfluorooctadecanoic acid (PFODA)	50-150	70-130	20
1H,1H,2H,2H Perfluorohexanesulfonate (4:2FTS)	50-150	70-130	20

1H,1H,2H,2H Perfluorooctanesulfonate (6:2FTS)	50-150	70-130	20
1H,1H,2H,2H Perfluorodecanesulfonate (8:2FTS)	50-150	70-130	20
1H,1H,2H,2H Perfluorododecanesulfonate (10:2FTS)	50-150	70-130	20
N-Methyl Perfluorooctane sulfonamidoacetic acid (N-MeFOSAA)	50-150	70-130	20
N-Ethyl Perfluorooctane sulfonamidoacetic acid (N-EtFOSAA)	50-150	70-130	20
Hexafluoropropylene oxide dimer acid	50-150	70-130	20
4,8-dioxa-3H-perfluorononanoic acid	50-150	70-130	20
9-chlorohexadecafluoro-3-oxanonane-1-sulfonic acid	50-150	70-130	20
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid	50-150	70-130	20

**The limits in this table are those in effect as of the published date of this SOP. The %R limits are specified by EPA 537r1.1 in sections 9.33, 9.36, and 9.37. The RPD the lab uses is more strict than those referenced in EPA 537 r1.1. If the lab makes changes to any of these limits, the updated limits will be no less strict than those specified in EPA537.*

Appendix A: Terms and Definitions

PFCAs: Perfluorocarboxylic acids
PFSAs: Perfluorinated sulfonic acids
FOSA: Perfluorinated sulfonamide
PFOA: Perfluorooctanoic acid
PFOS: Perfluorooctane sulfonate
PTFE: Polytetrafluoroethylene (e.g., Teflon®)
SPE: Solid phase extraction**.**
PP: Polypropylene
PE: Polyethylene
HDPE: High density polyethylene
AFFF: Aqueous Film Forming Foam
IDA: Isotope dilution analytes
Acceptance Criteria: specified limits placed on characteristics of an item, process or service defined in requirement documents.
Accuracy: the degree of agreement between an observed value and an accepted reference value. Accuracy includes a combination of random error (precision) and systematic error (bias) components which are due to sampling and analytical operations; a data quality indicator.
Analyte: The specific chemicals or components for which a sample is analyzed. (EPA Risk Assessment Guide for Superfund, OSHA Glossary).
Batch: environmental samples that are prepared and/or analyzed together with the same process, using the same lot(s) of reagents. A preparation/digestion batch is composed of one to 20 environmental samples of similar matrix, meeting the above criteria. An analytical batch is composed of prepared environmental samples (extracts, digestates and concentrates), which are analyzed together as a group.
Calibration: a set of operations that establish, under specified conditions, the relationship between values of quantities indicated by a measuring instrument or measuring system, or values represented by a material measure or a reference material and the corresponding values realized by the standards.
Calibration Curve: the graphical relationship between the known values or a series of calibration standards and their instrument response.
Calibration Standard: A substance or reference used to calibrate an instrument.
Continuing Calibration Verification (CCV): a single or multi-parameter calibration standard used to verify the stability of the method over time. Usually from the same source as the calibration curve.
Corrective Action: the action taken to eliminate the cause of an existing nonconformity, defect or other undesirable occurrence in order to prevent recurrence.
Data Qualifier: a letter designation or symbol appended to an analytical result used to convey information to the data user. (Laboratory)
Demonstration of Capability (DOC): procedure to establish the ability to generate acceptable accuracy and precision.
Holding Time: the maximum time that a sample may be held before preparation and/or analysis as promulgated by regulation or as specified in a test method.
Initial Calibration: Analysis of analytical standards for a series of different specified concentrations used to define the quantitative response, linearity and dynamic range of the instrument to target analytes.
Intermediate Standard: a solution made from one or more stock standards at a concentration between the stock and working standard. Intermediate standards may be certified stock standard solutions purchased from a vendor and are also known as secondary standards.

Laboratory Control Sample (LCS): a blank matrix spiked with a known amount of analyte(s) processed simultaneously with and under the same conditions as samples through all steps of the procedure.

Matrix Spike (MS): a field sample to which a known amount of target analyte(s) is added.

Matrix Spike Duplicate (MSD): a second replicate matrix spike

Method Blank (MB): a blank matrix processed simultaneously with and under the same conditions as samples through all steps of the procedure. Also known as the preparation blank (PB).

Method Detection Limit (MDL): the minimum amount of a substance that can be measured with a specified degree of confidence that the amount is greater than zero using a specific measurement system. The MDL is a statistical estimation at a specified confidence interval of the concentration at which relative uncertainty is ±100%. The MDL represents a range where qualitative detection occurs. Quantitative results are only produced in this range and qualified with the proper data reporting flag when a project requires this type of data reporting.

Non-conformance: an indication, judgment, or state of not having met the requirements of the relevant specification, contract or regulation.

Precision: the degree to which a set of observations or measurements of the same property, obtained under similar conditions, conform to themselves.

Preservation: refrigeration and/or reagents added at the time of sample collection to maintain the chemical, physical, and/or biological integrity of the sample.

Quality Control Sample (QC): a sample used to assess the performance of all or a portion of the measurement system.

Reporting Limit (RL): the level to which data is reported for a specific test method and/or sample.

Stock Standard: a solution made with one or more neat standards usually with a high concentration. Also known as a primary standard. Stock standards may be certified solutions purchased from a vendor.

Surrogate: a substance with properties that mimic the analyte of interest but that are unlikely to be found in environmental samples.

Appendix B: Standard Preparation Tables

The standard formulations contained in this appendix are recommended and are subject to change. If the concentration of the stock standard is different than those noted in this table, adjust the standard preparation formulation accordingly. Unless otherwise specified, prepare the standard solutions in methanol using Class A volumetric glassware and Hamilton syringes and assign an expiration date of 1 year from date of preparation unless the parent standard expires sooner; then use the earlier date. See laboratory SOP BR-QA-002 *Standard Preparation* for further guidance. For stock standards solutions made from neat material, assign an expiration date of 2 years from the date of formulation.

Stock Standard Solutions

PFAS LCS/Matrix Spike Stock Solution 1000 ng/mL

Parent Standard	Vendor	Component	Stock Standard Conc (µg/mL)	Volume Added (µL)	Final Volume (mL)	Final Conc (ng/mL)
PFBA	Wellington Laboratories Code: PFBA	Perfluorobutanoic acid	50	200	10	1000
PFPeA	Wellington Laboratories Code: PFPeA	Perfluoropentanoic acid	50	200		1000
PFBS	Wellington Laboratories Code: L-PFBS	Perfluorobutanesulfonic acid	44.2	200		884
PFHxA	Wellington Laboratories Code: PFHxA	Perfluorohexanoic acid	50	200		1000
PFPeS	Wellington Laboratories Code: L-PFPeS	Perfluoropentanesulfonic acid	46.9	200		938
PFHpA	Wellington Laboratories Code: PFHpA	Perfluoroheptanoic acid	50	200		1000
PFHxSK	Wellington Laboratories Code: br-PFHxSK	Perfluorohexanesulfonic acid	45.5	200		910
PFOA	Wellington Laboratories Code: PFOA	Perfluorooctanoic acid	50	200		1000
PFHpS	Wellington Laboratories Code: L-PFHpS	Perfluoroheptanesulfonic acid	47.6	200		952
PFNA	Wellington Laboratories Code: PFNA	Perfluorononanoic acid	50	200		1000
PFOS	Wellington Laboratories Code: br-PFOSK	Perfluorooctanesulfonic acid	46.4	200		928
PFDA	Wellington Laboratories Code: PFDA	Perfluorodecanoic acid	50	200		1000
PFNS	Wellington Laboratories Code: L-PFNS	Perfluorononanesulfonic acid	48.0	200		960
PFUdA	Wellington Laboratories Code: PFUdA	Perfluoroundecanoic acid	50	200		1000
PFDS	Wellington Laboratories Code: L-PFDS	Perfluorodecanesulfonic acid	48.2	200		964
FOSA	Wellington Laboratories Code: FOSA-I	Perfluorooctane sulfonamide	50	200		1000
PFDoA	Wellington Laboratories Code: PFDoA	Perfluorododecanoic acid	50	200		1000
PFDoS	Wellington Laboratories Code: L-PFDoS	Perfluorododecanesulfonic acid	48.4	200		968
PFTrDA	Wellington Laboratories Code: PFTrDA	Perfluorotridecanoic acid	50	200		1000
PFTeDA	Wellington Laboratories Code: PFTeDA	Perfluorotetradecanoic acid	50	200		1000
PFHxDA	Wellington Laboratories Code: PFHxDA	Perfluorohexadecanoic acid	50	200		1000
PFODA	Wellington Laboratories Code: PFODA	Perfluorooctadecanoic acid	50	200		1000
4:2FTS	Wellington Laboratories Code: 4:2FTS	1H,1H,2H,2H-perfluorohexane sulfonate (4:2)	46.7	200		934
6:2FTS	Wellington Laboratories Code: 6:2FTS	1H,1H,2H,2H-perfluorooctane sulfonate (6:2)	47.4	200		948

8:2FTS	Wellington Laboratories Code: 8:2FTS	1H,1H,2H,2H-perfluorodecane sulfonate (8:2)	47.9	200		958
10:2FTS	Wellington Laboratories Code: 10:2FTS	1H,1H,2H,2H-perfluorododecane sulfonate (10:2)	48.2	200		964
NMeFOSAA	Wellington Laboratories Code: br-NMeFOSAA	N-methyl Perfluorooctane sulfonamidoacetic acid	50	200		1000
NEtFOSAA	Wellington Laboratories Code: br-NEtFOSAA	N-ethyl Perfluorooctane sulfonamidoacetic acid	50	200		1000
HFPO-DA	Wellington Laboratories Code: HFPO-DA	Hexafluoropropylene oxide dimer acid	50	200		1000
DONA	Wellington Laboratories Code: NaDONA	4,8-dioxa-3H-perfluorononanoic acid	47.1	200		942
9Cl-PF3ONS	Wellington Laboratories Code: 9Cl-PF3ONS	9-Chlorohexadecafluoro-3-oxanone-1-sulfonate	46.6	200		932
11Cl-PF3OUdS	Wellington Laboratories Code: 11Cl-PF3OUdS	11-Chloroeicosafluoro-3-oxaundecane-1-sulfonate	47.1	200		942

Solvent: Methanol

PFAS Matrix Spike Solution 400 ng/mL

Parent Standard	Vendor	Component	Stock Standard Conc (ng/mL)	Volume Added (mL)	Final Volume (mL)	Final Conc (ng/mL)
PFAS Matrix Spike Stock Solution	In-house	See above list	1000	2.0	5.0	400

Solvent: Methanol

PFAS MDL Spiking Solution 100 ng/mL

Parent Standard	Vendor	Component	Stock Standard Conc (ng/mL)	Volume Added (mL)	Final Volume (mL)	Final Conc (ng/mL)
PFAS Matrix Spike Stock Solution	In-house	See above list	1000	0.10	1.0	100

Solvent: Methanol

PFAS-IDA Solution (Surrogate) 500 ng/mL

Parent Standard	Vendor	Component	Stock Standard Conc (µg/mL)	Volume Added (µL)	Final Volume (mL)	Final Conc (ng/mL)
13C4 PFBA	Wellington Laboratories Code: MPFBA	$^{13}C_4$-Perfluorobutanoic acid	50	200	20	500
13C5-PFPeA	Wellington Laboratories Code: MPFPeA	$^{13}C_5$-Perfluoropentanoic acid	50	200		500
13C3-PFBS	Wellington Laboratories Code: M3PFBS	$^{13}C_3$-Perfluorobutanesulfonic acid	46.5	200		465
13C2 PFHxA	Wellington Laboratories Code: MPFHxA	$^{13}C_2$-Perfluorohexanoic acid	50	200		500
13C4 PFHpA	Wellington Laboratories Code: M4PFHpA	$^{13}C_4$-Perfluoroheptanoic acid	50	200		500
18O2 PFHxS	Wellington Laboratories Code: MPFHxS	$^{18}O_2$-Perfluorohexanesulfonic acid	47.3	200		473
13C4 PFOA	Wellington Laboratories Code: MPFOA	$^{13}C_4$-Perfluorooctanoic acid	50.0	200		500
13C5 PFNA	Wellington Laboratories Code: MPFNA	$^{13}C_5$-Perfluorononanoic acid	50.0	200		500
13C4 PFOS	Wellington Laboratories Code: MPFOS	$^{13}C_4$-Perfluorooctanesulfonic acid	47.8	200		478
13C2 PFDA	Wellington Laboratories Code: MPFDA	$^{13}C_2$-Perfluorodecanoic acid	50.0	200		500
13C8 FOSA	Wellington Laboratories Code: M8FOSA-I	$^{13}C_8$-Perfluorooctane sulfonamide	50.0	200		500

13C2 PFUdA	Wellington Laboratories Code: MPFUdA	$^{13}C_2$-Perfluoroundecanoic acid	50.0	200		500
13C2 PFDoA	Wellington Laboratories Code: MPFDoA	$^{13}C_2$-Perfluorododecanoic acid	50.0	200		500
13C2 PFTeDA	Wellington Laboratories Code: MPFTeDA	$^{13}C_2$-Perfluorotetradecanoic acid	50.0	200		500
13C2 PFHxDA	Wellington Laboratories Code: MPFHxDA	$^{13}C_2$-Perfluorohexadecanoic acid	50.0	200		500
M2-4:2FTS	Wellington Laboratories Code: M2-4:2FTS	Sodium 1H,1H,2H,2H-perfluoro-1-[1,2-$^{13}C_2$]-hexane sulfonate (4:2)	46.7	200		467
M2-6:2FTS	Wellington Laboratories Code: M2-6:2FTS	Sodium 1H,1H,2H,2H-perfluoro-1-[1,2-$^{13}C_2$]-octane sulfonate (6:2)	47.5	200		475
M2-8:2FTS	Wellington Laboratories Code: M2-8:2FTS	Sodium 1H,1H,2H,2H-perfluoro-1-[1,2-$^{13}C_2$]-decane sulfonate (8:2)	47.9	200		479
d3-NMeFOSAA	Wellington Laboratories Code: d3-M-MeFOSAA	N-methyl-d_3-perfluoro-1-octane sulfonamidoacetic acid	50.0	200		500
d5-NEtFOSAA	Wellington Laboratories Code: d5-M-EtFOSAA	N-ethyl-d_5-perfluoro-1-octane sulfonamidoacetic acid	50.0	200		500
M3HFPO-DA	Wellington Laboratories Code: M3HFPO-DA	$^{13}C_3$-Hexafluoropropylene oxide dimer acid	50.0	200		500

Solvent: Methanol

PFAS Internal Standard Stock Solution 5000 ng/mL

Parent Standard	Vendor	Component	Stock Standard Conc (µg/mL)	Volume Added (µL)	Final Volume (mL)	Final Conc (ng/mL)
13C2 PFOA	Wellington Laboratories Code: M2PFOA	$^{13}C_2$-Perfluorooctanoic acid	50.0	400	4	5000

Solvent: Methanol

PFAS Internal Standard Spiking Solution 1250 ng/mL

Parent Standard	Vendor	Component	Stock Standard Conc (µg/mL)	Volume Added (mL)	Final Volume (mL)	Final Conc (ng/mL)
PFAS Internal Standard Stock Solution	In-house	$^{13}C_2$-Perfluorooctanoic acid	5.0	2.0	8.0	1250

Solvent: Methanol

PFAS-IDA-IS Calibration Standards Level 1-Level 6

ICAL Level	Vol of PFAS LCS/Matrix Spike Stock (µL)	Vol of PFAS MDL Spiking Solution (µL)	Nominal Conc of PFAS (ng/mL)	Vol of PFAS-IDA Solution (µL)	Conc of IDA (ng/mL)	Vol of 0.5ppm PFAS-IS Stock Solution (µL)	Conc of IS (ng/mL)	Vol of 80/20 MeOH/H2O (µL)	Final Vol (mL)
1	0	2	0.050	10	1.25	4	1.25	3988	4.0
2	0	2	0.10	5	1.25	2	1.25	1993	2.0
3	0	10	0.50	5	1.25	2	1.25	1985	2.0
4	12	0	1.0	30	1.25	12	1.25	11958	12.0
5	30	0	2.5	30	1.25	12	1.25	11940	12.0
6	20	0	10.0	5	1.25	2	1.25	1975	2.0

The solvent is 80/20 Methanol/Water.

Appendix C: Equations

Initial Calibration Curve Evaluation:

The linear curve uses the following function:

Equation 1

$$y = bx + c$$

Where:

y = $\frac{\text{Area (analyte)}}{\text{Area (IS)}} \times \text{Concentration (IS)}$
x = concentration
b = slope
c = intercept

The quadratic curve uses the following function:

Equation 2

$$y = ax^2 + bx + c$$

Where y, x, b, and c are the same as above, and a = curvature.

The external standard method uses the following equation:

Equation 3

$$ResponseFactor = \frac{Peak\ Area}{Concentration\ of\ Solution (ng/mL)}$$

Equation 4

$$\text{Concentration, ng/mL} = \frac{y - c}{b}$$

Equation 5

$$\text{Concentration, ng/mL} = \frac{-b + \sqrt{b^2 - 4a(c - y)}}{2a}$$

Where:

y = $\frac{\text{Area (analyte)}}{\text{Area (IS)}} \times \text{Concentration (IS)}$
x = concentration
a = curvature
b = slope
c = intercept

Water Sample Result Calculation:

Equation 6

$$\text{Concentration, ng/L} = \frac{C_{ex} V_t}{V_o}$$

Where:

C_{ex} = Concentration measured in sample extract (ng/mL)
V_t = Volume of total extract (mL)
V_o = Volume of water extracted (L)

IDA Recovery Calculation:

Equation 8

$$\%\,\mathrm{Recovery} = \frac{A_t Q_{is}}{A_{is} Q_t RRF_{IDA}} X100$$

Where ng/g = µg/kg and:

RF_{IDA} = Response Factor for IDA compound
A_t = Area response for IDA compound
A_{IS} = Area Response for IS compound
Q_{IS} = Amount of IS added
Q_t = Amount of IDA added

Calibration Factor (CF_x) =

$$\frac{\text{Peak area or height}_{(x)}}{\text{Standard concentration}_{(\mu g/L)}}$$

Mean Calibration Factor ($\overline{CF}$) =

$$\frac{\sum_{i=1}^{n} CF_i}{n}$$

where: n = number of calibration levels

Standard Deviation of the Calibration Factor (SD) =

$$\sqrt{\frac{\sum_{i=1}^{n}\left(CF_i - \overline{CF}\right)^2}{n-1}}$$

where: n = number of calibration levels

Percent Relative Standard Deviation (RSD) of the Calibration Factor =

$$\frac{SD}{\overline{CF}} \times 100\%$$

Percent Difference (%D) =

$$\frac{CF_v - \overline{CF}}{\overline{CF}} \times 100\%$$

where: CF_v = Calibration Factor from the Continuing Calibration Verification (CCV)

Percent Drift =

$$\frac{\text{Calculated Concentration} - \text{Theoretical Concentration}}{\text{Theoretical Concentration}} \times 100\%$$

Percent Recovery (%R) = $\frac{C_s}{C_n} \times 100\%$

where: C_s = Concentration of the Spiked Field or QC Sample
C_n = Nominal Concentration of Spike Added

Percent Recovery (%R) for MS/MSD = $\frac{C_s - C_u}{C_n} \times 100\%$

where: C_s = Concentration of the Spiked Sample
C_u = Concentration of the Unspiked Sample
C_n = Nominal Concentration of Spike Added

Relative Percent Difference (%RPD) = $\frac{|C_1 - C_2|}{\left(\frac{C_1 + C_2}{2}\right)} \times 100\%$

where: C_1 = Measured Concentration of First Sample
C_2 = Measured Concentration of Second Sample

Sample Concentration

Extract

$C_{extract}$ (µg/L) = $\frac{\text{Peak Area (or Height)}}{\overline{\text{CF}}}$

Note: The concentrations of the 3-5 peaks chosen for quantificaton is calculated and the average is then taken for final calculation.

Appendix D: Analytes applied for Secondary Certification with NJDEP

Compound Name	Abbreviation	CAS #
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	PFUdA (PFUnA)	2058-94-8
Perfluorododecanoic acid	PFDoA	307-55-1
Perfluorotridecanoic acid	PFTrDA	72629-94-8
Perfluorotetradecanoic acid	PFTeDA (PFTA)	376-06-7
Perfluorobutanesulfonic acid	PFBS	375-73-5
Perfluorohexanesulfonic acid	PFHxS	355-46-4
Perfluorooctanesulfonic acid	PFOS	1763-23-1

NEW YORK STATE OF OPPORTUNITY. | Department of Health

ANDREW M. CUOMO
Governor

HOWARD A. ZUCKER, M.D., J.D.
Commissioner

LISA J. PINO, M.A., J.D.
Executive Deputy Commissioner

LAB ID: 10391

December 21, 2020

MS. KRISTINE A. DUSABLON
EUROFINS TESTAMERICA BURLINGTON
530 COMMUNITY DRIVE
SUITE #11
SOUTH BURLINGTON, VT 05403

Certificate Expiration Date:
April 01, 2021

Dear Ms. Dusablon,

Enclosed are revised certificate(s) of approval issued to your environmental laboratory for the current permit year. The certificate(s) supersede(s) any previously issued one(s) and are in effect through the expiration date listed. Please carefully examine the certificate(s) to insure that the categories, subcategories, analytes, and methods for which your laboratory is approved are correct. In addition, verify that your laboratory's name, address, lead technical director, and identification number are accurate.

Pursuant to NYCRR Subpart 55-2.2, original certificates must be posted conspicuously in the laboratory and copies shall be made available to any client of the laboratory upon request.

Pursuant to NYCRR Subpart 55-2.6, any misrepresentation of the fields of accreditation (category - method - analyte) for which your laboratory is approved may result in denial, suspension, or revocation of your certification. Any use of the Environmental Laboratory Approval Program (ELAP) or National Environmental Laboratory Accreditation Program (NELAP) name, reference to the laboratory's approval status, and/or using the NELAP logo in any catalogs, advertising, business solicitations, proposals, quotations, laboratory analytical reports, or other materials must include the laboratory's ELAP identification number and distinguish between testing for which the laboratory is approved and testing for which the laboratory is not approved.

If the changes to your certificate are due to insufficient proficiency tests and/or proficiency test failures, the expired certificates (listed below) must be returned to the ELAP office within 10 days of the date of this letter. In addition, your laboratory must investigate the root cause for any insufficient and/or unsatisfactory proficiency tests and keep this on file for review during an onsite assessment. Also, the laboratory must provide a corrective action report to ELAP within 30 calendar days of a request by the program.

If you have any questions, please contact us at the Environmental Laboratory Approval Program, Wadsworth Center, New York State Department of Health, Empire State Plaza, Albany NY, 12237; by phone at (518) 485-5570; by facsimile at (518) 485-5568; and by email at elap@health.ny.gov.

Expired Certificates:
61075 PW NELAC
61076 PW ELAP
61077 NW NELAC
61078 SW NELAC
61079 AI NELAC

Sincerely,

Victoria Pretti

Victoria Pretti
Director and QA Officer
Environmental Laboratory Approval Program

NEW YORK STATE OF OPPORTUNITY. | Department of Health

ANDREW M. CUOMO
Governor

HOWARD A. ZUCKER, M.D., J.D.
Commissioner

LISA J. PINO, M.A., J.D.
Executive Deputy Commissioner

LAB ID: 10391

December 21, 2020

MS. KRISTINE A. DUSABLON
EUROFINS TESTAMERICA BURLINGTON
530 COMMUNITY DRIVE
SUITE #11
SOUTH BURLINGTON, VT 05403

Dear Ms. Dusablon,

A revised certificate has been generated because of the change(s) listed below.

If your laboratory has applied for a change in the laboratory's location and/or technical director, the approved change(s) will be reflected on the certificate.

If the changes to your certification are due to insufficient proficiency tests and/or proficiency test failures, the expired certificates must be returned to the Environmental Laboratory Approval Program (ELAP) office within 10 days of the date of this letter. In addition, your laboratory must investigate the root cause for any insufficient and/or unsatisfactory proficiency tests and keep this on file for review during an onsite assessment. Also, the laboratory must provide a corrective action report to ELAP within 30 calendar days of a request by the program.

In addition, your laboratory must investigate and document the root cause for any insufficient and/or unsatisfactory proficiency tests. If your lab lost accreditation due to two PT failures, you must submit the corrective action response to ELAP for review before accreditation will be re-instated.

AppCat	Analyte Name	Method Name	Comments	Date
AI - NELAC			Lab Address Changed	12/21/2020
NW - NELAC			Lab Address Changed	12/21/2020
PW			Lab Address Changed	12/21/2020
PW - NELAC			Lab Address Changed	12/21/2020
SW - NELAC			Lab Address Changed	12/21/2020

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2021
Issued April 01, 2020
Revised December 21, 2020

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. KRISTINE A. DUSABLON
EUROFINS TESTAMERICA BURLINGTON
530 COMMUNITY DRIVE SUITE #11
SOUTH BURLINGTON, VT 05403

NY Lab Id No: 10391

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2016) for the category
ENVIRONMENTAL ANALYSES AIR AND EMISSIONS
All approved analytes are listed below:

Acrylates	
Acetonitrile	EPA TO-15
Methyl methacrylate	EPA TO-15
Chlorinated Hydrocarbons	
1,2,4-Trichlorobenzene	EPA TO-15
Hexachlorobutadiene	EPA TO-15
Polychlorinated Biphenyls	
PCBs and Aroclors	EPA TO-10A
	EPA TO-4A
Polynuclear Aromatics	
Acenaphthene	EPA TO-13A
Acenaphthylene	EPA TO-13A
Anthracene	EPA TO-13A
Benzo(a)anthracene	EPA TO-13A
Benzo(a)pyrene	EPA TO-13A
Benzo(b)fluoranthene	EPA TO-13A
Benzo(g,h,i)perylene	EPA TO-13A
Benzo(k)fluoranthene	EPA TO-13A
Chrysene	EPA TO-13A
Dibenzo(a,h)anthracene	EPA TO-13A
Fluoranthene	EPA TO-13A
Fluorene	EPA TO-13A
Indeno(1,2,3-cd)pyrene	EPA TO-13A
Naphthalene	EPA TO-13A
	EPA TO-15
Polynuclear Aromatics	
Phenanthrene	EPA TO-13A
Pyrene	EPA TO-13A
Purgeable Aromatics	
1,2,4-Trimethylbenzene	EPA TO-15
1,2-Dichlorobenzene	EPA TO-15
1,3,5-Trimethylbenzene	EPA TO-15
1,3-Dichlorobenzene	EPA TO-15
1,4-Dichlorobenzene	EPA TO-15
2-Chlorotoluene	EPA TO-15
Benzene	EPA TO-15
Chlorobenzene	EPA TO-15
Ethyl benzene	EPA TO-15
m/p-Xylenes	EPA TO-15
o-Xylene	EPA TO-15
Styrene	EPA TO-15
Toluene	EPA TO-15
Total Xylenes	EPA TO-15
Purgeable Halocarbons	
1,1,1-Trichloroethane	EPA TO-15
1,1,2,2-Tetrachloroethane	EPA TO-15
1,1,2-Trichloro-1,2,2-Trifluoroethane	EPA TO-15
1,1,2-Trichloroethane	EPA TO-15
1,1-Dichloroethane	EPA TO-15
1,1-Dichloroethene	EPA TO-15
1,2-Dibromoethane	EPA TO-15

Serial No.: 62336

Property of the New York State Department of Health. Certificates are valid only at the address shown, must be conspicuously posted, and are printed on secure paper. Continued accreditation depends on successful ongoing participation in the Program. Consumers are urged to call (518) 485-5570 to verify the laboratory's accreditation status.

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2021
Issued April 01, 2020
Revised December 21, 2020

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

NY Lab Id No: 10391

MS. KRISTINE A. DUSABLON
EUROFINS TESTAMERICA BURLINGTON
530 COMMUNITY DRIVE SUITE #11
SOUTH BURLINGTON, VT 05403

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2016) for the category ENVIRONMENTAL ANALYSES AIR AND EMISSIONS
All approved analytes are listed below:

Purgeable Halocarbons

1,2-Dichloroethane	EPA TO-15
1,2-Dichloropropane	EPA TO-15
3-Chloropropene (Allyl chloride)	EPA TO-15
Bromodichloromethane	EPA TO-15
Bromoform	EPA TO-15
Bromomethane	EPA TO-15
Carbon tetrachloride	EPA TO-15
Chloroethane	EPA TO-15
Chloroform	EPA TO-15
Chloromethane	EPA TO-15
cis-1,2-Dichloroethene	EPA TO-15
cis-1,3-Dichloropropene	EPA TO-15
Dibromochloromethane	EPA TO-15
Dichlorodifluoromethane	EPA TO-15
Methylene chloride	EPA TO-15
Tetrachloroethene	EPA TO-15
trans-1,2-Dichloroethene	EPA TO-15
trans-1,3-Dichloropropene	EPA TO-15
Trichloroethene	EPA TO-15
Trichlorofluoromethane	EPA TO-15
Vinyl bromide	EPA TO-15
Vinyl chloride	EPA TO-15

Volatile Chlorinated Organics

Benzyl chloride	EPA TO-15

Volatile Organics

1,2-Dichlorotetrafluoroethane	EPA TO-15
1,3-Butadiene	EPA TO-15
1,4-Dioxane	EPA TO-15
2,2,4-Trimethylpentane	EPA TO-15
2-Butanone (Methylethyl ketone)	EPA TO-15
4-Methyl-2-Pentanone	EPA TO-15
Acetone	EPA TO-15
Carbon Disulfide	EPA TO-15
Cyclohexane	EPA TO-15
Hexane	EPA TO-15
Isopropanol	EPA TO-15
Methyl tert-butyl ether	EPA TO-15
n-Heptane	EPA TO-15
tert-butyl alcohol	EPA TO-15

Serial No.: 62336

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NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2021
Issued April 01, 2020
Revised December 21, 2020

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

NY Lab Id No: 10391

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530 COMMUNITY DRIVE SUITE #11
SOUTH BURLINGTON, VT 05403

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2016) for the category ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved analytes are listed below:

Characteristic Testing	
Synthetic Precipitation Leaching Proc.	EPA 1312
TCLP	EPA 1311
Metals I	
Barium, Total	EPA 6010D
	EPA 6020B
Cadmium, Total	EPA 6010D
	EPA 6020B
Calcium, Total	EPA 6010D
	EPA 6020B
Chromium, Total	EPA 6010D
	EPA 6020B
Copper, Total	EPA 6010D
	EPA 6020B
Iron, Total	EPA 6010D
	EPA 6020B
Lead, Total	EPA 6010D
	EPA 6020B
Magnesium, Total	EPA 6010D
	EPA 6020B
Manganese, Total	EPA 6010D
	EPA 6020B
Nickel, Total	EPA 6010D
	EPA 6020B
Potassium, Total	EPA 6010D
	EPA 6020B

Metals I	
Silver, Total	EPA 6010D
	EPA 6020B
Sodium, Total	EPA 6010D
	EPA 6020B
Strontium, Total	EPA 6010D
Metals II	
Aluminum, Total	EPA 6010D
	EPA 6020B
Antimony, Total	EPA 6010D
	EPA 6020B
Arsenic, Total	EPA 6010D
	EPA 6020B
Beryllium, Total	EPA 6010D
	EPA 6020B
Mercury, Total	EPA 7471B
Selenium, Total	EPA 6010D
	EPA 6020B
Vanadium, Total	EPA 6010D
	EPA 6020B
Zinc, Total	EPA 6010D
	EPA 6020B
Metals III	
Cobalt, Total	EPA 6010D
	EPA 6020B
Molybdenum, Total	EPA 6010D

Serial No.: 62335

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All approved analytes are listed below:

Metals III

Molybdenum, Total	EPA 6020B
Thallium, Total	EPA 6010D
	EPA 6020B
Tin, Total	EPA 6010D
Titanium, Total	EPA 6010D

Miscellaneous

Organic Carbon, Total	USER DEFINED Lloyd Kahn mod
Perchlorate	EPA 6850

Nitroaromatics and Isophorone

1,3,5-Trinitrobenzene	EPA 8330B
1,3-Dinitrobenzene	EPA 8330B
2,4,6-Trinitrotoluene	EPA 8330B
2,4-Dinitrotoluene	EPA 8330B
2,6-Dinitrotoluene	EPA 8330B
2-Amino-4,6-dinitrotoluene	EPA 8330B
2-Nitrotoluene	EPA 8330B
3-Nitrotoluene	EPA 8330B
4-Amino-2,6-dinitrotoluene	EPA 8330B
4-Nitrotoluene	EPA 8330B
Hexahydro-1,3,5-trinitro-1,3,5-triazine	EPA 8330B
Methyl-2,4,6-trinitrophenylnitramine	EPA 8330B
Nitrobenzene	EPA 8330B
Octahydro-tetranitro-tetrazocine	EPA 8330B

Polychlorinated Biphenyls

Aroclor 1016 (PCB-1016)	EPA 8082A
Aroclor 1221 (PCB-1221)	EPA 8082A
Aroclor 1232 (PCB-1232)	EPA 8082A
Aroclor 1242 (PCB-1242)	EPA 8082A
Aroclor 1248 (PCB-1248)	EPA 8082A
Aroclor 1254 (PCB-1254)	EPA 8082A
Aroclor 1260 (PCB-1260)	EPA 8082A
Aroclor 1262 (PCB-1262)	EPA 8082A
Aroclor 1268 (PCB-1268)	EPA 8082A

Sample Preparation Methods

	EPA 3050B
	EPA 3550C
	EPA 3540C
	EPA 3541

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ENVIRONMENTAL ANALYSES NON POTABLE WATER
All approved analytes are listed below:

Dissolved Gases

Ethane	RSK-175
Ethene (Ethylene)	RSK-175
Methane	RSK-175

Metals I

Barium, Total	EPA 6010D
	EPA 6020B
Cadmium, Total	EPA 6010D
	EPA 6020B
Calcium, Total	EPA 6010D
	EPA 6020B
Chromium, Total	EPA 6010D
	EPA 6020B
Copper, Total	EPA 6010D
	EPA 6020B
Iron, Total	EPA 6010D
	EPA 6020B
Lead, Total	EPA 6010D
	EPA 6020B
Magnesium, Total	EPA 6010D
	EPA 6020B
Manganese, Total	EPA 6010D
	EPA 6020B
Nickel, Total	EPA 6010D
	EPA 6020B
Potassium, Total	EPA 6010D

Metals I

Potassium, Total	EPA 6020B
Sodium, Total	EPA 6010D
	EPA 6020B
Strontium, Total	EPA 6010D

Metals II

Aluminum, Total	EPA 6010D
	EPA 6020B
Arsenic, Total	EPA 6010D
	EPA 6020B
Beryllium, Total	EPA 6010D
	EPA 6020B
Mercury, Total	EPA 7470A
Selenium, Total	EPA 6010D
	EPA 6020B
Vanadium, Total	EPA 6010D
	EPA 6020B
Zinc, Total	EPA 6010D
	EPA 6020B

Metals III

Cobalt, Total	EPA 6010D
	EPA 6020B
Molybdenum, Total	EPA 6010D
	EPA 6020B
Thallium, Total	EPA 6010D
	EPA 6020B

Serial No.: 62334

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All approved analytes are listed below:

Metals III

Tin, Total	EPA 6010D
Titanium, Total	EPA 6010D

Miscellaneous

Perchlorate	EPA 6850

Nitroaromatics and Isophorone

1,3,5-Trinitrobenzene	EPA 8330B
1,3-Dinitrobenzene	EPA 8330B
2,4,6-Trinitrotoluene	EPA 8330B
2,4-Dinitrotoluene	EPA 8330B
2,6-Dinitrotoluene	EPA 8330B
2-Amino-4,6-dinitrotoluene	EPA 8330B
2-Nitrotoluene	EPA 8330B
3-Nitrotoluene	EPA 8330B
4-Amino-2,6-dinitrotoluene	EPA 8330B
4-Nitrotoluene	EPA 8330B
Hexahydro-1,3,5-trinitro-1,3,5-triazine	EPA 8330B
Methyl-2,4,6-trinitrophenylnitramine	EPA 8330B
Nitrobenzene	EPA 8330B
Octahydro-tetranitro-tetrazocine	EPA 8330B

Polychlorinated Biphenyls

Aroclor 1016 (PCB-1016)	EPA 8082A
Aroclor 1221 (PCB-1221)	EPA 8082A
Aroclor 1232 (PCB-1232)	EPA 8082A
Aroclor 1242 (PCB-1242)	EPA 8082A

Polychlorinated Biphenyls

Aroclor 1248 (PCB-1248)	EPA 8082A
Aroclor 1254 (PCB-1254)	EPA 8082A
Aroclor 1260 (PCB-1260)	EPA 8082A
Aroclor 1262 (PCB-1262)	EPA 8082A
Aroclor 1268 (PCB-1268)	EPA 8082A

Sample Preparation Methods

EPA 3010A
EPA 3510C
EPA 3520C

Serial No.: 62334

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is hereby APPROVED as an Environmental Laboratory for the category
ENVIRONMENTAL ANALYSES POTABLE WATER
All approved subcategories and/or analytes are listed below:

Perfluorinated Alkyl Acids

Perfluorooctanesulfonic acid (PFOS)	ISO 25101
Perfluorooctanoic acid (PFOA)	ISO 25101

Serial No.: 62333

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Miscellaneous

Perchlorate	EPA 331.0

Serial No.: 62332

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Title: Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometery (GC/MS), SW846 Methods 8270D and 8270E

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Approvals (Signature/Date):

Sylvanus Klusey Organics Operations Manager	6/29/2020 Date	Dan Helfrich Health & Safety Manager	6/29/2020 Date
Carl Armbruster Quality Assurance Manager	6/29/2020 Date	Mark Acierno Laboratory Director	6/29/2020 Date
Diaa Nimer SVOA GC/MS Manager	6/29/2020 Date		

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1.0 Scope and Application

1.1 Analytes, Matrix(s), and Reporting Limits

USEPA Methods 8270D and 8270E are analytical methods which employ the use of GC/MS to determine the concentration of semivolatile organic compounds in extracts prepared from many types of solid waste matrices, soils, and water samples

TestAmerica Edison has the capability to analyze and report the compounds listed in Table 1 via Methods 8270D and 8270E.

Table 1

Compound	CAS No.	Compound	CAS No.
1,1'-Biphenyl	92-52-4	Anthracene **(1)**	120-12-7
1,2,4,5-Tetrachlorobenzene	95-94-3	Atrazine	1912-24-9
1,2,4-Trichlorobenzene	120-82-1	Benzaldehyde	100-52-7
1,2-Dichlorobenzene	95-50-1	Benzidine	92-87-5
1,2-Diphenylhydrazine	122-66-7	Benzo[a]anthracene **(1)**	56-55-3
1,3-Dichlorobenzene	541-73-1	Benzo[a]pyrene **(1)**	50-32-8
1,3-Dimethylnaphthalene	575-41-7	Benzo[b]fluoranthene **(1)**	205-99-2
1,4-Dichlorobenzene	106-46-7	Benzo[g,h,i]perylene **(1)**	191-24-2
1,4-Dichlorobenzene-d4 **(ISTD)**	3855-82-1	Benzo[k]fluoranthene **(1)**	207-08-9
1,4-Dioxane **(1) (2)**	123-91-1	Benzoic acid	65-85-0
1-Methylnaphthalene	90-12-0	Benzyl alcohol	100-51-6
1-Naphthylamine	134-32-7	Bis(2-chloroethoxy)methane	111-91-1
2,2'-oxybis[1-chloropropane]	108-60-1	Bis(2-chloroethyl)ether **(1)**	111-44-4
2,3,4,6-Tetrachlorophenol	58-90-2	Bis(2-ethylhexyl) phthalate	117-81-7
2,3,7,8-TCDD	1746-01-6	Bisphenol-A	80-05-7
2,3-Dihydroindene	496-11-7	Butyl benzyl phthalate	85-68-7
2,3-Dimethylaniline	87-59-2	Caprolactam	105-60-2
2,4,5-Trichlorophenol	95-95-4	Carbamazepine	298-46-4
2,4,5-Trimethylaniline	137-17-7	Carbazole	86-74-8
2,4,6-Tribromophenol **(Surrogate)**	118-79-6	Chrysene **(1)**	218-01-9
2,4,6-Trichlorophenol	88-06-2	Chrysene-d12 **(ISTD)**	1719-03-5
2,4-Dichlorophenol	120-83-2	Coumarin	91-64-5
2,4-Dimethylphenol	105-67-9	Dibenz(a,h)anthracene **(1)**	53-70-3
2,4-Dinitrophenol	51-28-5	Dibenzofuran	132-64-9
2,4-Dinitrotoluene	121-14-2	Diethyl phthalate	84-66-2
2,4-Xylidine	95-68-1	Dimethyl phthalate	131-11-3
2,6-Dinitrotoluene	606-20-2	Di-n-butyl phthalate	84-74-2
2-Chloronaphthalene	91-58-7	Di-n-octyl phthalate	117-84-0
2-Chlorophenol	95-57-8	Fluoranthene **(1)**	206-44-0
2-Ethylaniline	578-54-1	Fluorene **(1)**	86-73-7
2-Fluorobiphenyl **(Surrogate)**	321-60-8	Hexachlorobenzene **(1)**	118-74-1
2-Fluorophenol **(Surrogate)**	367-12-4	Hexachlorobutadiene	87-68-3
2-Methylnaphthalene	91-57-6	Hexachlorocyclopentadiene	77-47-4
2-Methylphenol	95-48-7	Hexachloroethane	67-72-1
2-Naphthylamine	91-59-8	Indeno[1,2,3-cd]pyrene **(1)**	193-39-5
2-Nitroaniline	88-74-4	Isophorone	78-59-1
2-Nitrophenol	88-75-5	n,n'-Dimethylaniline	121-69-7
2-tertbutyl-4-methylphenol	2409-55-4	Naphthalene **(1)**	91-20-3
2-Toluidine	95-53-4	Naphthalene-d8 **(ISTD)**	1146-65-2

Table 1

Compound	CAS No.	Compound	CAS No.
3 & 4 Methylphenol	15831-10-4	n-Decane	124-18-5
3,3'-Dichlorobenzidine	91-94-1	Nitrobenzene	98-95-3
3,4-Dimethylaniline	95-64-7	Nitrobenzene-d5 **(Surrogate)**	4165-60-0
3,5-di-tert-butyl-4-hydroxytol	128-37-0	N-Nitrosodimethylamine **(1)**	62-75-9
3-Nitroaniline	99-09-2	N-Nitrosodi-n-propylamine	621-64-7
4,6-Dinitro-2-methylphenol **(1)**	534-52-1	N-Nitrosodiphenylamine	86-30-6
4-Bromophenyl phenyl ether	101-55-3	n-Octadecane	593-45-3
4-chloro-2-methylaniline	95-69-2	o-Toluidine-d9 **(Surrogate)**	194423-47-7
4-Chloro-3-methylphenol	59-50-7	Pentachloronitrobenzene	82-68-8
4-Chloroaniline	106-47-8	Pentachlorophenol **(1)**	87-86-5
4-Chloroaniline–d4 **(Surrogate)**	191656-33-4	Perylene-d12 **(ISTD)**	1520-96-3
4-Chlorophenyl phenyl ether	7005-72-3	Phenanthrene **(1)**	85-01-8
4-Methylphenol	106-44-5	Phenanthrene-d10 **(ISTD**)	1517-22-2
4-Nitroaniline	100-01-6	Phenol	108-95-2
4-Nitrophenol	100-02-7	Phenol-d5 **(Surrogate)**	4165-62-2
Acenaphthene **(1)**	83-32-9	Phenyl ether	101-84-8
Acenaphthene-d10 **(ISTD)**	15067-26-2	Pyrene **(1)**	129-00-0
Acenaphthylene **(1)**	208-96-8	Pyridine	110-86-1
Acetophenone	98-86-2	Terphenyl-d14 **(Surrogate)**	1718-51-0
Aniline	62-53-3	Total Cresols	STL00160
Aniline-d5 **(Surrogate)**	4165-61-1		

(1) Compound can be analyzed by full scan or Selected Ion Monitoring (SIM).
(2) Compound can also be analyzed by Isotope Dilution/SIM.

1.2 For a listing of method detection limits (MDLs) and Reporting Limits (RLs) please refer to the currently active Method 8270 Method Limit Groups in TALS (TestAmerica LIMS).

1.3 On occasion clients may request modifications to this SOP. These modifications are handled following the procedures outlined in Section 7 (*Review of Work)*, and Section 19 (*Test Methods and Method Validation)* in TestAmerica Edison's Quality Assurance Manual (TestAmerica Edison Document No. ED-QA-LQM).

1.4 Any variation in procedure shall be completely documented using an NCM. The NCM is approved by the supervisor and then automatically sent to the laboratory Project Manager by e-mail so that the client can be notified as appropriate. The QA department also receives NCMs by e-mail for tracking and trending purposes. The NCM process is described in more detail in SOP ED-GEN-003. The NCM shall be filed in the project file and addressed in the case narrative. Any unauthorized deviations from this procedure must also be documented as a nonconformance, with a cause and corrective action described.

2.0 <u>Summary of Method</u>

2.1 This method is used for the analysis of aqueous and solid matrices for semi-volatile base, neutral and acid organic compounds that are extracted from the sample matrix with an organic solvent.

2.2 An aliquot of sample containing surrogate spiking compounds is extracted with an organic solvent. The extract is concentrated on a steam bath to a suitable volume. Internal standards are added to the extract.

2.3 Sample extraction techniques are specified for each matrix in the following TestAmerica Edison SOPs:

- ED-ORP-002 (*Extraction of Semivolatile Organic Compounds in Water by Separatory Funnel, SW846 Method 3510C*);
- ED-ORP-043 (*SW846 Method 3580A - Waste Dilution Prep for Analysis of BNAs by SW846 Method 8270);*
- ED-ORP-0044 (*Microwave Extraction for Solids, SW846 Method 3546*);

2.4 A small aliquot of the extract is injected into a gas chromatograph (GC) equipped with a capillary column. The GC is temperature programmed to separate the compounds which were recovered during the extraction step by boiling point. The effluent of the gas chromatograph is interfaced to a mass spectrometer (MS) which is used to detect the compounds eluting from the GC. The detected compounds are fragmented with an electron beam to produce a mass spectrum which is characteristic of the compound introduced into the MS. Identification of target analytes is accomplished by comparing their mass spectra with the electron ionization spectra of authentic standards. Quantitation is accomplished by comparing the response of a major ion (quantitation ion) relative to an internal standard established through a five-point calibration (six points for second order regression). Specific calibration and quality control steps are included in the method that must be performed and must meet the specifications of SW846 Methods 8270D or 8270E as applicable.

2.5 The standard preparation procedure for aqueous samples involves use of a Reduced Volume Extraction (250 ml) (RVE) followed by analysis using a Large Volume Injection (LVI). Optionally, a full volume (1000 ml nominal) may be employed. The details of the extractions are outlined in the applicable prep SOPs while the analytical details for 8270D and 8270E are presented in this SOP.

2.6 These methods are also applicable to the analysis of samples by Selected Ion Monitoring (SIM) for the purpose of obtaining lower reporting limits for the following compounds:

Table 2 – SIM Analytes	
SIM Analytes	**CAS #**
1,4-Dioxane	123-91-1
4,6-Dinitro-2-methylphenol	534-52-1
Acenaphthene	83-32-9

Table 2 – SIM Analytes	
SIM Analytes	**CAS #**
Acenaphthylene	208-96-8
Anthracene	120-12-7
Benzo[a]anthracene	56-55-3
Benzo[a]pyrene	50-32-8
Benzo[b]fluoranthene	205-99-2
Benzo[g,h,i]perylene	191-24-2
Benzo[k]fluoranthene	207-08-9
Bis(2-chloroethyl)ether	111-44-4
Chrysene	218-01-9
Dibenz(a,h)anthracene	53-70-3
Fluoranthene	206-44-0
Fluorene	86-73-7
Hexachlorobenzene	118-74-1
Indeno[1,2,3-cd]pyrene	193-39-5
Naphthalene	91-20-3
N-Nitrosodimethylamine	62-75-9
Pentachlorophenol	87-86-5
Phenanthrene	85-01-8
Pyrene	129-00-0

2.7 An isotope dilution selected ion monitoring (SIM) technique for the analysis of 1,4-dioxane in water at a reporting level of 0.4 ug/l is also described in this SOP. Using this technique 1,4-dioxane-d8 is added prior to sample extraction and is used as an internal standard to calculate the concentration of 1,4-dioxane present. Additionally, 1,4-dichorobenzene-d4 is added to the extract prior to analysis to monitor the recovery of 1,4-dioxane-d8.

3.0 Definitions

For a complete list of definitions refer to Appendix 2 in the most current revision of the Quality Assurance Manual (ED-QA-LQM).

4.0 Interferences

4.1 GC/MS data from all blanks, samples, and spikes must be evaluated for interferences. Analysts must take steps to determine the source of the interference and take corrective action to eliminate the problem.

4.1.1 Contamination by carryover can occur whenever high-concentration and low-concentration samples are sequentially analyzed. To reduce carryover, the sample syringe is automatically rinsed with solvent between sample injections. Whenever an unusually concentrated sample is encountered, it should be followed by the analysis of a solvent blank to check for cross-contamination. Alternately, verify that the sample analyzed after the high concentration sample does not show any carryover through inspection of chromatogram and target results.

4.1.2 Contaminants from the extraction process detected in the method blank should be evaluated to determine the impact on the analysis. Interferences from any target analyte must not be present in the method blank above the reporting limit for that compound. If these types of interferences occur, corrective action is required. The source should be identified and corrective action initiated to eliminate the interference from the extraction process. Affected samples must be re-extracted and re-analyzed.

4.1.3 The analyst must take precautions to make sure that contaminants do not enter the analytical system. These precautions include systematic procedures designed to eliminate interferences.

4.2 Some compounds analyzed by this method are unstable or sensitive to extraction and/or instrument conditions:

- Benzidine is easily oxidized during extraction. Neutral extraction may enhance the recovery of this compound.
- Hexachlorocyclopentadiene breaks down photochemically and can decompose from high temperatures, particularly in the injection port of the GC. This compound can also react with acetone in solution.
- 1,2-Diphenylhydrazine is unstable even at room temperature and readily converts to azobenzene.
- Phenols are sensitive to active sites and can give a low response or exhibit poor chromatography by tailing. Therefore, it is important the GC is maintained in the best possible condition. See Section 10.1 for proper daily maintenance.
- N-Nitrosodiphenylamine decomposes in the gas chromatographic inlet and cannot be distinguished from diphenylamine.
- 3-Methylphenol cannot be separated from 4-methylphenol by the conditions specified in this method. They are reported as 3 and 4-methylphenol.
- Pyridine may perform poorly at the GC injection port temperatures listed in this SOP. Lowering the injection port temperature may reduce the amount of degradation.

5.0 <u>Safety</u>

Employees must abide by the policies and procedures in the Corporate Environmental Health and Safety Manual (CW-E-M-001) and this document. This procedure may involve hazardous material, operations and equipment. This SOP does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of the method to follow appropriate safety, waste disposal and health practices under the assumption that all samples and reagents are potentially hazardous. Safety glasses, gloves, lab coats and closed-toe, nonabsorbent shoes are a minimum.

5.1. Specific Safety Concerns or Requirements

The gas chromatograph and mass spectrometer contain zones that have elevated temperatures. The analyst needs to be aware of the locations of those zones, and must cool them to room temperature prior to working on them.

The mass spectrometer is under deep vacuum. The mass spectrometer must be brought to atmospheric pressure prior to working on the source.

There are areas of high voltage in both the gas chromatograph and the mass spectrometer. Depending on the type of work involved, either turn the power to the instrument off, or disconnect it from its source of power.

5.2. Primary Materials Used

The following is a list of the materials used in this method, which have a serious or significant hazard rating. **Note: This list does not include all materials used in the method. The table contains a summary of the primary hazards listed in the MSDS for each of the materials listed in the table.** A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the MSDS for each material before using it for the first time or when there are major changes to the MSDS.

Material (1)	Hazards	Exposure Limit (2)	Signs and symptoms of exposure
Methanol	Flammable Poison Irritant	200 ppm-TWA	A slight irritant to the mucous membranes. Toxic effects exerted upon nervous system, particularly the optic nerve. Symptoms of overexposure may include headache, drowsiness and dizziness. Methyl alcohol is a defatting agent and may cause skin to become dry and cracked. Skin absorption can occur; symptoms may parallel inhalation exposure. Irritant to the eyes.
Methylene Chloride	Carcinogen Irritant	25 ppm-TWA 125 ppm-STEL	Causes irritation to respiratory tract. Has a strong narcotic effect with symptoms of mental confusion, light-headedness, fatigue, nausea, vomiting and headache. Causes irritation, redness and pain to the skin and eyes. Prolonged contact can cause burns. Liquid degreases the skin. May be absorbed through skin.
Toluene	Flammable Poison Irritant	200 ppm-TWA 300 ppm-Ceiling	Inhalation may cause irritation of the upper respiratory tract. Symptoms of overexposure may include fatigue, confusion, headache, dizziness and drowsiness. Peculiar skin sensations (e. g. pins and needles) or numbness may be produced. Causes severe eye and skin irritation with redness and pain. May be absorbed through the skin.
Dimethyl-dichloro-silane	Flammable	none	Can be corrosive to the respiratory tract causing severe irritation and tissue damage. Harmful if absorbed through the skin. May cause severe irritation and systemic damage. Severely irritating to the skin and eyes. Harmful if swallowed. Can cause abdominal discomfort, nausea, vomiting, diarrhea, and irritation to the mouth, throat and stomach.
1 – Always add acid to water to prevent violent reactions.			
2 – Exposure limit refers to the OSHA regulatory exposure limit.			

6.0 Equipment and Supplies

6.1 Gas chromatograph/mass spectrometer system

6.1.1 Gas chromatograph: An Agilent/HP 6890/7890/900 Intuvo (or equivalent) houses the capillary column. The GC provides a splitless injection port and allows the column to be directly coupled to the mass spectrometer. The oven is temperature programmable to meet the requirements of the method. An HP/Agilent 7673/7683/7963 autosampler (or equivalent) with a 10 ul syringe provides automatic injection of sample extracts while the instrument is unattended.

6.1.2 Analytical Column: 30m x 0.25mm ID, 0.25 um film thickness, Restek Rxi-5Sil MS, Catalog #13623

6.1.3 Mass spectrometer: Agilent (HP) 5972, 5973, 5975 or 5977A Mass Selective Detector (MSD) Capable of scanning from 35 to 500 amu every 1 sec or less, using 70 volts electron energy in the electron ionization mode. The mass spectrometer must be capable of producing a mass spectrum for 50 ng of decafluorotriphenylphosphine (DFTPP) which meets the criteria in Section 9.2.1 when 2 ul of the 25 ug/ml GC/MS tuning standard is injected through the GC.

6.1.4 GC/MS interface: Any GC-to-MS interface may be used that gives acceptable calibration points at 50 ng per injection for each compound of interest and achieves acceptable tuning performance criteria.

6.1.5 Data system: The data system is interfaced to the mass spectrometer and accommodates continuous acquisition and storage of GC/MS data throughout the duration of the chromatographic program. The data system consists of a Hewlett-Packard Chemstation equipped with Mustang software used for instrument control and data acquisition. This, in turn, is interfaced to TestAmerica's Chrom software for data processing. Data from sample extract analysis can be accessed in real-time, while sample data reports and library searches can be performed on data files from previously run samples. The software is also capable of searching any GC/MS data file for ions of a specific mass whose abundances can be plotted versus time or scan number which allows integration of abundances for any extracted ion between specified times or scan-number limits. Library searches utilize a NIST 02.1 Mass Spectral Library.

6.2 Bottles, glass with polytetrafluoroethylene (PTFE)-lined screw caps or crimp tops.

6.3 Injection port liners, splitless

6.4 Injection port septa

6.5 Injection port graphite seals

6.6 Pre-silanized glass wool (Supelco 2-0411 or equivalent)

6.7 Syringes, Assorted sizes 10ul - 1000ul; gas-tight

6.8 Bottles, 10 and 5ml amber screw cap with Teflon liner

6.9 Vials, 2ml amber screw cap with Teflon liner

6.10 Wheaton microvials 100ul (or equivalent)

6.11 Volumetric Flasks, Class A with ground glass stoppers (2ml - 100ml)

6.12 Analytical balance, ASP Model SP-180 (or equivalent), capable of accurately weighing to 0.0001 gr.

7.0 Reagents and Standards

The following items are recommended for performing this procedure. Equivalent items should only be used when they result in an improvement in quality, efficiency, productivity, or cost. An item can be considered equivalent if with its use, the analytical and QA/QC requirements in this SOP can be met. Please refer to the MSDS prior to the use of any reagent or standard.

The preparation of standards, surrogates and spiking solutions is documented in the TALS Reagent Module. Formulary reports can be generated upon request.

7.1. Reagents:

7.1.1. Methylene Chloride: J.T.Baker Resi-Analyzed, used for Organic Residue Analysis (P/N 9266-V8 or equivalent).

7.1.2. Methanol: J.T.Baker Purge and Trap Grade (P/N 9077-02 or equivalent).

7.1.3. Sylon-CT: Supelco (P/N 33065-U or equivalent). Sylon-CT is a highly reactive silanizing reagent consisting of 95% Toluene and 5% Dimethyldichlorosilane (DMDCS).

7.1.4. Each lot of solvent is screened for contaminants before being used for analysis as detailed in TestAmerica Corporate Quality SOP No. CA-Q-S-001 (*Solvent & Acid Lot Testing & Approval*) and TestAmerica Edison SOP No. ED-GEN-023 (*Bulk Solvent Testing and Approval*).

7.2. Standards:

7.2.1. **Calibration Standards (Full Scan Analysis)**: Stock analytical standard solutions are purchased mainly from Restek Corporation. Other standards are prepared in the laboratory as needed using neat compounds or prepared solutions purchased from Agilent, SPEX CertiPrep, Chem Service, Accustandard, Supelco or other suppliers. Standards prep instructions are detailed for the following full scan analyte list options:

- Full Volume Aqueous Prep; and,
- Reduced Volume Aqueous Prep and Soils

Secondary dilutions are either made from purchased stock solutions as listed below or from prepared solutions as listed in the following table:

NOTE: Second sources (from certified separate lots) are used for ICV standards.

Table 3 – Full Scan Stock Standards

Target Analyte Standard Name	Conc. (PPM)	Vendor	Catalog #
1,2,3,4-TCDD	50	SPEX	SVO-TANJ-12
Agilent Mix (contains compounds listed in Table 4 below)	2000 *	Agilent	Cus 0456
8270 List 1/ Std #1 Megamix	Varied	Restek	571995
8270 List 1/ Std#9	2000	Restek	569730
8270 List 1/ Std#11	2000	Restek	569732
8270 Surrogate Standard	5000*	Restek	567685
8270 Internal Standard	2000	Restek	567684
8270 List 1/ Std#10	2000	Restek	569731
Bisphenol-A	1000	Agilent	Cus-0457

*Agilent Mix, 8270 list1/std#9 and 8270 Surrogate standard are diluted to 100ppm prior to the preparation of the 1.0ppm and 0.5ppm standards.

Table 4 Agilent Mix Catalog No. Cus-0456

Analyte	Concentration (PPM)
Pentachloronitrobenzene	2000
2 -tert-butyl-4-Methylphenol	2000
2,6-Di-tert-butyl-4-Methylphenol	2000
Coumarin	2000
Phenyl ether	2000
N,N'-Dimethylaniline	2000
N-Methylaniline	2000
Carbamazepine	2000
Benzonitrile	2000
1,3-Dimethylnaphthalene	2000

7.2.1.1. Individual calibration standards for full scan analysis are prepared in one of several ways depending upon the technique (full volume aqueous prep, soils prep, reduced volume prep with LVI) as well as the target analyte list. The following tables detail the preparation of calibration standard solutions for each of these techniques and analyte lists. Prepare by combining the indicated volumes of each stock solution using volumetric flask. Dilute to the volume marker with methylene chloride.

Table 5
Full Volume Aqueous Prep and Soils
Working Standards Preparation

Solution Name	**120 PPM**	**80 PPM**	**50 PPM**	**20 PPM**	**10 PPM**	**5 PPM**	**2 PPM**	**1 PPM**	**0.5 PPM**
8270 List 1/ Std #1 Megamix	3000 ul	2000 ul	2500 ul	500ul	250ul	250ul	100ul	50ul	25ul
8270 List 1/ Std #9	1500 ul	1000 ul	1250 ul	250ul	125ul	125ul	50ul	500ul*	250ul *
8270 List 1/ Std #10	1500 ul	1000 ul	1250 ul	250ul	125ul	125ul	-	-	-
Agilent custom Mix	1500 ul	1000 ul	1250 ul	250ul	125ul	125ul	50ul	500ul*	250ul *
1,2,3,4-TCDD	-	-	500ul	-	-	-	-	-	-
8270 Surrogate Standard	600ul	400ul	500ul	100ul	50ul	50ul	20ul	500ul*	250ul *
8270 Internal Standard	500ul	500ul	1000 ul	500ul	500ul	1000 ul	1000 ul	1000 ul	1000 ul
Bisphenol-A	3000 ul	2000 ul	2500 ul	500ul	250ul	250ul	100ul	-	-
8270 List 1/ Std #11	400ul	300ul	500ul	200ul	125ul	125ul	50ul	25ul	-
Final Volume (ml)	**25**	**25**	**50**	**25**	**25**	**50**	**50**	**50**	**50**

Note: The 1.0ppm and 0.5pmm standards (above) are prepared using the 100ug/ml standard for Agilent custom Mix, 8270 List1/std#9 and 8270 Surrogate Standard.

Table 6
Reduced Volume Extraction/LVI
Working Standards Preparation

Solution Name	**24 PPM**	**16 PPM**	**10 PPM**	**4 PPM**	**2 PPM**	**1 PPM**	**0.4 PPM**	**0.2 PPM**	**0.1 PPM**
120 ppm (see Table 5)	2.0mL								
80 ppm (see Table 5)		2.0 mL							
50 ppm (see Table 5)			2.0 mL						
20 ppm (see Table 5)				2.0 mL					

Table 6
Reduced Volume Extraction/LVI
Working Standards Preparation

Solution Name	24 PPM	16 PPM	10 PPM	4 PPM	2 PPM	1 PPM	0.4 PPM	0.2 PPM	0.1 PPM
10 ppm (see Table 5)					2.0 mL				
5.0 ppm (see Table 5)						2.0 mL			
2.0 ppm (see Table 5)							2.0mL		
1.0 ppm (see Table 5)								2.0 mL	
0.5 ppm (see Table 5)									2.0mL
Final Volume (ml)	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**

7.2.1.2. **Initial Calibration Verification (full scan)**: Second source ICVs for full scan analysis are prepared in one of several ways depending upon the technique (full volume aqueous prep, soils prep, reduced volume prep with LVI) as well as the target analyte list. The following tables detail the preparation of ICVs for each of these techniques and analyte lists. Prepare by combining the indicated volumes of each stock solution using volumetric flask. Dilute to the volume marker with methylene chloride.

Table 7
8270/625 ICV
Working Standards Preparation

Solution Name	25 PPM
8270 List 1/ Std #1 Megamix (2nd Lot)	250ul
8270 List 1/ Std #9 (2nd Lot)	125ul
8270 List 1/ Std #10 (2nd Lot)	125ul
Agilent custom Mix (2nd Lot)	125ul
8270 Internal Standard	200ul
8270 List 1/ Std#11	125ul
Bisphenol-A (2nd Lot)	250ul
Final Volume (ml)	**10**

7.2.1.3. **Surrogate Standards (Full Scan Analysis):** A 5000ppm Surrogate Standard is purchased from Restek for use in spiking blanks, samples and associated QC prior to extraction (reference the applicable sample prep SOPs for spiking instructions).

Table 8 Full Scan Surrogate Standards Solution Restek Catalog No. 567685	
Surrogate Standard Compounds	**Concentration (PPM)**
Nitrobenzene-d5	5000
p-Terphenyl-d14	5000
2,4,6-Tribromophenol	5000
Phenol-d5	5000
2-Fluorobiphenyl	5000
2-Fluorophenol	5000

7.2.1.4. **Internal Standards** (**Full Scan Analysis**): The Internal Standards Solution at 2000ppm is purchased from Restek (Catalog # 567684). The Internal Standard solution is stored in 10ml amber screw cap bottles with Teflon liners in the dark at 4°C. The Internal standard solution is used in preparing all analytical standards. Inject 20ul of this solution (2000ppm) per ml of sample extract prior to analysis resulting in a concentration of 40ppm (ug/ml) in the extract.

Table 9 Full Scan Internal Standards Solution Restek Catalog No. 567684	
Internal Standard Compounds	**Concentration (PPM)**
1,4-Dichlorobenzene-d4	2000
Phenanthrene-d10	2000
Naphthalene-d8	2000
Chrysene-d12	2000
Acenaphthene-d10	2000
Perylene-d12	2000

7.2.2. **Calibration Standards (SIM analysis)**: The Edison lab currently analyzes only a select list of compounds by 8270D/8270E SIM (see Sections 1.0 and 2.0). Stock analytical SIM standard solutions are purchased mainly from Accustandard. Working standards are prepared from these solutions as listed in the tables in Section 7.2.2.1:

Table 10 Stock SIM Standards			
Standard Name	**Concentration**	**Vendor**	**Catalog #**
Pentachlorophenol	100ppm	Accustandard	App-9-176
n-Nitrosodimethylamine	100ppm	Accustandard	APP-9-149
Hexachlorobenzene	100ppm*	Accustandard	APP-9-112
PAH Mix	100ppm	Accustandard	M-610
Bis(2-chloroethyl)ether	100ppm*	Accustandard	App-9-027
4,6-Dinitro-2-methylphenol	100ppm	Accustandard	P-3845
1,4-Dioxane	1000ppm**	Accustandard	APP-9-096

*Hexachlorobenzene and Bis(2-chloroethyl)ether are diluted to 10ppm prior to SIM Standards prep

** 1,4-Dioxane is diluted (10x) to 100ppm prior to SIM Standards prep

NOTE: Second sources (from separate lots are used for ICV standards).

7.2.2.1 Individual calibration standards for SIM analysis are prepared in one of two ways depending upon the technique (full volume aqueous prep or reduced volume prep with LVI) as well as the target analyte list. The following tables detail the preparation of calibration standard solutions for each of these techniques and analyte lists. Prepare by combining the indicated volumes of each stock solution using volumetric flask. Dilute to the volume marker with methylene chloride.

Table 11
Full Volume Aqueous Prep – SIM
Working Standards Preparation

	0.025 PPM	**0.05 PPM**	**0.1 PPM**	**0.5 PPM**	**1.0 PPM**	**5.0 PPM**
Pentachlorophenol	10uL	25uL	50uL	50uL	100uL	250uL
n-Nitrosodimethylamine	10uL	25uL	50uL	50uL	100uL	250uL
PAH mix	2.5uL	5uL	100uL	25uL	50uL	100uL
Hexachlorobenzene	10uL	25uL	100uL	500uL	1000uL	2500uL
Bis(2-chloroethyl)ether	10uL	25uL	100uL	500uL	1000uL	250uL*
4,6-dinitro-2-methylphenol	50ul	100ul	200ul	200ul	250ul	500ul
1,4-Dioxane	20ul	50ul	100ul	100ul	200ul	500ul
ISTD	200uL	200uL	200uL	100uL	100uL	100uL
Final Volume (ml)	**10**	**10**	**10**	**5**	**5**	**5**

*For Bis(2-chloroethyl)ether the 5.0 ppm level is prepared using the 100ppm standard.

Table 12
Reduced Volume Extraction/LVI – SIM
Working Standards Preparation

	0.005 PPM	**0.01 PPM**	**0.02 PPM**	**0.10 PPM**	**0.20 PPM**	**1.0 PPM**
0.025 PPM Std (see Table 11)	1.0 mL					
0.05 PPM Std (see Table 11)		1.0 mL				
0.1 PPM Std (see Table 11)			1.0 mL			
0.5 PPM Std (see Table 11)				1.0 mL		
1.0 PPM Std (see Table 11)					1.0 mL	
5.0 PPM Std (see Table 11)						1.0 mL
Final Volume (ml)	**5**	**5**	**5**	**5**	**5**	**5**

7.2.2.2 Initial Calibration Verification (SIM): A 0.1 ppm separate lot SIM ICV is prepared as detailed in Table 13 using the stock standards detailed in Section 7.2.2 (above)

Table 13 0.1ppm SIM ICV preparation	
Pentachlorophenol	25uL
n-Nitrosodimethylamine	25uL
PAH mix	5uL
Hexachlorobenzene	5uL
1,4-Dioxane	5ul
4,6-Dinitro-2-methylphenol	100ul
ISTD	**100uL**
Final Volume	**5 ml**

7.2.2.3 Internal Standard solution (SIM): A 50 ppm Internal Standard solution for SIM analysis is prepared by adding 125ul of the 2000ppm stock ISTD (see Section 7.2.1.4) and bringing to volume with Methylene Chloride in a 5ml volumetric flask.

7.2.2.3.1 For SIM analysis inject 20ul of this solution (50ppm) per ml of sample extract prior to analysis resulting in a concentration of 1ppm (ug/ml) in the extract.

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7.2.3. Calibration Standards (Isotope Dilution SIM – 1,4-Dioxane): The Edison lab currently analyzes only for 1,4-dioxane by 8270D/8270E isotope dilution SIM (see Sections 1.0 and 2.0). Stock analytical isotope dilution SIM standard solutions are purchased mainly from Accustandard and Restek. Working standards are prepared from these solutions as listed in the tables below.

Table 14 -
Stock 1,4-Dioxane Isotope Dilution SIM Standards

Standard Name	**Concentration**	**Vendor**	**Catalog #**
1,4-Dioxane	1000ppm*	Accustandard	APP-9-096

* 1,4-Dioxane is diluted (10x) to 100ppm prior to SIM Standards prep

Table 15 -
Stock Labeled 1,4-Dioxane SIM Surrogate/Internal Standard (added at prep)

Standard Name	**Concentration**	**Vendor**	**Catalog #**
1,4-Dioxane-d8	2000ppm	Restek	30614

Table 16 -
Stock 1,4-Dioxane Isotope Dilution SIM Internal Standard (added to extract)

Standard Name	**Concentration**	**Vendor**	**Catalog #**
1,4-Dichlorobenzene-d4	2000ppm	Accustandard	AZ-014J-3

7.2.3.1 Individual calibration standards for 1,4-dioxane isotope dilution SIM analysis are prepared at the concentrations detailed in the following tables. Prepare by combining the appropriate volumes of each stock solution using volumetric flask. Dilute to the volume marker with methylene chloride.

Table 17
Reduced Volume Extraction/LVI – 1,4-Dioxane Isotope Dilution SIM
ICAL Standard Concentrations (ug/ml)

	Lev 1	**Lev 2**	**Lev 3**	**Lev 4**	**Lev 5**	**Lev 6**	**Lev 7**	**Lev 8**	**ICV***
1,4-Dioxane	0.02	0.04	0.1	0.2	0.5	1	2	10	0.2
1,4-Dioxane-d8	4	4	4	4	4	4	4	4	4
1,4-Dichlorobenzene-d4	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2

***:** The ICV is prepared from the second source stock in Table 13.

7.2.4. **GC/MS Instrument Performance Check (DFTPP):** The DFTPP standard is prepared by is prepared at 25 ppm by adding 2.5ml of EPA 8270 GC/MS Tuning Solution II (Restek Catalog # 31615) to a 100ml volumetric flask and bringing to volume with Methylene Chloride.

7.2.5. Information on prepared standard solutions must be recorded in the TALS Reagent Module. Information such as standard supplier, lot number, original concentration, a description of how the standard was made, are required along with the laboratory lot number, analyst's initials, date prepared, expiration date and verification signature. Standards must be remade every 6 months, or sooner, if the standards expire or begin to show signs of unacceptable degradation. Class "A" volumetric must be used at all times and syringes, preferably gas-tight syringes when available, should be checked for accuracy using an analytical balance. Class "A" pipettes should also be used if volumes permit.

7.2.6. Please refer to TestAmerica Edison SOP No. ED-GEN-008, Standard Operating Procedure for Preparation, Purity and storage of Reagents and Standards.

- Shelf Life of Standard: 1 year after preparation or stock standard manufacture expiration, whichever comes first;
- Storage Requirements: Stock standards are stored at 4℃ and Working Standards stored at -10℃ to -20℃.

8.0 Sample Collection, Preservation, Shipment and Storage

8.1 All samples must be stored at 4ºC (± 2ºC) upon receipt.

8.2 Sample Extract Storage. Samples extracts must be protected from light and refrigerated at 4ºC (± 2ºC) from time of extraction until analysis.

8.3 Sample Extract Holding Time. All sample extracts must be analyzed within 40 days of extraction.

Matrix	Sample Container	Min. Sample Size	Preservation	Holding Time	Reference
Waters	Amber glass, 1L	1000 ml or 250 ml (1)	Cool 4 ± 2°C	7 days to extraction; Analyze within 40 days of extraction	EPA Method SW846 8270D/8270E
Solids	Wide mouth glass, 8 or 16 oz.	50g	Cool 4 ± 2°C	14 days to extraction; Analyze within 40 days of extraction	EPA Method SW846 8270D/8270E

(1) : Reduced volume extraction (RVE) LVI option

9.0 Quality Control

9.1. **Sample QC** - The following quality control samples are prepared with each batch of samples.

Quality Controls	Frequency	Control Limit
Method Blank (MB)	1 in 20 or fewer samples	< Rpt. Limit
Laboratory Control Sample (LCS)[1]	1 in 20 or fewer samples	Statistical Limits [4]
Matrix Spike (MS)[2]	1 in 20 or fewer samples	Statistical Limits [4]
MS Duplicate (MSD)[2]	1 in 20 or fewer samples	Statistical Limits [4]
Surrogates	every sample[3]	Statistical Limits [4]
Internal Standards	Every sample	Response within -50% to +100% of CCV

[1] LCS Duplicate (LCD) is performed only when insufficient sample is available for the MS/MSD or when requested by the client/project/contract.
[2] The sample selection for MS/MSD are randomly selected, unless specifically requested by a client….predetermined by the extraction lab.
[3] Analytical and QC samples (MB, LCS, MS/MSD, Method Blank)
[4] Statistical control limits are determined annually and are updated into TALS limit group..

9.1.1. **Method blanks** are extracted with every sample batch on each day that samples are extracted. To be considered acceptable, the method blank must contain less than the reporting limit of all target compounds except for phthalates, which can be present at up to 5x the MDL. For method 8270E the method blank is generally acceptable if target analyte concentrations are less than the one half the reporting limit.

If method blanks are unacceptably contaminated with target compounds that are also present in field samples, all affected samples must be re-extracted and re-analyzed. Corrective action must be taken to identify and eliminate the contamination source. Demonstrate that acceptable blanks can be obtained before continuing with sample extraction and analysis. Method blanks must be analyzed on each instrument on which the associated samples are analyzed.

9.1.1.1. Surrogate recoveries for the method blank are compared to laboratory generated limits. If two or more surrogates for any one fraction (base-neutral or acid) are outside of recovery limits or if any one surrogate recovers at <10%, the sample must be re-extracted and re-analyzed to confirm matrix interference.. If any surrogate is still outside limits, all samples and QC samples associated with that method blank must be re-extracted (volume permitting).

9.1.2. **Matrix Spike (MS)/Matrix Spike Duplicate (MSD):** A matrix spike/matrix spike duplicate (MS/MSD) pair is extracted and analyzed with every 20 environmental samples of a specific matrix (defined as a sample batch). Full compound list spiking is employed for MS/MSDs and LCSs. These spikes are prepared and extracted concurrent with sample preparation. MS and MSD recoveries are calculated and compared to lab generated acceptance criteria. See the current active TALS 8270 Method Limit Group for QC limits. The MS/MSD spiking solution should the same as used for the calibration standards.

9.1.2.1 A Laboratory Control Sample Duplicate (LCSD) is extracted and analyzed only when insufficient client sample is available for preparation of an MS/MSD pair. The LCS/LSCD is evaluated in the same manner as the MS/MSD (see Section 9.1.2)

9.1.2.2 An LCS/LCSD may be substituted for the MS/MSD if insufficient sample volume is available.

9.1.3. **Laboratory Control Sample (LCS)/Laboratory Control Sample Duplicate (LCSD):** A Laboratory Control Sample (LCS) (aka blank spike) must be extracted and analyzed with each batch of 20 environmental samples. The LCS data is used to assess method performance if the MS/MSD recoveries fall outside of the lab generated limits (See the current active TALS 8270 Method Limit Group for QC limits). If the LCS recovery is within the current lab generated limits, the MS/MSD recoveries are attributed to matrix interference.

9.1.3.1 A Laboratory Control Sample Duplicate (LCSD) is extracted and analyzed only when insufficient client sample is available for preparation of an MS/MSD pair. The LCS/LSCD is evaluated in the same manner as the MS/MSD (see Section 9.1.2)

9.1.3.2 Spike recovery limits are lab generated and are updated annually. Certain state regulatory programs have defined recovery limits which, where applicable, are used for spike recovery evaluations. The TALS Method Limit Groups detail these regulatory program criteria.

9.1.4. **Surrogate Standards:** All full scan samples, blanks and QC samples are spiked with a six (6) component surrogate standard mix (see Section 7.2.1.3). The percent recovery of the surrogate standards is calculated and compared to lab generated limits (See the current active TALS 8270 Method Limit Group for QC limits*)*.

If any two or more surrogates for any one fraction (base-neutral or acid) are outside of recovery limits or if any one surrogate recovers at <10%, the sample must be re-extracted and re-analyzed to confirm matrix interference. If a surrogate is diluted to a concentration below that of the lowest calibration standard, no corrective action is necessary.

9.1.4.1 Surrogate recovery limits are lab generated and are updated annually. Certain state regulatory programs have defined recovery limits which, where applicable, are used for spike recovery evaluations. The TALS Method Limit Groups detail these regulatory program criteria.

9.1.5. **Internal Standards:** The response (area count) of each internal standard in the sample must be within -50 +100% of its corresponding internal standard in the CCV or, the ICAL midpoint for samples analyzed under the initial calibration range. Failure to meet these criteria is indicative of sample matrix effects. All samples failing these criteria must be reanalyzed to confirm matrix effects.

9.2. Instrument QC

9.2.1 **GC/MS Instrument Performance Check (DFTPP)**: (**Note**: the DFTPP performance check applies only to full scan analyses and is not evaluated for SIM analysis). The GC/MS system is tuned using Perfluortributylamine (PFTBA) such that an injection of 50ng of Decafluorotriphenylphosphine (DFTPP) meet the abundance criteria listed in the table below. Prior to the analysis of any calibration standards or samples, the GC/MS system must meet all DFTPP key ion abundance criteria. This analysis will verify proper tuning of the system for a period of 12 hours post-injection. After 12 hours, the instrument performance must again be verified prior to the analysis of standards, QC or samples. Daily tune verification is not required for 8270E CCV.

DFTPP Key Ions and Abundance Criteria	
Mass	**Ion Abundance Criteria**
51	30-60% of mass 198
68	<2% of mass 69
69	reference only
70	<2% of mass 69
127	40-60% of mass 198
197	<1% of mass 198
198	Base Peak, 100% relative abundance
199	5-9% of mass 198
275	10-30% of mass 198
365	>1% of mass 198
441	present but less than mass 443
442	>40% of mass 198
443	17-23% of mass 442

9.2.1.1. Evaluate DFTPP using three scan averaging and background subtraction techniques. Select the scan at the peak apex, add +1 scan from the apex and -1 scans from the apex.

9.2.1.2. The mass spectrum of DFTPP may be background subtracted to eliminate column bleed or instrument background ions. Background subtract DFTPP by selecting a scan for subtraction ≤20 scans before the apex scan of DFTPP.

9.2.1.3. Check column performance using pentachlorophenol and the benzidine peaks (these compounds are included in the DFTPP solution). Benzidine & Pentachlorophenol should respond normally without significant peak tailing (Tailing Factor should be <2 measured at 10% peak height). If responses are poor and excessive peak tailing is present, corrective action for the GC/MS instrument may be required. Corrective actions may include:

9.2.1.3.1 Retune the GC/MS;
9.2.1.3.2 Clip the injector end of the GC column;
9.2.1.3.3 Replace the septum and injection port liner;
9.2.1.3.4 Change the injection port seal;
9.2.1.3.5 Replace the GC column;
9.2.1.3.6 Clean the injection port with MeCl2
9.2.1.3.7 Clean the MS ion source;
9.2.1.3.8 Place a service call.

9.2.1.4. The breakdown of 4, 4-DDT into 4,4-DDD and 4,4'DDE may also be used to assess GC column performance and injection port inertness. If so evaluated the breakdown must be <20%.

9.2.1.5. DFTPP parameter settings are stored in a tune file, which will be used in all subsequent analysis of standards and sample extracts.

9.2.2 Initial Calibration Range and Initial Calibration Verification

9.2.2.1. **Initial Calibration:** The initial calibration range consists of a minimum of five concentration levels of analytical standards (six for second order regression) prepared as described in Section 7.2. and analyzed once the DFTPP instrument performance check has met the criteria in Section 9.2.1. .

9.2.2.2. **Initial Calibration Verification (ICV):** An Initial Calibration Verification (ICV) standard is analyzed immediately after the Initial Calibration Range and before any samples are analyzed. The ICV is prepared as detailed in Section 7.2. The ICV must be from a source (or lot) separate from the standards used in the Initial Calibration Range.

9.2.3 **Continuing Calibration Verification (CCV) and Low Level Continuing Calibration Verification (LLCCV):** A mid-point Continuing Calibration Verification (CCV) must be analyzed every 12 hours after the DFTPP instrument performance check (when applicable).. The CCV is prepared as detailed in Section 7.2. (typically, 50 ug/ml for full volume aqueous and soils, 10 ug/ml for LV, 0.02 ug/ml for LVI SIM) and 0.2 for isotope dilution SIM). Additionally a Low Level Continuing Calibration Verification (LLCCV) is analyzed after the CCV for full scan analysis. The LLCCV is the same as the lowest calibration level analyzed with the initial calibration range (See Section 7.2).

9.2.4 Calibration Acceptance Summary

9.2.4.1. **Retention Time Windows:** Retention time windows must be established to compensate for minor shifts in absolute retention times as a result of sample loading and normal chromatographic variability. Obtain the retention time for all compounds from the analysis of the midpoint standard for the calibration curve. Establish the center of the retention time window by using the absolute retention time for each analyte, internal standard and surrogate from the calibration verification standard at the beginning of the analytical shift. For samples run during the same shift as an initial calibration, use the retention time of the mid-point standard of the initial calibration. For qualitative identification to be acceptable the retention time of the relative retention time (automatically calculated in Chrom) must be within 0.8 - 1.2 RRT units of its assigned internal standard. The relative retention times of each compound in the five calibration standards must agree within .06 relative retention time units.

9.2.4.2. **Initial Calibration Range:** Internal standard calibration is employed for this method. After the initial calibration range has been analyzed the relative response factor (RRF) for each target/surrogate compound at each concentration level is determined using the following equation.

$$RRF = \frac{A_x}{A_{is}} \times \frac{C_{is}}{C_x}$$

Where:
A_x = Area characteristic ion (see Table 21) for the compound
Ais = Area characteristic ion (see Table 21) of associated internal standard
Cis = Concentration of internal standard
Cx = Concentration of compound in standard

9.2.4.2.1. Determine the mean RRF for each compound. Minimum response factors must be met for each of the compounds listed in Table 18 (below). Any compound that fails the minimum response factor must be reported as estimated for detects and must have a demonstration of sensitivity in the analytical batch to report non-detects. To demonstrate adequate sensitivity for out of criterion compounds analyze the low level point of the calibration (LLCCV) in the analytical sequence. The criterion for the LLCCV is detection only but the standard qualitative identification criteria in the method must be met.

Table 18:
Minimum Response Factors

Compound	Minimum Response Factor
Benzaldehyde	0.010
Phenol	0.800
Bis(2-chloroethyl) ether	0.700
2-Chlorophenol	0.800
2-Methylphenol	0.700
2,2-Oxybis-(1-chloropropane)	0.010
Acetophenone	0.010
4-Methylphenol	0.600
N-Nitroso-di-n-propylamine	0.500
Hexachloroethane	0.300
Nitrobenzene	0.200
Isophorone	0.400
2-Nitrophenol	0.100
2,4-Dimethylphenol	0.200
Bis(2-chloroethoxy)methane	0.300
2,4-Dichlorophenol	0.200
Naphthalene	0.700

**Table 18:
Minimum Response Factors**

Compound	Minimum Response Factor
4-Chloroaniline	0.010
Hexachlorobutadiene	0.010
Caprolactam	0.010
4-chloro-3-methylphenol	0.200
2-Methylnaphthalene	0.400
Hexachlorocyclopentadiene	0.050
2,4,6-Trichlorophenol	0.200
2,4,5-Trichlorophenol	0.200
1,1'-Biphenyl	0.010
2-Chloronaphthalene	0.800
2-Nitroaniline	0.010
Dimethyl phthalene	0.010
2,6-Dinitrotoluene	0.200
Acenaphthylene	0.900
3-Nitroaniline	0.010
Acenaphthene	0.900
2,4-Dinitrophenol	0.010
4-Nitrophenol	0.010
Dibenzofuran	0.800
2,4-Dinitrotoluene	0.200
Diethyl phthalate	0.010
1,2,4,5-Tetrachlorobenzene	0.010
4-chlorophenyl-phenyl ether	0.400
Fluorene	0.900
4-Nitroanailine	0.010
4,6-Dinitro-2-methylphenol	0.010
4-Bromophenyl-phenyl ether	0.100
N-Nitrosodiphenylamine	0.010
Hexachlorobenzene	0.100
Atrazine	0.010
Pentachlorophenol	0.050
Phenanthrene	0.700
Anthracene	0.700
Carbazole	0.010
Di-n-butyl phthalene	0.010
Fluoranthene	0.600
Pyrene	0.600
Butyl benzyl phthalate	0.010
3,3'-Dichlorobenzidine	0.010
Benzo(a)anthracene	0.800
Chrysene	0.700
Bis-(2-ethylhexyl)phthalate	0.010
Di-n-octyl phthalate	0.010
Benzo(b)fluoranthene	0.700

Table 18:
Minimum Response Factors

Compound	Minimum Response Factor
Benzo(k)fluoranthene	0.700
Benzo(a)pyrene	0.700
Indeno(1,2,3-cd)pyrene	0.500
Dibenz(a,h)anthracene	0.400
Benzo(g,h,i)perylene	0.500
2,3,4,6-Tetrachlorophenol	0.010
Pentachloronitrobenzene	0.050

9.2.4.2.2. Calculate the Standard Deviation (SD) and Percent Relative Standard Deviation (% RSD) of the response factors for each compound:

$$\% \text{ RSD} = \frac{\text{Standard Deviation of RRFs}}{\text{Mean RRF}}$$

9.2.4.2.3. The % RSD of the RRF's must be ≤20% for each target analyte listed in Table 18. The % RSD of each target analytes must be ≤20% in order for the calibration range to be acceptable. Additionally for 8270E, the calculated concentration or amount of each analyte of interest in the CCV standard should fall within ±20%. If more than 10% of the compounds included with the initial calibration exceed the 20% RSD limit or do not meet the minimum correlation coefficient (0.99) for alternate fits (see below) then appropriate corrective maintenance action must be performed. If more than 10% of the compounds included with the initial calibration exceed the 20% RSD limit **AND** do not meet the minimum correlation coefficient (0.99) then recalibration is necessary.

9.2.4.2.4. If the above listed criteria is met, the system can be assumed to be linear and sample analysis may begin and the average RF from the initial calibration range is used to quantitate all samples.

9.2.4.2.4.1 Certain state regulatory programs have defined calibration acceptance limits which, where applicable, are used for calibration evaluations. The TALS ICAL Limit Groups detail these regulatory program criteria.

9.2.4.2.5. An alternative calibration technique may be employed for those any compounds exceeding the 20% RSD criteria:

9.2.4.2.5.1 Calculate the first order linear regression for any compound which did not meet the 20% criteria. First order linear regression calibration may be employed if alternative average response calibration procedures were not applicable. The r value (Correlation Coefficient) of the equation must be ≥0.99 for the calibration to be employed.

9.2.4.2.5.2 Second order regression calibration can be used for any compound that has an established history as a non-linear performer.

9.2.4.2.5.3 If second order regression calibration is used a minimum of six (6) calibration levels must be analyzed.

9.2.4.2.5.4 If second order regression calibration is used, the r^2 (Correlation Coefficient) value must be $\geq$ 0.99

9.2.4.2.5.5 Any compound that fails to meet the 20% RSD or or 0.99 correlation coefficient criteria must be flagged as estimated for detects (or must be noted in the narrative). If there are non-detects the compounds may be reported if there is adequate sensitivity to detect at the quantitation limit. To demonstrate adequate sensitivity analyze the low level point of the initial calibration in each analytical batch (LLCCV) The criteria for demonstrating adequate sensitivity is detection in the LLCCV using the standard qualitative identification criteria.

9.2.4.2.5.6. When calculating the calibration curve using the linear calibration model a minimum quantitation check on the viability of the lowest calibration point should be performed by re-fitting the response from the low concentration back into the curve. The recalculated concentration of the low calibration point should be within ±50% of the standard's concentration. This evaluation can be checked using the Initial Calibration %Drift Report in Chrom. Any detects for analytes calibrated using the linear model and failing this readback criterion must be flagged as estimated or detailed in the narrative.

9.2.4.3. **Calibration Point Read-back Criteria**: Whichever calibration model above is selected, it should be subjected to an additional check to establish the representativeness of the data that were used to produce it. This check is the refitting of each calibration point response back to the calibration model, or the comparison of the calculated amount of the standard against the expected amount.

- CHROM software provides an Initial Calibration %Drift report which shows the % Error for each calibration point. This report must be reviewed in addition to the %RSD / Linear Response Factor.

- The absolute value of the % Error for each calibration point should be < 30%. For the lowest calibration point, the % Error may be <50%.

- See Section 11.8 for the Calculation of Percent (%) Error.

9.2.4.4. **Initial Calibration Verification (ICV):**.Once the initial calibration has been analyzed and has met the above criteria, a second source Initial Calibration Verification (ICV) (as prepared in Section 7.2) must be analyzed and evaluated. The ICV must meet the criteria of 70-130% recovery for all compounds with the exception of the poor performing compounds listed in Attachment 1 which are allowed to be within 50-150% : An NCM must be initiated to denote any ICV non-conformances.

9.2.4.5. The ICV must meet the criteria of 70-130% recovery for all compounds however up to 10% of the compounds are allowed to exceed these criteria as long as their recoveries are within 65-135%. For the poor performers (see Attachment 1) the range is 50-150%. If the criterion is not met, a second ICV may be analyzed after corrective measures are taken. If a second ICV analysis fails to meet criteria proceed with corrective action and the analysis of a new initial calibration range. Flagging: If the ICV limits are outside of criteria (high) for an analyte and that analyte is undetected in the sample, no flagging or narration is required. If the ICV limits are outside of criteria (low) for an analyte and that analyte is undetected in a sample, narrate the non-conformance in an NCM. When that out of spec analyte is detected in a sample, describe the issue in the narrative, or flag as estimated.

9.2.4.6. **Continuing Calibration Verification (CCV):** A CCV consisting of a standard at or near the midpoint of the Initial Calibration Range is analyzed every 12 hours of instrument operation or at the beginning of an analytical sequence to verify the initial calibration. The calibration verification consists of a DFTPP instrument performance check (not required for 8270E), and analysis of a calibration verification standard. **Note:** Certain state regulatory programs have defined calibration acceptance limits which, where applicable, are used for calibration evaluations. The TALS ICAL Limit Groups detail these regulatory program criteria.

9.2.4.5.1 Tune Verification: Follow the procedure for verifying the instrument tune described in section 9.2.1 using a 50 ng injection of DFTPP. If the tune cannot be verified, analysis must be stopped, corrective action taken and a return to “control” demonstrated before continuing with the calibration verification process. For 8270E analysis only, tune verification is required just prior to ICAL.

9.2.4.5.2 Calibration Verification: Analyze the calibration verification standard immediately after a DFTPP that meets criteria. Daily analysis of the DFTPP is not required as part of the CCV for 8270E analysis. .When samples are analyzed after an ICAL the last ICAL standard may be used as the starting time reference for evaluation. Use the mid point calibration standard (approximately 50ug/l). NOTE: The calibration standard contains internal standards; Dichlorobenzene d_4, Naphthalene d_8, Acenaphthene d_{10}, Phenanthrene d_{10}, Chrysene d_{12}, and Perylene d_{12} at 40ug/l (0.1ug/L for SIM). The calibration check standard must also include all the target analytes from the original calibration.

9.2.4.5.3 The RFs must meet the criteria for the compounds in Table 18. Any compound that fails the minimum response factor must be reported as estimated for detects and must have a demonstration of sensitivity to report non-detects. To demonstrate adequate sensitivity for out of criterion compounds analyze the low level point of the calibration (LLCCV) in the analytical sequence. The criterion for the LLCCV is detection only but the standard qualitative identification criteria in the method must be met

9.2.4.5.4 The percent difference (when using average response factor) or percent drift (when using linear regression) of the compounds in Table 18 must be ≤20% for at least 80% of the total analyte list. If more than 20% of the compound list fail to 20% difference or drift criterion then appropriate corrective action must be taken prior to the analysis of the samples. Any individual compound that fails must be reported as estimated for detects and must have a demonstration of sensitivity to report non-detects. To demonstrate adequate sensitivity for out of criterion compounds analyze the low level point of the calibration (LLCCV) in the analytical sequence. The criterion for the LLCCV is detection only (%D criteria are not applied) but the standard qualitative identification criteria in the method must be met.

9.2.4.5.5 **CCV Poor Performers**: Refer to Attachment 1 for the identification of poor and/or erratic performing analytes. These analytes are allowed a %D >20% but must be <50 %D to be acceptable. If there are poor performers that exceed 50%D, the data may be reported provided results are noted as estimated. An NCM must be initiated to denote this situation.

9.2.4.5.6 The retention times of the internal standards from the calibration check must be within ±30 seconds of the internal standards from the mid point standard of the original calibration. If the retention time for any internal standard changes by more than 30 seconds from the latest daily (12 hour) calibration standard, the chromatographic system is inspected for malfunctions, and corrections made as required. If corrective action does not result in the retention time criteria being achieved, the system must be re-calibrated using four additional standards.

9.2.4.5.7 The response (area count) of each internal standard in the calibration verification standard must be within 50 - 100% of its corresponding internal standard in the mid-level calibration standard of the active calibration curve. If the EICP area for any internal standard changes by more than a factor of two (-50% +100%), the mass spectrometer system must be inspected for malfunction and corrections made as appropriate. When corrections are made, re-analysis of samples analyzed while the system was malfunctioning is required.

9.2.4.5.8 The relative retention times of each compound in the calibration verification standard must agree within .06 relative retention time units of its value in the initial calibration.

9.2.4.5.9 Use the average response factors from the original five-point calibration for quantitative analysis of target analytes identified in field samples.

9.2.4.5.10 Prepare a calibration summary or list indicating which compounds did not meet the 20% average percent difference criteria. Record this information in that run log.

9.2.4.7. **Low Level Continuing Calibration Verification (LLCCV):** An LLCCV consisting of the low level standard from the initial calibration range is analyzed every 12 hours of instrument operation after the CCV. The purpose and evaluation of the LLCCV is described in Section 9.2.4.4.4.

10.0 Procedure

10.1. Gas Chromatograph/Mass Spectrometer Operation

10.1.1. The sequence of events for GC/MS analysis involves many steps. First the injection system and column performance and calibration must be verified. Maintenance operations are performed as needed.

10.1.2. Preparation of the Injection Port Liner and Installation Procedure: Prior to the start of initial calibration and each daily analysis of sample extracts, a new liner for the injection port must be prepared. Once a liner has been used it is no longer inert and will cause serious chromatography problems with phenols and other compounds. When preparing the liner, proper laboratory protection must be worn and the liner must be prepared in a well-ventilated hood. When the procedure is completed all traces of toluene, Sylon-Ct and methanol will be removed immediately so that extraction solvents and preparation of sample extracts will not come into contact with these solvents and become contaminated.

10.1.2.1 Remove one liner from a 40ml VOA bottle containing other liners immersed in Sylon-Ct solution. Rinse off the liner with Toluene and wipe dry. Insert 1cm of pre-silanized glass wool partially into one end of the liner and trim neatly. Push the glass wool into the center of the liner so that it is 1 1/4" from the bottom. Do not use glass wool or solvents that are dirty (i.e. suspended particles) or use liners which are chipped on the ends, deformed or fractured. Inspect the glass wool for cleanliness after it has been inserted.

10.1.2.2 Using a Pasteur pipette flush out the interior of the liner containing the glass wool with Sylon-Ct. Rest the liner horizontally on a small beaker and allow the Sylon-Ct to re-deactivate the interior surfaces and the glass wool. There should be no air bubbles caught in the glass wool. After several minutes flush out the Sylon-Ct with toluene and finally with methanol. Dry the outer surface of the liner and rest it on the injection port housing until the remaining methanol is boiled off

10.1.2.3 Insert the liner with the newly silanized glass wool plug into the injection port. Verify that the column extends up into the injection port and is perpendicular. Inspect the graphite seal and replace it if the edges are knife-shaped.

10.1.2.4 The septum is always replaced daily. Bake out the column at 300^{o}C for 15 minutes after the vacuum in the analyzer has returned to normal.

10.1.2.5 Performance may enhanced by clipping a small portion of the column at the injection port end. Document this activity in the maintenance record.

10.1.3. Prior to calibration or sample analysis always verify that the analyzer is under sufficient vacuum and that the column has proper carrier gas flow.

10.1.4. Establish the following GC/MS operating conditions:

10.1.4.1 Full Scan Operating Mode

Full Scan Mode – Standard Injection Volume
Mass Range: 35 to 500amu
Scan Time: 1 sec/scan
Transfer Line Temperature: 300°C
Source Temperature: Preset by H.P. at 280°C
Scan start time: 1.0 minutes
Initial Column Temperature and Hold Time: 45°C for 0.5 minutes
Column Temperature Program: 20°C /min to 100°C 25°C/min to 270°C 10° C/min to 310°C
Final Column Temperature Hold: 310°C for 5 minutes
Carrier Gas: Ultra High Purity Grade Helium at 1.3ml/min
Injector Temperature: 275°C
Injector: Grob-type, pulse, splitless
Injection Volume: 1ul
Splitless Valve Time: 0.3 minutes

Full Scan Mode – Large Volume Injection (LVI)
Mass Range: 35 to 500amu
Scan Time: 1 sec/scan
Transfer Line Temperature: 300°C
Source Temperature: Preset by H.P. at 280°C
Scan start time: 1.0 minutes
Initial Column Temperature and Hold Time: 45°C for 0.5 minutes
Column Temperature Program: 20°C /min to 100°C

25°C/min to 270°C 10° C/min to 310°C
Final Column Temperature Hold: 310°C for 5 minutes
Carrier Gas: Ultra High Purity Grade Helium at 1.3ml/min
Injector Temperature: 275°C
Injector: Grob-type, pulse, splitless
Injection Volume: 5ul
Splitless Valve Time: 0.3 minutes

10.1.4.2 SIM Operating Mode

SIM Mode
Mass Range: 35 to 500amu
Scan Time: 1 sec/scan
Transfer Line Temperature: 300°C
Source Temperature: Preset by H.P. at 280°C
Scan start time: 1.5 minutes
Initial Column Temperature and Hold Time: 40°C for 0.5 minutes
Column Temperature Program: 20°C /min to 100°C 25°C/min to 270°C 10° C/min to 310°C
Final Column Temperature Hold: 310°C for 3 minutes
Carrier Gas: Ultra High Purity Grade Helium at 1.3ml/min
Injector Temperature: 275°C
Injector: Grob-type, pulse splitless
Injection Volume: 1ul
Splitless Valve Time: 0.3 minutes

10.1.4.3 Isotope Dilution Selected Ion Monitoring Mode :

SIM Parameters

Group 1
Plot 1 Ion: 74.0

	(Mass	Dwell)	(Mass	Dwell)	(Mass	Dwell)
Ions/Dwell in Group	42.0	50	43. 0	50	68.0	50
	74.0	50	128.0	50	129.0	50
	136.0	50	150.0	50	152.0	50
	93.0	50	66.0	50		
	58.0	50				
	88.0	50				

Group 2
Group Start Time: 6.00
Plot 1 Ion: 152.0

Ions/Dwell in Group	(Mass	Dwell)	(Mass	Dwell)	(Mass	Dwell)
	151.0	50	152.0	50	153.0	50
	154.0	50	162.0	50	164.0	50
	165.0	50	166.0	50		

Group 3
Group Start Time: 7.80
Plot 1 Ion: 188.0

Ions/Dwell in Group	(Mass	Dwell)	(Mass	Dwell)	(Mass	Dwell)
	94.0	50	101.0	50	142.0	50
	178.0	50	179.0	50	188.0	50
	202.0	50	264.0	50	266.0	50
	284.0	50				

Group 4
Group Start Time: 10.50
Plot 1 Ion: 228

Ions/Dwell in Group	(Mass	Dwell)	(Mass	Dwell)	(Mass	Dwell)
	120.0	50	228.0	50	229.0	50
	240.0	50				

Group 5
Group Start Time: 12.00
Plot 1 Ion: 252.0

Ions/Dwell in Group	(Mass	Dwell)	(Mass	Dwell)	(Mass	Dwell)
	138.0	50	139.0	50	252.0	50
	253.0	50	260.0	50	264.0	50
	267.0	50	276.0	50	278.0	50

Table 19: Target Compound - Primary and Monitoring Ions

Compound	1	2	3
1,4-Dioxane-d8	96	64	62
1,4-Dioxane	88	58	57
1,4-Dichlorobenzene-d4	152	150	

10.1.5. The above listed instrument conditions are used for all analytical standards for calibration and for all sample extracts analyzed by this method.

10.1.5.1 The column conditions, scan start time, and splitless valve time for analysis of DFTPP only are as follows are as follows:

Initial Column Temperature and Hold Time: 140^{o}C for 0.5 minutes
Column Temperature Program: 140^{o} to 320^{o}C at 22^{o}C/minute
Final Column Temperature Hold: 320C for 0.5 minutes
Scan Start Time: approx. 5 minutes
Splitless Valve Time: 0.3 minutes
Injection Volume: 2 ul

10.2. Analytical Sequence

10.2.1. Dilutions are made based on initial GC/MS analysis. Dilutions are made in 1-ml vials using microsyringes. Calculate the dilution factor using the equation below:

$$DF = Ph / 5 \times Is$$

Where:

DF = Dilution Factor
Ph = Sample Peak Height
Is = Internal Standard Peak Height

When DF >1 but <2, combine 500ul of sample extract with 500ul methylene chloride in a 1 ml amber vial, add20 ul internal standard and crimp seal

Use **Table 20** to determine dilution and internal standard amount.

Table 20
Dilution Factor Calculations

DF Value	Volume of Sample (ul)	Volume of Methylene Chloride (ul)	Volume of ISTD (ul)
<1	1,000	None	None
>1, <2	500	500	10
>4, <5	200	800	16
>10, <20	100	900	36
>20	500*	500	10

*Prepare this dilution by serially diluting the >10, <20 dilution

10.2.2. Instrument Performance and Calibration Sequence

10.2.2.1. Once the GC/MS instrument has been setup and maintained as detailed in Section 10.1, the first operations to be performed are the performance checks and calibration standards.

10.2.2.2. Analyze the Instrument Performance Check Standard (DFTPP) as discussed in Section 9.2.1.

10.2.2.3. Initially and as required, analyze the Initial Calibration Range (minimum 5 points, six points for second order regression) as detailed in Sections 7.2.1 and 9.2.4.2. Evaluate the acceptability of the Initial Calibration Range as detailed in Section 9.2.4.2.

10.2.2.4. Immediately after the Initial Calibration Range only, analyze the Initial Calibration Verification (ICV) as detailed in Sections 7.2. and 9.2.4.3. Evaluate the acceptability of the ICV as detailed in Section 9.2.4.3.

10.2.2.5. Every 12 hours, reanalyze and evaluate the Instrument Performance Check Standard (DFTPP), not required for 8270E followed by the Continuing Calibration Verification (CCV) and Low Level Continuing Calibration Verification (LLCCV) as detailed in Section 9.2.3, 9.2.4.4 and 9.2.4.5. Evaluate the acceptability of the CCV and LLCCV as detailed in Section 9.2.4.4

10.2.2.6. Client samples and QC samples are analyzed (as detailed in Section 10.2.3) after acceptable Instrument Performance and Calibration Checks and until the 12 hour clock expires. Repeat the sequence as required. The automation of GC/MS runs is accomplished via the “SEQUENCE” macro of the ChemStation.

10.2.3. Sample Analysis Sequence

10.2.3.1. Sample extracts are normally prepared on the same day as analysis. The GC/MS operator will prepare the extracts that will be run on his or her instrument. Volume adjustments to the extracts will be made at the discretion of the supervisor.

10.2.3.2. Prior to the start of sample analysis the GC/MS operator will generate a sequence program containing the list of the sample extracts to be analyzed, the position on the autosampler tray, and the proper acquisition and tune methods that are to be used. This sequence program contains all the necessary information on the samples to be analyzed and how the GC/MS system is to analyze them. The sample extracts are loaded onto the autosampler (ALS) tray. Their position is verified by checking them against the ALS number on the sequence. This batch analysis will be performed automatically over the 12-hour period.

10.2.3.3. The analytical run log is printed as a record of samples analyzed. The analyst will annotate the run log with any required information regarding anomalies or unusual events. The run log must be signed by the analyst and a reviewed and signed by a trained peer or manager

10.3. Data Processing

10.3.1. Prior to processing any standards or samples, target compound lists and sublists must be assembled. Chrom's auto-processing system queries TALS (LIMS) for each sample's processing parameters (including target compounds lists) and downloads the required processing methods from LIMS to analyze data. These lists are required for processing of all data files including calibration files. The data includes compound names, retention time data, quantitation ions, qualitative identification ions, and the assigned internal standard for qualitative and quantitative identification.

10.3.2. Key data is manually entered the first time a compound list is used for data processing. Processing data using a compound list automatically generates response factor data and updates retention information.

10.3.3. The characteristic ions for target compounds, surrogate compounds, and internal standards which can be determined using SW8270D and 8270E are listed in Table 21..

10.4. Interpretation and Qualitative Identification: Qualitative identification of target compounds is based on retention time and mass spectral comparison with characteristic ions in the target compound list. The reference mass spectrum is taken from a standard of the target compound analyzed by this method. The characteristic ions are the three ions of greatest relative intensity or any ions over 30% relative intensity if less than three such ions occur in the reference spectrum. Compounds are identified as present when the following criteria are met:

10.4.1 Target Analytes: Qualitative identification of target compounds is based on retention time and mass spectral comparison with characteristic ions in the target compound list. The reference mass spectrum is taken from a standard of the target compound analyzed by this method. The characteristic ions are the three ions of greatest relative intensity or any ions over 30% relative intensity if less than three such ions occur in the reference spectrum. Compounds are identified as present when the following criteria are met:

10.4.1.1. Once the GC/MS instrument has been setup and maintained as detailed in Section 10.1, the first operations to be performed are the performance checks and calibration standards.

10.4.1.2. The intensities of the characteristic ions of a compound maximize in the same scan or within one scan of each other.

10.4.1.3. The relative retention time (RRT) of the sample component is within ± 0.06 RRT units of the RRT of the standard component.

10.4.1.4. The most abundant ion in the standard target spectrum that equals 100% MUST also be present in the sample target spectrum.

10.4.1.5. All other ions that are greater than 10% in the standard target spectra should also be present in the sample.

10.4.1.6. The relative intensities of the characteristic ions agree within 30% of the relative intensities of these ions in the reference spectrum. (Example: For an ion with an abundance of 50% in the reference spectrum, the corresponding abundance in a sample spectrum can range between 20% and 80%).

10.4.1.7. If the compound does not meet all of the criteria listed above, but is deemed a match in the technical judgment of the mass spectral interpretation specialist, the compound will be positively identified and reported with documentation of the identification noted in the raw data record.

10.4.2 **Non-Target Analytes:** Upon client request a library search to identify non-target Tentatively Identified Compounds (TIC) is performed. The NIST/EPA/NIH mass spectral library is used to identify non-target compounds (not including internal standard and surrogate compounds) of greatest apparent concentration by a forward search of the library. The following guidelines are used by the analyst when making TIC identifications:

10.4.2.1. Relative intensities of major ions in the reference spectrum (ions greater than 10% of the most abundant ion) should be present in the sample spectrum.

10.4.2.2. The relative intensities of the major ions should agree within ±20%. (Example: For an ion with an abundance of 50% in the standard spectrum, the corresponding sample ion abundance must be between 30 and 70%).

10.4.2.3. Molecular ions present in the reference spectrum should be present in the sample spectrum.

10.4.2.4. Ions present in the sample spectrum but not in the reference spectrum should be reviewed for possible background contamination or presence of co-eluting compounds.

10.4.2.5. Ions present in the reference spectrum but not in the sample spectrum should be reviewed for possible subtraction from the sample spectrum because of background contamination or co-eluting peaks. Data system library reduction programs can sometimes create these discrepancies.

10.4.2.6. If, in the technical judgement of the mass spectral interpretation specialist, no tentative identification can be made, the compound will be reported as ‘Unknown’. If the compound can be further classified the analyst may do so (i.e, ‘Unknown hydrocarbon’, ‘Unknown acid’ , etc.).

10.5. Data Reporting

10.5.1. Final Report. The Chom data system automatically produces a data report consisting of hardcopy reports corresponding to specific data reporting requirements, which is uploaded to the TALS LIMS System for the report production group.

10.5.1.1. Total Ion Chromatogram. Full length chromatogram depicting the full length of the GC/MS acquisition.

10.5.1.2. Spectra of all detected target compounds. A page for each detected target compound spectra with a standard reference spectrum for comparison.

10.5.1.3. The calculations of the concentrations of each target compound in the sample, reported in units of ppb, ug/kg or ug/l.

10.5.1.4. Data summaries for each method blank indicating which samples were extracted with the indicated blank.

10.5.1.5. A copy of the initial calibration range together with the calibration verification report, and tune report.

10.5.1.6. Quality Control (QC) data report for each batch including surrogate recoveries, internal standard area summaries, LCS, MS/MSD and RPD summaries.

10.6. The low-level calibration standard establishes the reporting limit. All reported data must be at a concentration at or above the low concentration standard. Any quantitative values below the report limit must be qualified as estimated.

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11.0. Calculations/Data Reduction

11.1. **Target Compounds:** are quantitated using the internal standard method (see the formula in Section 11.3).

11.1.1. Identified target compounds are quantitated using the integrated abundance from the EICP of the primary characteristic ion. The internal standard used shall be the one nearest the retention time of the analyte).

11.1.2. The average response factor (RRF) from the initial calibration is used to calculate the target analyte concentration in client samples using the formula found in Section 11.3. See Section 9.2.4 for discussion of RRF.

11.1.3. Secondary ion quantitation is utilized only when there are sample interferences preventing use of the primary characteristic ion. If secondary ion quantitation is used an average relative response factor (RRF) must be calculated using that secondary ion.

11.2. Non-Target Compounds (Tentatively Identified Compounds): An estimated concentration for non-target (tentatively identified compounds) is calculated using the internal standard method (see formula in Section 11.3). For quantiation, the nearest eluting internal standard free of interferences is used. The procedure used for calculating the concentration of non-target compounds is the same as that used for target compounds (see Section 11.1) with the following revisions:

11.2.1. The total area count of the non-target compound is used for As (instead of the area of a characteristic ion).

11.2.2. The total area count of the chosen internal standard is used as Ais (instead of the area of a characteristic ion).

11.2.3. A RF on 1.0 is assumed.

11.2.4. The resulting concentration is qualified as estimated ('J') indicating the quantitative uncertainties of the reported concentration.

11.3. Internal Standard Calculation:

11.3.1. Aqueous Samples

$$\text{Concentration } (\mu g/L) = \frac{(As)(Cis)(D)}{(Ais)(RF)(Vs)\,(Vi)\,(1000)}$$

Where:

As = Area of the characteristic ion for the target analyte in the sample
Cis = Concentration of the internal standard (ug/L)
D = Dilution factor, if the sample or extract was diluted prior to analysis. If no dilution is performed, D = 1.
Vi = Volume of the extract injected (ul)
Ais = Area of the characteristic for the associated internal standard
RF = Average response factor from the initial calibration.
Vs = Volume of sample extracted (ml)

The 1000 in the denominator represents the number of ul in 1 ml.

11.3.2. Solid Samples

$$\text{Concentration (µg/KG)} = \frac{(As)(Cis)(D)(Vt)}{(Ais)(RF)(Ws)\ (Vi)\ (1000)}$$

Where:

As = Area of the characteristic ion for the target analyte in the sample
Cis = Concentration of the internal standard (ug/L)
D = Dilution factor, if the sample or extract was diluted prior to analysis. If no dilution is performed, D = 1.
Vi = Volume of the extract injected (ul)
Ais = Area of the characteristic for the associated internal standard
RF = Average response factor from the initial calibration.
Vt = Volume of concentrated extract (ul)
Ws = Weight of sample (g)

The 1000 in the denominator represents the number of ul in 1 ml.

11.4. Relative Response Factors

$$RRF = \frac{A_x}{A_{is}} \times \frac{C_{is}}{C_x}$$

Where:

A_x = Area characteristic ion for the compound (see Table 21)
Ais = Area characteristic ion of associated internal std (See Table 21)
Cis = Concentration of internal standard
Cx = Concentration of compound in standard

11.5. Percent Relative Standard Deviation (% RSD) : as discussed in Section 9.2.4.4 (Initial calibration):

$$\%\ RSD = \frac{\text{Standard Deviation of RRFs}}{\text{Mean RRF}}$$

11.6. Percent Difference (% D):as discussed in Section 9.2.4.4 (Continuing calibration):

$$\%\ D = \frac{RRF_c - \overline{RRF_i}}{\overline{RRF_i}} \times 100$$

Where: RRFc = RRF from continuing calibration

$\overline{RRF_i}$ = Mean RRF from current initial calibration

11.7. Percent Recovery (% R): Surrogates and Spikes

$$\text{Recovery (\%)} = \frac{\text{Concentration (or amount) found}}{\text{Concentration (or amount) added}} \text{ x } 100$$

11.8. Calculation of Percent (%) Error

$$\%Error = \frac{x_i - x_i'}{x_i} \text{x} \, 100$$

Where:

x_i^{1} = Measured amount of analyte at calibration level *i*, in mass or concentration units
x_i = True amount

11.9. Dry Weight Correction: All solid samples must be corrected for dry weight using the following formula for dry weight determination.

$$DW = \frac{Gd}{Gw} \text{ x } 100$$

Where:
DW = Percent % Dry Weight
Gd = Dry weight of selected sample aliquot
Gw = Wet weight of selected sample aliquot

Multiply the DW value times the wet weight of the sample extracted. NOTE: This calculation can also be performed automatically by the target system provided the DW value is available and entered into the system.

12.0. Method Performance

12.1. Method Detection Limit Study (MDL)

A Method Detection Limit (MDL) study, as described in the TestAmerica corporate Detection and Quantitation Limits SOP, CA-Q-S-006, must be performed initially and whenever a significant change affecting sensitivity is made to the analytical system. The MDL must be re-evaluated from quarterly MDL points at least every 12 months.

12.2. Demonstration of Capabilities

For DOC procedure refer to Section 19 in the most current revision of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM).

12.3. Lower Limit of Quantitation Verification

The lowest calibration standard analyzed establishes the LLOQ or Reporting Limit. The capability to reliably detect this concentration through the preparation, clean-up and analytical procedure is verified through the annual analysis of a standard at the LLOQ/RL. The LLOQ verification shall also be performed whenever significant changes are made to the preparation and/or analytical procedure.

12.3.1 The LLOQ verification standard shall be prepared at a concentration 0.5-2 times the LLOQ/RL, and be taken through all of the same preparation and clean-up methods as client samples.

12.3.2 The LLOQ verification standard for aqueous matrix shall be prepared using laboratory deionized water and for the solid matrix using clean Ottawa sand. Other clean matrices may be used in addition, for project specific requirements.

12.3.3 The LLOQ shall be verified annually on each instrument used for client sample analysis.

12.3.4 Recovery of each analyte must meet the laboratory established LCS recovery limits + 20%. (For example, if the LCS recovery limits are 70-130%, the LLOQ verification must meet recovery limits of 50-150%.) Once sufficient points have been generated, LLOQ based statistical limits may be used in place of limits based on LCS recovery.

NOTE: The lower recovery limit for the LLOQ can be no lower than 10%.

12.4. Training Requirements

Refer to TestAmerica SOP No. ED-GEN-022, (*Training*), for the laboratory's training program.

13.0. Pollution Control

13.1 It is TestAmerica's policy to evaluate each method and look for opportunities to minimize waste generated (i.e., examine recycling options, ordering chemicals based on quantity needed, preparation of reagents based on anticipated usage and reagent stability). Employees must abide by the policies in Section 13 of the Corporate Environmental Health and Safety Manual (CW-E-M-001) for "Waste Management and Pollution Prevention."

14.0. Waste Management

14.1 Waste management practices are conducted consistent with all applicable rules and regulations. Excess reagents, samples and method process wastes are disposed of in an accepted manner. Waste description rules and land disposal restrictions are followed. Waste disposal procedures are incorporated by reference to TestAmerica Edison SOPs Nos. ED-SPM-007 (*Disposal of Samples and*

Associated Laboratory Waste, current revision) and ED-SPM-008 (*Laboratory Waste Disposal Procedures, current revision).* The following waste streams are produced when this method is carried out:

- Auto sampler vials and expired standards: These vials are collected in satellite accumulation within the instrument laboratory. The vials are then placed into a 55 steel open top drum in the waste room. When the drums are full, the drum will be collected by the waste vendor for disposal. This waste is treated for incineration.

  Teris Profile Number: 50016652
  Onyx Profile WIP Number: 282493

- Mixed Solvent Waste: Mixed solvent waste is collected in a small beaker inside the bench top hood. This waste is then transferred into the satellite accumulation container in the Organic Prep. Lab. on a daily basis. This material is transferred into 5 gallon solvent cans as satellite accumulation. These cans are emptied every 24 hours into a steel drum in the waste room. This drum is kept in the walk in hood until it is full. The full drum is then removed from the hood and placed on secondary containment in the waste room.

  Teris Profile Number: 50016624
  Onyx Profile WIP Number: 545240

14.1. Pollution Prevention

14.2.1. Pollution prevention encompasses any technique that reduces or eliminates the quantity or toxicity of waste at the point of generation. Numerous opportunities for pollution prevention exist in laboratory operation. The USEPA has established a prevention hierarchy of environmental management techniques that places pollution prevention as the management option of first choice. Whenever feasible, laboratory personnel should use pollution prevention techniques to address their waste generation. When wastes cannot be feasibly reduced at the source, the agency recommends recycling as the next best option.

14.2.2. The quantity of chemical purchased should be based on expected usage during its shelf life and disposal cost of unused material. Actual reagent preparation volumes should reflect anticipated usage and reagent stability.

15.0. <u>References / Cross-References</u>

15.1. United States Environmental Protection Agency, “Method SW8270D, Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry”, Test Methods for Evaluating Solid Wastes, SW846 Third Edition, Laboratory Manual, Physical/Chemical Methods, Revision 5, July 2014..

15.2. United States Environmental Protection Agency, “Method SW8270E, Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry”, Test Methods for Evaluating Solid Wastes, SW846 Update IV, Laboratory Manual, Physical/Chemical Methods, Revision 6, June 2018.

15.3. United States Environmental Protection Agency, “Method SW8000D: Determinative Chromatographic Separations”, Test Methods for Evaluating Solid Wastes, SW846, Laboratory Manual, Physical/Chemical Methods, Update V, Revision 4, October 2012..

15.4. TestAmerica Edison Document No. ED-QA-LQM, *Laboratory Quality Manual*, current revision.

15.5. TestAmerica Edison SOP No. ED-ORP-002, *SW846 Method 3510C-Extraction of Semi-Volatile Organic Compounds in Water by Separatory Funnel,* current revision.

15.6. TestAmerica Edison SOP No. ED-ORP-043, *SW846 Method 3580A - Waste Dilution Prep for Analysis of BNAs by SW846 Method 8270,* current revision.

15.7. TestAmerica Edison SOP No. ED-ORP-044, *Procedure for the Microwave Extraction of Solids, SW3546, current revision.*

15.8. TestAmerica Document No. CW-E-M-001, Corporate Environmental Health and *Safety Manual,* current revision.

15.9. TestAmerica Corporate Quality SOP No. CA-Q-S-001, *Solvent & Acid Lot Testing & Approval*, current revision.

15.10. TestAmerica Edison SOP No. ED-GEN-023 (*Bulk Solvent Testing and Approval*), current revision.

15.11. TestAmerica Edison SOP No. ED-GCS-001, *Preparation and Screening of Semivolatile Organic Extracts for GC/MS Analysis*, current revision.

15.12. TestAmerica Edison Work Instruction Document No. EDS-WI-012, *Client Complaint/Corrective Action Form,* current revision.

15.13. TestAmerica Edison SOP No. ED-GEN-003, *Standard Operating Procedure for Control of Non-Conformances and Corrective Action,* current revision.

15.14. TestAmerica Edison SOP No. ED-ORP-001, *Extraction of Semivolatile Organic Compounds in Water, EPA Method 625.1,* current revision.

15.15. TestAmerica Edison SOP No. ED-GEN-022, *Training,* current revision.

15.16. TestAmerica Corporate Quality Memorandum, CA-Q-QM-002, *GC/MS Tuning Policy*, current revision.

15.17. TestAmerica Corporate Quality SOP No. CA-Q-S-006, *Detection and Quantitation Limits,* current revision.

16.0. Method Modifications:

Method 8270E requires the DFTPP tune standard to be analyzed once prior to an ICAL and not daily prior to sample analysis. Until such time as 8270D is removed from lab capabilities and in order to satisfy both 8270D and 8270E The laboratory will analyze the DFTPP tune daily, prior to QC and sample analysis. The laboratory will use the tighter criteria from Methods 8270C/8270D for tune evaluation, rather than the criteria suggested in Table 3 of Method 8270E.

17.0. Attachments

Attachment 1 Poor Performing Analytes

18.0. Revision History

- Revision 8, date 06/29/2020
  - Updated to Eurofins branding.
  - Updated throughout to include 8270E requirements.
  - Removed references to SW846 3550B/C prep methods (no longer in use for this method at Edison lab).
  - Update equipment listed in Section 6.0.Updated analytical column in Section 6.1.2.
  - Updated, deleted and renumbered tables as required.
  - Made extensive updates to Standards (sources and preparation) in Section 7.2.
  - Removed all references to Aromatic Amines. Deleted all tables specific to Aromatic Amine analysis. Renumbered remaining tables in document and updated text references.
  - Throughout document clarified tune requirements for 8270E.
  - Following added to Section 9.1.1: For method 8270E the method blank is generally acceptable if target analyte concentrations are less than the one half the reporting limit.
  - Calibration Point Read-back Criteria was added to Section 9.2.4.3. The calculation for percent error was added to Section 11.8.
  - Section 9.2.4.2.3: added following for 8270E: the calculated concentration or amount of each analyte of interest in the CCV standard should fall within ±20%.
  - Section 9.2.4.2.5.6: added ‘The recalculated concentration of the low calibration point should be within ±50% of the standard’s concentration.”
  - Section 12.1 revised to reflect the updated MDL procedure.
  - Added Section 12.3: annual Lower Limit of Quantitation Verification
  - Added Corporate SOP CA-Q-S-006, Detection and Quantitation Limits to references.
  - Section 16.0: added a Method Modification regarding tuning check requirements.

- Revision 7, date 06/08/2018
  - Section 2.3: revised to clarify that RVE/LVI is lab standard procedure.
  - Section 9.1.3: removed statement regarding allowance for up to five analytes to recover outside of lab acceptance limits in LCS/LCSD.
  - Section 9.2.4.3: Replace table ‘ICV Poor Performers (50-150% Recovery) with

    expanded list of ‘Poor Performing Analytes’ in Attachment 1.
  - Added Section 9.2.4.4.5: CCV Poor Performers
  - Corrected number in section 9.2.4.5
  - Added Attachment 1 – Poor Performing Analytes

- Revision 6, date 01/12/2018:

  - Section 7.2.5 included to specify reagent and standard storage conditions.
  - Revised Section 9.1.3 to clarify requirements for specific LCS/LCSD evaluation criteria regarding the # of out of criteria analytes.
  - Revised Section 9.2.4.3 to add 2,4-Dimethylphenol as a poor performing analyte, increased the range for the poor performers to 50-150 and also expanded the guidelines for flagging the ICV outliers.

- Revision 5, dated 09/29/2017:
  - Revised Section 9.1.1 to clarify requirements for surrogate recovery in method blanks.

- Revision 4, dated 08/21/2017:
  - Updated throughout to add a procedure for the analysis of 1,4-dioxane by isotope dilution selected ion monitoring (SIM)
  - Added tables for isotope dilution SIM standards. Renumbered all tables as necessary.
  - Section 7.2.1: added a list of full scan calibration list options.
  - Table 3: Renamed ‘Full Scan Stock Standards’.
  - Section 9.2.1: noted that DFTTP applies only to full scan analysis.
  - Section 9.2.3: updated CCV concentrations
  - Added reference to GC/MS Tuning Policy in Section 15.16.

- Revision 3, dated 01/07/2016:
  - Tables 1 and 2: added SIM as option for 1,4-Dioxane.
  - Section 2.3: removed SW3541 (Soxtherm) as option for soils prep (lab has discontinued use of this method). Also removed SW3541 SOP reference from Section 15.0.
  - Tables 19 and 20: added source and prep instructions for 1,4-Dioxane SIM standard. Updated source and prep instructions for 4,6-Dinitro-2-methylphenol.
  - Table 22: added prep instructions for 1,4-Dioxane and 4,6-Dinitro-2-methylphenol SIM ICV standard.
  - Corrected the information in the ‘DFTPP Key Ions and Abundance Criteria’ table in Section 9.2.1 to match the info found in SW846 8270C.
  - Section 10.1.4.2: updated “SIM Parameters” to included ion masses/dwell times for 1,4-Dioxane.

- Revision 2, dated 01/28/2015:
  - Extensively reformatted the SOP. Placed tables that had been in rear of document into the body of the text. Renumbered tables as applicable and fixed text references to tables.
  - Section 1.1, Table 1: Revised table to include all current analytes. Also footnoted those compounds which are currently analyzed by SIM.

- Section 2.3: added options for extraction of solids by SW846 3456 (Microwave Extraction) and by SW3580A (Waste Dilution) and added SOP references. Deleted reference to SOP ED-ORP-005 (SW3550B – Low Level); Updated Section 15 (References).
- Section 2.5: added text detailing the RVE/LVI options.
- Section 2.6: added table which includes all analytes routinely analyzed by SIM.
- Section 6: updated to include newer GC, MS and autosampler models currently in use.
- Section 6.1.3: added Zebron ZB column as an option.
- Section 7.2: extensively revised standards information to reflect switch to Restek standards.
- Table 3:Added Custom Aromatic Amine Surrogate Standard and revised Table 8 to include initial calibration prep instructions for the Aromatic Amine surrogates.
- Throughout document: removed references to Target and replaced with Chrom.
- Section 7.2.1: Added reference to section 10.2.1.2 for LVI.
- Added Section 7.2.1.3.1 and Table 17A both of which discuss use of Aromatic Amine surrogates.
- Section 7.2.1.2: Added reference to Tables 9,10 and 11 (ICV Preparation)
- Section 8.0: Added Sample container and minimum sample size (250 ml) for Reduced volume extraction.
- Sections 9.1.2, 9.1.3, 9.1.4 and 9.2.4: added statement that certain state regulatory programs have defined recovery limits which, where applicable, are used for spike and calibration evaluations.
- Section 9.1.2: Deleted sentence “A minimum of 16 spiked analytes are reported to in client reports (the full list is reported at least once during each 2 year period because we employ full spiking list.
- Section 9.1.4: Added note regarding use of Aromatic Amine Surrogates.
- Section 9.2.2.2: Added reference to ICV Preparation tables in Section 7.2.
- Section 9.2.3: added more specific info as to the concentration of the CCVs for all techniques.
- Section 9.2.4.2.1: Changed to reflect that each analyte should meet minimum RF’s, not the average across the calibration. Added LLCCV requirement.
- Section 10.3.1: added explanation of Chrom’s interaction with TALS. Removed references to Target.
- Section 9.2.4.2.5.5: Added: (or can be noted in the narrative)
- Section 9.2.4.2.5.6: Revised last sentence to read: “This evaluation can be checked using the Initial Calibration %Drift Report in Chrom.”
- Section 9.2.4.3: Removed 65-135% criteria and added “poor performing” analyte list and associated criteria of 60-140%.
- Section 9.2.4.4.3: Added LLCCV criterion for RFs
- Section 9.2.4.4.4: Added LLCCV criterion for %D
- Section 10.1.4: Updated GC/MS operating conditions for full scan, SIM and DFTPP.
- Section 10.1.4.1: added a table detailing operating conditions for LVI option.
- Table 2: Added 2-ethylaniline, 2,4-dimethylaniline, 3,4-dimethylaniline, 2,3-dimethylaniline, 2,4,5-trimethylaniline and 4-chloro-o-toluidine to Working Standards preparation information.
- Table 25: updated to include all current analytis/surrogates/internal standards and associated ions.
- Throughout document: updated LQM section references as appropriate as some have changed with the latest LQM revision.

- Revision 1, dated 11/07/2011
  - Section 1.1, Table 1: Added Pentachloronitrobenzene and associated CAS# to the analyte list.
  - Section 7.2.1: Added Pentachloronitrobenzene standard information.
  - Table 2: Added Pentachloronitrobenzene to Working Standards preparation information.
  - Table 4: Added Pentachloronitrobenzene and associated minimum RF.
  - Table 8: Added Pentachloronitrobenzene and associated ions.

- Revision 0, dated 02/22/2011: NEW

Table 21
Characteristic Ions Of Semi-Volatile Organic Compounds

Compound	**Primary Ion**	**Secondary Ion(s)**
1,1'-Biphenyl	154	153,76
1,2,4,5-Tetrachlorobenzene	216	214, 179
1,2,4-Trichlorobenzene	180	182, 145
1,2-Dichlorobenzene	146	148, 111
1,2-Diphenylhydrazine	77	105, 182
1,3-Dichlorobenzene	146	148, 111
1,3-Dimethylnaphthalene	156	141, 115
1,4-Dichlorobenzene	146	148, 111
1,4-Dichlorobenzene d4 **(ISTD)**	152	150, 115
1,4-Dioxane	88	58, 43
1-Methylnaphthalene	142	141, 115
1-Naphthylamine	143	115, 116
2,2'-oxybis[1-chloropropane]	45	77, 121
2,3,4,6-Tetrachlorophenol	232	131, 230
2,3,7,8-TCDD (screen)	320	322, 324
2,3-Dihydroindene		
2,3-Dimethylaniline	106	129
2,4,5-Trichlorophenol	196	198, 200
2,4,5-Trimethylaniline	102	55, 56
2,4,6-Tribromophenol **(Surrogate)**	330	132, 141
2,4,6-Trichlorophenol	196	198, 200
2,4-Dichlorophenol	162	164, 98
2,4-Xylidine	121	120, 106
2,4-Dimethylphenol	122	107, 121
2,4-Dinitrophenol	184	63, 154
2,4-Dinitrotoluene	165	63, 89
2,6-Dinitrotoluene	165	63, 89
2-Chloronaphthalene	162	127, 164
2-Chlorophenol	128	64, 130

Table 21
Characteristic Ions Of Semi-Volatile Organic Compounds

Compound	Primary Ion	Secondary Ion(s)
2-Ethylaniline	106	122,104
2-Fluorobiphenyl **(Surrogate)**	172	171
2-Fluorophenol **(Surrogate)**	112	64
2-Methylnaphthalene	142	141
2-Methylphenol	108	107
2-Naphthylamine	143	115, 116
2-Nitroaniline	65	108, 138
2-Nitrophenol	139	109, 65
2-tert-butyl-4-Methylphenol	149	121, 91
2-Toluidine	107	106, 77
3,3'-Dichlorobenzidine	252	254, 126
3,4-Dimethylaniline	106	129, 127
3,5-Di-tert-butyl-4-Hydroxytol	205	220, 145
3-Nitroaniline	138	108, 65
4,6-Dinitro-2-methylphenol	198	51, 105
4-Bromophenyl phenyl ether	248	250, 141
4-chloro-2-methylaniline	106	144, 142
4-Chloro-3-methylphenol	107	144, 142
4-Chloroaniline	127	129
4-Chloroaniline-d4 **(Surrogate)**	131	133
4-Chlorophenyl phenyl ether	204	206, 141
4-Methylphenol	108	107
4-Nitroaniline	138	108, 65
4-Nitrophenol	139	109, 65
Acenaphthene	154	153, 152
Acenaphthene d10 **(ISTD)**	164	162, 160
Acenaphthylene	152	151, 153
Acetophenone	105	77, 51
Aniline	93	66
Aniline-d5 **(Surrogate**)	98	71,42
Anthracene	178	176, 179
Atrazine	200	173,215
Benzaldehyde	77	105,106
Benzidine	184	92, 185
Benzo(a)anthracene	228	229, 226
Benzo(a)pyrene	252	253, 125
Benzo(b)fluoranthene	252	253, 125
Benzo(g,h,i)perylene	276	138, 277
Benzo(k)fluoranthene	252	253, 125
Benzoic Acid	122	105, 77
Benzyl Alcohol	108	79, 77
Bis(2-chloroethoxy)methane	93	95, 123
Bis(2-chloroethyl)ether	93	63, 95
Bis(2-ethylhexyl)phthalate	149	167, 279
Bisphenol-A	213	228, 119
Butyl benzyl phthalate	149	91, 206

Table 21
Characteristic Ions Of Semi-Volatile Organic Compounds

Compound	Primary Ion	Secondary Ion(s)
Caprolactam	113	55,56
Carbamazepine	193	236, 135
Carbazole	167	166, 139
Chrysene	228	226, 229
Chrysene d12 **(ISTD)**	240	120, 136
Coumarin	146	118, 63
Dibenz(a,h)anthracene	278	139, 279
Dibenzofuran	168	139
Diethylphthalate	149	177, 150
Dimethylphthalate	163	194, 164
Di-n-butylphthalate	149	150, 104
Di-n-octylphthalate	149	167, 43
Fluoranthene	202	101, 203
Fluorene	166	165, 167
Hexachlorobenzene	284	142, 249
Hexachlorobutadiene	225	223, 227
Hexachlorocyclopentadiene	237	235, 272
Hexachloroethane	117	201, 199
Indeno(1,2,3-cd)pyrene	276	138, 227
Isophorone	82	95,138
Kepone	272	237, 355
N,N-Dimethylaniline	120	122, 104
Naphthalene	128	129, 127
Naphthalene d8 **(ISTD)**	136	68
n-decane	43	57
Nitrobenzene	77	123, 65
Nitrobenzene-d5 **(Surrogate)**	82	128, 54
N-Nitrosodimethylamine	42	74, 44
N-Nitroso-di-n-propylamine	170	42,101,130
N-Nitrosodiphenylamine	169	168, 167
n-Octadecane	57	43, 85
o-Toluidine-d9 **(Surrogate)**	114	112, 42
Pentachloronitrobenzene	237	214,295
Pentachlorophenol	266	264, 268
Perylene d12 **(ISTD)**	264	260, 265
Phenanthrene	178	179, 176
Phenanthrene d10 **(ISTD)**	188	94, 80
Phenol	94	65, 66
Phenol-d5 **(Surrogate)**	99	42, 71
Phenyl ether	170	77, 115
Pyrene	202	200, 203
Pyridine	79	52, 51
Terphenyl-d14 **(Surrogate)**	244	122, 212

Attachment 1
Poor Performing Compounds

1,2,4,5-Tetrachlorobenzene
1,4-Dioxane
1-Naphthylamine
2,3,4,6-Tetrachlorophenol
2,4-Dimethylphenol
2,4-Dinitrophenol
2-Chloroaniline
2-Naphthylamine
3&4-Methylphenol
3’3-Dichlorobenzidine
4,6-Dinitro-2-methyl- phenol
4-Chloroaniline
4-Nitrophenol
Aniline
Atrazine
Benzaldehyde
Benzidine
Benzoic Acid
Benzyl Alcohol
Biphenyl
Caprolactam
Diphenylamine
Hexachlorocyclopentadiene
Hexachloroethane
n-Decane
n-Nitrosodimethylamine
o,o,o-Triethylphosphorothioate
o-Toluidine
Pentachloronitrobenzene
Pentachlorophenol
Phenol
Pyridine

These analytes are exempt from the ICV and CCV criteria as detailed in this SOP

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Fuel Additives

Methyl tert-butyl ether	EPA 524.2
Naphthalene	EPA 524.2

Metals I

Arsenic, Total	EPA 200.8 Rev. 5.4
Barium, Total	EPA 200.7 Rev. 4.4 EPA 200.8 Rev. 5.4
Cadmium, Total	EPA 200.7 Rev. 4.4 EPA 200.8 Rev. 5.4
Chromium, Total	EPA 200.7 Rev. 4.4 EPA 200.8 Rev. 5.4
Copper, Total	EPA 200.7 Rev. 4.4 EPA 200.8 Rev. 5.4
Iron, Total	EPA 200.7 Rev. 4.4
Lead, Total	EPA 200.8 Rev. 5.4
Manganese, Total	EPA 200.7 Rev. 4.4 EPA 200.8 Rev. 5.4
Mercury, Total	EPA 245.1 Rev. 3.0
Selenium, Total	EPA 200.8 Rev. 5.4
Silver, Total	EPA 200.7 Rev. 4.4 EPA 200.8 Rev. 5.4
Zinc, Total	EPA 200.7 Rev. 4.4 EPA 200.8 Rev. 5.4

Metals II

Aluminum, Total	EPA 200.7 Rev. 4.4 EPA 200.8 Rev. 5.4
Antimony, Total	EPA 200.8 Rev. 5.4
Beryllium, Total	EPA 200.7 Rev. 4.4 EPA 200.8 Rev. 5.4
Nickel, Total	EPA 200.7 Rev. 4.4 EPA 200.8 Rev. 5.4
Thallium, Total	EPA 200.8 Rev. 5.4
Vanadium, Total	EPA 200.7 Rev. 4.4 EPA 200.8 Rev. 5.4

Metals III

Boron, Total	EPA 200.7 Rev. 4.4
Calcium, Total	EPA 200.7 Rev. 4.4
Magnesium, Total	EPA 200.7 Rev. 4.4
Potassium, Total	EPA 200.7 Rev. 4.4
Sodium, Total	EPA 200.7 Rev. 4.4

Miscellaneous

Methyl iodide	EPA 524.2
Organic Carbon, Dissolved	SM 21-23 5310B (-00)
Organic Carbon, Total	SM 21-23 5310B (-00)
Turbidity	SM 21-23 2130 B (-01) EPA 180.1 Rev. 2.0

Non-Metals

Alkalinity	SM 21-23 2320B (-97)
Calcium Hardness	EPA 200.7 Rev. 4.4
Chloride	SM 21-23 4500-Cl- B (-97)

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Non-Metals

Chloride	EPA 300.0 Rev. 2.1
Color	SM 21-23 2120B (-01)
Cyanide	LACHAT QuikChem 10-204-00-1-X
	SM 20, 21-23 4500-CN G
	EPA 335.4 Rev. 1.0
Fluoride, Total	EPA 300.0 Rev. 2.1
	SM 21-23 4500-F C (-97)
Nitrate (as N)	EPA 353.2 Rev. 2.0
	EPA 300.0 Rev. 2.1
	SM 21-23 4500-NO3 F (-00)
Nitrite (as N)	EPA 353.2 Rev. 2.0
	EPA 300.0 Rev. 2.1
	SM 21-23 4500-NO3 F (-00)
	SM 21-23 4500-NO2 B (-00)
Orthophosphate (as P)	EPA 300.0 Rev. 2.1
	SM 19, 21-23 4500-P E (-99)
Solids, Total Dissolved	SM 21-23 2540C (-97)
Specific Conductance	SM 21-23 2510B (-97)
Sulfate (as SO4)	ASTM D516-07, 11, 16
	EPA 300.0 Rev. 2.1

Trihalomethanes

Bromodichloromethane	EPA 524.2
Bromoform	EPA 524.2
Chloroform	EPA 524.2
Dibromochloromethane	EPA 524.2

Volatile Aromatics

1,2,3-Trichlorobenzene	EPA 524.2
1,2,4-Trichlorobenzene	EPA 524.2
1,2,4-Trimethylbenzene	EPA 524.2
1,2-Dichlorobenzene	EPA 524.2
1,3,5-Trimethylbenzene	EPA 524.2
1,3-Dichlorobenzene	EPA 524.2
1,4-Dichlorobenzene	EPA 524.2
2-Chlorotoluene	EPA 524.2
4-Chlorotoluene	EPA 524.2
Benzene	EPA 524.2
Bromobenzene	EPA 524.2
Chlorobenzene	EPA 524.2
Ethyl benzene	EPA 524.2
Hexachlorobutadiene	EPA 524.2
Isopropylbenzene	EPA 524.2
n-Butylbenzene	EPA 524.2
n-Propylbenzene	EPA 524.2
p-Isopropyltoluene (P-Cymene)	EPA 524.2
sec-Butylbenzene	EPA 524.2
Styrene	EPA 524.2
tert-Butylbenzene	EPA 524.2
Toluene	EPA 524.2
Total Xylenes	EPA 524.2

Volatile Halocarbons

1,1,1,2-Tetrachloroethane	EPA 524.2

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All approved analytes are listed below:

Volatile Halocarbons	
1,1,1-Trichloroethane	EPA 524.2
1,1,2,2-Tetrachloroethane	EPA 524.2
1,1,2-Trichloroethane	EPA 524.2
1,1-Dichloroethane	EPA 524.2
1,1-Dichloroethene	EPA 524.2
1,1-Dichloropropene	EPA 524.2
1,2,3-Trichloropropane	EPA 524.2
1,2-Dichloroethane	EPA 524.2
1,2-Dichloropropane	EPA 524.2
1,3-Dichloropropane	EPA 524.2
2,2-Dichloropropane	EPA 524.2
Bromochloromethane	EPA 524.2
Bromomethane	EPA 524.2
Carbon tetrachloride	EPA 524.2
Chloroethane	EPA 524.2
Chloromethane	EPA 524.2
cis-1,2-Dichloroethene	EPA 524.2
cis-1,3-Dichloropropene	EPA 524.2
Dibromomethane	EPA 524.2
Dichlorodifluoromethane	EPA 524.2
Methylene chloride	EPA 524.2
Tetrachloroethene	EPA 524.2
trans-1,2-Dichloroethene	EPA 524.2
trans-1,3-Dichloropropene	EPA 524.2
Trichloroethene	EPA 524.2
Trichlorofluoromethane	EPA 524.2

Volatile Halocarbons	
Vinyl chloride	EPA 524.2

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All approved analytes are listed below:

Acrylates

Acrolein (Propenal)	EPA 8260D
	EPA 624.1
Acrylonitrile	EPA 8260D
	EPA 624.1
Ethyl methacrylate	EPA 8260D
Methyl methacrylate	EPA 8260D

Amines

1,2-Diphenylhydrazine	EPA 625.1
	EPA 8270E
1-Naphthylamine	EPA 8270E
2,3-Dichloroaniline	EPA 625.1
2-Naphthylamine	EPA 8270E
2-Nitroaniline	EPA 8270E
3-Nitroaniline	EPA 8270E
4-Chloroaniline	EPA 8270E
4-Nitroaniline	EPA 8270E
Aniline	EPA 625.1
	EPA 8270E
Carbazole	EPA 625.1
	EPA 8270E
Diphenylamine	EPA 8270E
Propionitrile	EPA 8260D
Pyridine	EPA 625.1
	EPA 8270E

Benzidines

3,3'-Dichlorobenzidine	EPA 625.1
	EPA 8270E
Benzidine	EPA 625.1
	EPA 8270E

Chlorinated Hydrocarbon Pesticides

4,4'-DDD	EPA 8081B
	EPA 608.3
4,4'-DDE	EPA 8081B
	EPA 608.3
4,4'-DDT	EPA 8081B
	EPA 608.3
Aldrin	EPA 8081B
	EPA 608.3
alpha-BHC	EPA 8081B
	EPA 608.3
alpha-Chlordane	EPA 8081B
beta-BHC	EPA 8081B
	EPA 608.3
Chlordane Total	EPA 8081B
	EPA 608.3
delta-BHC	EPA 8081B
	EPA 608.3
Dieldrin	EPA 8081B
	EPA 608.3
Endosulfan I	EPA 8081B

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Chlorinated Hydrocarbon Pesticides

Endosulfan I	EPA 608.3
Endosulfan II	EPA 8081B EPA 608.3
Endosulfan sulfate	EPA 8081B EPA 608.3
Endrin	EPA 8081B EPA 608.3
Endrin aldehyde	EPA 8081B EPA 608.3
Endrin Ketone	EPA 8081B
gamma-Chlordane	EPA 8081B
Heptachlor	EPA 8081B EPA 608.3
Heptachlor epoxide	EPA 8081B EPA 608.3
Lindane	EPA 8081B EPA 608.3
Methoxychlor	EPA 8081B EPA 608.3
Mirex	EPA 8081B
Toxaphene	EPA 8081B EPA 608.3

Chlorinated Hydrocarbons

1,2,3-Trichlorobenzene	EPA 8260D
1,2,4,5-Tetrachlorobenzene	EPA 8270E

Chlorinated Hydrocarbons

1,2,4-Trichlorobenzene	EPA 625.1 EPA 8270E
2-Chloronaphthalene	EPA 625.1 EPA 8270E
Hexachlorobenzene	EPA 625.1 EPA 8270E
Hexachlorobutadiene	EPA 625.1 EPA 8270E
Hexachlorocyclopentadiene	EPA 625.1 EPA 8270E
Hexachloroethane	EPA 625.1 EPA 8270E

Chlorophenoxy Acid Pesticides

2,4,5-T	EPA 8151A
2,4,5-TP (Silvex)	EPA 8151A
2,4-D	EPA 8151A
2,4-DB	EPA 8151A
Dalapon	EPA 8151A
Dicamba	EPA 8151A
Dichloroprop	EPA 8151A
Dinoseb	EPA 8151A
Pentachlorophenol	EPA 8151A

Demand

Biochemical Oxygen Demand	SM 5210B-2011
Carbonaceous BOD	SM 5210B-2011

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Demand	
Chemical Oxygen Demand	EPA 410.4, Rev. 2.0 (1993)
	SM 5220D-2011
Fuel Oxygenates	
Di-isopropyl ether	EPA 8260D
Ethanol	EPA 8260D
	EPA 624.1
Methyl tert-butyl ether	EPA 8260D
	EPA 624.1
tert-amyl methyl ether (TAME)	EPA 8260D
tert-butyl alcohol	EPA 8260D
	EPA 624.1
tert-butyl ethyl ether (ETBE)	EPA 8260D
Haloethers	
2,2'-Oxybis(1-chloropropane)	EPA 625.1
	EPA 8270E
4-Bromophenylphenyl ether	EPA 625.1
	EPA 8270E
4-Chlorophenylphenyl ether	EPA 625.1
	EPA 8270E
Bis(2-chloroethoxy)methane	EPA 625.1
	EPA 8270E
Bis(2-chloroethyl)ether	EPA 625.1
	EPA 8270E

Low Level Polynuclear Aromatics	
Acenaphthene Low Level	EPA 8270E SIM
Acenaphthylene Low Level	EPA 8270E SIM
Anthracene Low Level	EPA 8270E SIM
Benzo(a)anthracene Low Level	EPA 8270E SIM
Benzo(a)pyrene Low Level	EPA 8270E SIM
Benzo(b)fluoranthene Low Level	EPA 8270E SIM
Benzo(g,h,i)perylene Low Level	EPA 8270E SIM
Benzo(k)fluoranthene Low Level	EPA 8270E SIM
Chrysene Low Level	EPA 8270E SIM
Dibenzo(a,h)anthracene Low Level	EPA 8270E SIM
Fluoranthene Low Level	EPA 8270E SIM
Fluorene Low Level	EPA 8270E SIM
Indeno(1,2,3-cd)pyrene Low Level	EPA 8270E SIM
Phenanthrene Low Level	EPA 8270E SIM
Pyrene Low Level	EPA 8270E SIM
Metals I	
Barium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Cadmium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Calcium, Total	EPA 200.7, Rev. 4.4 (1994)

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Metals I

Calcium, Total	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Chromium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Copper, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Iron, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Lead, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Magnesium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Manganese, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
	EPA 6020B

Metals I

Manganese, Total	EPA 200.8, Rev. 5.4 (1994)
Nickel, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Potassium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Silver, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Sodium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Strontium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
	EPA 6020B

Metals II

Aluminum, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)

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Metals II

Antimony, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Arsenic, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Beryllium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Chromium VI	USGS I-1230-85
	EPA 7196A
Mercury, Total	EPA 245.1, Rev. 3.0 (1994)
	EPA 7470A
Selenium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Vanadium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Zinc, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D

Metals II

Zinc, Total	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)

Metals III

Cobalt, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Molybdenum, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Thallium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Tin, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Titanium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)

Mineral

Acidity	SM 2310B-2011

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Mineral

Alkalinity	SM 2320B-2011
Chloride	SM 4500-Cl- B-2011
	EPA 300.0, Rev. 2.1 (1993)
	SM 4110B-2011
	SM 4500-Cl- E-2011
	EPA 9253
Fluoride, Total	EPA 300.0, Rev. 2.1 (1993)
	SM 4110B-2011
Hardness, Total	SM 2340C-2011
	SM 2340B-2011
Sulfate (as SO4)	ASTM D516-11
	EPA 300.0, Rev. 2.1 (1993)
	SM 4110B-2011

Miscellaneous

Boron, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Bromide	EPA 300.0, Rev. 2.1 (1993)
	SM 4110B-2011
Color	SM 2120B-2011
Cyanide, Total	LACHAT QuikChem 10-204-00-1-X
	SM 4500-CN E-2011
	EPA 335.4, Rev. 1.0 (1993)
	EPA 9012B

Miscellaneous

Oil and Grease Total Recoverable (HEM)	EPA 1664A
Organic Carbon, Total	SM 5310B-2011
	EPA 9060A
Phenols	EPA 420.1 (Rev. 1978)
	EPA 420.4, Rev. 1.0 (1993)
	EPA 9065
	EPA 9066
Specific Conductance	EPA 120.1 (Rev. 1982)
	SM 2510B-2011
	EPA 9050A
Sulfide (as S)	SM 4500-S2- F-2011
	EPA 9034
Turbidity	SM 2130 B-2011
	EPA 180.1, Rev. 2.0 (1993)

Nitroaromatics and Isophorone

2,4-Dinitrotoluene	EPA 625.1
	EPA 8270E
2,6-Dinitrotoluene	EPA 625.1
	EPA 8270E
Isophorone	EPA 625.1
	EPA 8270E
Nitrobenzene	EPA 625.1
	EPA 8270E

Nitrosoamines

N-Nitrosodimethylamine	EPA 625.1

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Nitrosoamines	
N-Nitrosodimethylamine	EPA 8270E
N-Nitrosodi-n-propylamine	EPA 625.1 EPA 8270E
N-Nitrosodiphenylamine	EPA 625.1 EPA 8270E
Nutrient	
Ammonia (as N)	SM 4500-NH3 G-2011 EPA 350.1, Rev. 2.0 (1993)
Nitrate (as N)	EPA 353.2, Rev. 2.0 (1993) EPA 300.0, Rev. 2.1 (1993) SM 4110B-2011 SM 4500-NO3 F-2011
Nitrate-Nitrite (as N)	EPA 353.2, Rev. 2.0 (1993) EPA 300.0, Rev. 2.1 (1993) SM 4110B-2011 SM 4500-NO3 F-2011
Nitrite (as N)	EPA 353.2, Rev. 2.0 (1993) EPA 300.0, Rev. 2.1 (1993) SM 4110B-2011 SM 4500-NO3 F-2011 SM 4500-NO2 B-2011
Orthophosphate (as P)	SM 4500-P E-2011
Phosphorus, Total	SM 4500-P E-2011
Organophosphate Pesticides	
Atrazine	EPA 8270E

Petroleum Hydrocarbons	
Diesel Range Organics	EPA 8015D
Gasoline Range Organics	EPA 8015D
Phthalate Esters	
Benzyl butyl phthalate	EPA 625.1 EPA 8270E
Bis(2-ethylhexyl) phthalate	EPA 625.1 EPA 8270E
Diethyl phthalate	EPA 625.1 EPA 8270E
Dimethyl phthalate	EPA 625.1 EPA 8270E
Di-n-butyl phthalate	EPA 625.1 EPA 8270E
Di-n-octyl phthalate	EPA 625.1 EPA 8270E
Polychlorinated Biphenyls	
Aroclor 1016 (PCB-1016)	EPA 8082A EPA 608.3
Aroclor 1221 (PCB-1221)	EPA 8082A EPA 608.3
Aroclor 1232 (PCB-1232)	EPA 8082A EPA 608.3
Aroclor 1242 (PCB-1242)	EPA 8082A EPA 608.3
Aroclor 1248 (PCB-1248)	EPA 8082A

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Polychlorinated Biphenyls

Aroclor 1248 (PCB-1248)	EPA 608.3
Aroclor 1254 (PCB-1254)	EPA 8082A
	EPA 608.3
Aroclor 1260 (PCB-1260)	EPA 8082A
	EPA 608.3
Aroclor 1262 (PCB-1262)	EPA 8082A
Aroclor 1268 (PCB-1268)	EPA 8082A

Polynuclear Aromatics

Acenaphthene	EPA 625.1
	EPA 8270E
Acenaphthylene	EPA 625.1
	EPA 8270E
Anthracene	EPA 625.1
	EPA 8270E
Benzo(a)anthracene	EPA 625.1
	EPA 8270E
Benzo(a)pyrene	EPA 625.1
	EPA 8270E
Benzo(b)fluoranthene	EPA 625.1
	EPA 8270E
Benzo(g,h,i)perylene	EPA 625.1
	EPA 8270E
Benzo(k)fluoranthene	EPA 625.1
	EPA 8270E
Chrysene	EPA 625.1

Polynuclear Aromatics

Chrysene	EPA 8270E
Dibenzo(a,h)anthracene	EPA 625.1
	EPA 8270E
Fluoranthene	EPA 625.1
	EPA 8270E
Fluorene	EPA 625.1
	EPA 8270E
Indeno(1,2,3-cd)pyrene	EPA 625.1
	EPA 8270E
Naphthalene	EPA 625.1
	EPA 8270E
Phenanthrene	EPA 625.1
	EPA 8270E
Pyrene	EPA 625.1
	EPA 8270E

Priority Pollutant Phenols

2,3,4,6 Tetrachlorophenol	EPA 8270E
2,4,5-Trichlorophenol	EPA 625.1
	EPA 8270E
2,4,6-Trichlorophenol	EPA 625.1
	EPA 8270E
2,4-Dichlorophenol	EPA 625.1
	EPA 8270E
2,4-Dimethylphenol	EPA 625.1
	EPA 8270E

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Priority Pollutant Phenols

2,4-Dinitrophenol	EPA 625.1
	EPA 8270E
2-Chlorophenol	EPA 625.1
	EPA 8270E
2-Methyl-4,6-dinitrophenol	EPA 625.1
	EPA 8270E
2-Methylphenol	EPA 625.1
	EPA 8270E
2-Nitrophenol	EPA 625.1
	EPA 8270E
3-Methylphenol	EPA 8270E
4-Chloro-3-methylphenol	EPA 625.1
	EPA 8270E
4-Methylphenol	EPA 625.1
	EPA 8270E
4-Nitrophenol	EPA 625.1
	EPA 8270E
Cresols, Total	EPA 8270E
Pentachlorophenol	EPA 625.1
	EPA 8270E
Phenol	EPA 625.1
	EPA 8270E

Residue

Settleable Solids	SM 2540 F-2011
Solids, Total	SM 2540 B-2011

Residue

Solids, Total Dissolved	SM 2540 C-2011
Solids, Total Suspended	SM 2540 D-2011
Solids, Volatile	EPA 160.4 (Issued 1971)

Semi-Volatile Organics

1,1'-Biphenyl	EPA 8270E
1,2-Dichlorobenzene, Semi-volatile	EPA 8270E
1,3-Dichlorobenzene, Semi-volatile	EPA 8270E
1,4-Dichlorobenzene, Semi-volatile	EPA 8270E
2-Methylnaphthalene	EPA 8270E
Acetophenone	EPA 625.1
	EPA 8270E
alpha-Terpineol	EPA 625.1
Benzaldehyde	EPA 8270E
Benzoic Acid	EPA 8270E
Benzyl alcohol	EPA 8270E
Caprolactam	EPA 8270E
Dibenzofuran	EPA 8270E
n-Decane	EPA 625.1
	EPA 8270E
n-Octadecane	EPA 625.1
	EPA 8270E

Volatile Aromatics

1,2,4-Trichlorobenzene, Volatile	EPA 8260D
1,2,4-Trimethylbenzene	EPA 8260D
1,2-Dichlorobenzene	EPA 8260D

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Volatile Aromatics

1,2-Dichlorobenzene	EPA 624.1
1,3,5-Trimethylbenzene	EPA 8260D
1,3-Dichlorobenzene	EPA 8260D
	EPA 624.1
1,4-Dichlorobenzene	EPA 8260D
	EPA 624.1
2-Chlorotoluene	EPA 8260D
4-Chlorotoluene	EPA 8260D
Benzene	EPA 8260D
	EPA 624.1
Bromobenzene	EPA 8260D
Chlorobenzene	EPA 8260D
	EPA 624.1
Ethyl benzene	EPA 8260D
	EPA 624.1
Isopropylbenzene	EPA 8260D
m/p-Xylenes	EPA 8260D
	EPA 624.1
Naphthalene, Volatile	EPA 8260D
n-Butylbenzene	EPA 8260D
n-Propylbenzene	EPA 8260D
o-Xylene	EPA 8260D
	EPA 624.1
p-Isopropyltoluene (P-Cymene)	EPA 8260D
sec-Butylbenzene	EPA 8260D
Styrene	EPA 8260D

Volatile Aromatics

Styrene	EPA 624.1
tert-Butylbenzene	EPA 8260D
Toluene	EPA 8260D
	EPA 624.1
Total Xylenes	EPA 8260D
	EPA 624.1

Volatile Chlorinated Organics

Benzyl chloride	EPA 8260D

Volatile Halocarbons

1,1,1,2-Tetrachloroethane	EPA 8260D
1,1,1-Trichloroethane	EPA 8260D
	EPA 624.1
1,1,2,2-Tetrachloroethane	EPA 8260D
	EPA 624.1
1,1,2-Trichloro-1,2,2-Trifluoroethane	EPA 8260D
	EPA 624.1
1,1,2-Trichloroethane	EPA 8260D
	EPA 624.1
1,1-Dichloroethane	EPA 8260D
	EPA 624.1
1,1-Dichloroethene	EPA 8260D
	EPA 624.1
1,1-Dichloropropene	EPA 8260D
1,2,3-Trichloropropane	EPA 8260D
1,2-Dibromo-3-chloropropane	EPA 8260D

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Volatile Halocarbons	
1,2-Dibromoethane	EPA 8260D
1,2-Dichloroethane	EPA 8260D
	EPA 624.1
1,2-Dichloropropane	EPA 8260D
	EPA 624.1
1,3-Dichloropropane	EPA 8260D
2,2-Dichloropropane	EPA 8260D
2-Chloro-1,3-butadiene (Chloroprene)	EPA 8260D
2-Chloroethylvinyl ether	EPA 8260D
	EPA 624.1
3-Chloropropene (Allyl chloride)	EPA 8260D
Bromochloromethane	EPA 8260D
Bromodichloromethane	EPA 8260D
	EPA 624.1
Bromoform	EPA 8260D
	EPA 624.1
Bromomethane	EPA 8260D
	EPA 624.1
Carbon tetrachloride	EPA 8260D
	EPA 624.1
Chloroethane	EPA 8260D
	EPA 624.1
Chloroform	EPA 8260D
	EPA 624.1
Chloromethane	EPA 8260D
	EPA 624.1

Volatile Halocarbons	
cis-1,2-Dichloroethene	EPA 8260D
	EPA 624.1
cis-1,3-Dichloropropene	EPA 8260D
	EPA 624.1
Dibromochloromethane	EPA 8260D
	EPA 624.1
Dibromomethane	EPA 8260D
Dichlorodifluoromethane	EPA 8260D
	EPA 624.1
Hexachlorobutadiene, Volatile	EPA 8260D
Methyl iodide	EPA 8260D
Methylene chloride	EPA 8260D
	EPA 624.1
Tetrachloroethene	EPA 8260D
	EPA 624.1
trans-1,2-Dichloroethene	EPA 8260D
	EPA 624.1
trans-1,3-Dichloropropene	EPA 8260D
	EPA 624.1
trans-1,4-Dichloro-2-butene	EPA 8260D
Trichloroethene	EPA 8260D
	EPA 624.1
Trichlorofluoromethane	EPA 8260D
	EPA 624.1
Vinyl chloride	EPA 8260D
	EPA 624.1

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Volatiles Organics

1,4-Dioxane	EPA 8260D
	EPA 8260D SIM
	EPA 8270D SIM
	EPA 8270E
2-Butanone (Methylethyl ketone)	EPA 8260D
2-Hexanone	EPA 8260D
2-Nitropropane	EPA 8260D
4-Methyl-2-Pentanone	EPA 8260D
Acetone	EPA 8260D
	EPA 624.1
Acetonitrile	EPA 8260D
	EPA 624.1
Carbon Disulfide	EPA 8260D
Cyclohexane	EPA 8260D
Di-ethyl ether	EPA 8260D
Ethyl Acetate	EPA 8260D
Isobutyl alcohol	EPA 8260D
Isopropanol	EPA 8260D
Methyl acetate	EPA 8260D
Methyl cyclohexane	EPA 8260D
n-Butanol	EPA 8260D
o-Toluidine	EPA 8260D
Tetrahydrofuran	EPA 8260D
	EPA 624.1
Vinyl acetate	EPA 8260D
	EPA 624.1

Sample Preparation Methods

SM 4500-P B(5)-2011
EPA 5030C
SM 4500-CN B-2011 and C-201
EPA 9030B
EPA 3010A
EPA 3005A
EPA 3510C
EPA 3520C
SM 4500-NH3 B-2011
EPA 9010C

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Acrylates

Acrolein (Propenal)	EPA 8260D
Acrylonitrile	EPA 8260D
Ethyl methacrylate	EPA 8260D
Methyl acrylonitrile	EPA 8260D
Methyl methacrylate	EPA 8260D

Amines

1,2-Diphenylhydrazine	EPA 8270E
1-Naphthylamine	EPA 8270E
2-Naphthylamine	EPA 8270E
2-Nitroaniline	EPA 8270E
3-Nitroaniline	EPA 8270E
4-Chloroaniline	EPA 8270E
4-Nitroaniline	EPA 8270E
Aniline	EPA 8270E
Carbazole	EPA 8270E

Benzidines

3,3'-Dichlorobenzidine	EPA 8270E
Benzidine	EPA 8270E

Characteristic Testing

Corrosivity (pH)	EPA 9040C
	EPA 9045D
Free Liquids	EPA 9095B
Ignitability	EPA 1030
	EPA 1020B

Characteristic Testing

Synthetic Precipitation Leaching Proc.	EPA 1312
TCLP	EPA 1311

Chlorinated Hydrocarbon Pesticides

4,4'-DDD	EPA 8081B
4,4'-DDE	EPA 8081B
4,4'-DDT	EPA 8081B
Aldrin	EPA 8081B
alpha-BHC	EPA 8081B
alpha-Chlordane	EPA 8081B
Atrazine	EPA 8270E
beta-BHC	EPA 8081B
Chlordane Total	EPA 8081B
delta-BHC	EPA 8081B
Dieldrin	EPA 8081B
Endosulfan I	EPA 8081B
Endosulfan II	EPA 8081B
Endosulfan sulfate	EPA 8081B
Endrin	EPA 8081B
Endrin aldehyde	EPA 8081B
Endrin Ketone	EPA 8081B
gamma-Chlordane	EPA 8081B
Heptachlor	EPA 8081B
Heptachlor epoxide	EPA 8081B
Lindane	EPA 8081B
Methoxychlor	EPA 8081B

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Chlorinated Hydrocarbon Pesticides

Mirex	EPA 8081B
Pentachloronitrobenzene	EPA 8270E
Toxaphene	EPA 8081B

Chlorinated Hydrocarbons

1,2,3-Trichlorobenzene	EPA 8260D
1,2,4-Trichlorobenzene	EPA 8270E
2-Chloronaphthalene	EPA 8270E
Hexachlorobenzene	EPA 8270E
Hexachlorobutadiene	EPA 8270E
Hexachlorocyclopentadiene	EPA 8270E
Hexachloroethane	EPA 8270E

Chlorophenoxy Acid Pesticides

2,4,5-T	EPA 8151A
2,4,5-TP (Silvex)	EPA 8151A
2,4-D	EPA 8151A
2,4-DB	EPA 8151A
Dalapon	EPA 8151A
Dicamba	EPA 8151A
Dichloroprop	EPA 8151A
Dinoseb	EPA 8151A
MCPA	EPA 8151A
MCPP	EPA 8151A
Pentachlorophenol	EPA 8151A

Haloethers

2,2'-Oxybis(1-chloropropane)	EPA 8270E
4-Bromophenylphenyl ether	EPA 8270E
4-Chlorophenylphenyl ether	EPA 8270E
Bis(2-chloroethoxy)methane	EPA 8270E
Bis(2-chloroethyl)ether	EPA 8270E

Low Level Polynuclear Aromatic Hydrocarbons

Acenaphthene Low Level	EPA 8270E SIM
Acenaphthylene Low Level	EPA 8270E SIM
Anthracene Low Level	EPA 8270E SIM
Benzo(a)anthracene Low Level	EPA 8270E SIM
Benzo(a)pyrene Low Level	EPA 8270E SIM
Benzo(b)fluoranthene Low Level	EPA 8270E SIM
Benzo(g,h,i)perylene Low Level	EPA 8270E SIM
Benzo(k)fluoranthene Low Level	EPA 8270E SIM
Chrysene Low Level	EPA 8270E SIM
Dibenzo(a,h)anthracene Low Level	EPA 8270E SIM
Fluoranthene Low Level	EPA 8270E SIM
Fluorene Low Level	EPA 8270E SIM
Indeno(1,2,3-cd)pyrene Low Level	EPA 8270E SIM
Phenanthrene Low Level	EPA 8270E SIM
Pyrene Low Level	EPA 8270E SIM

Metals I

Barium, Total	EPA 6010D EPA 6020B
Cadmium, Total	EPA 6010D

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NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2021
Issued April 01, 2020
Revised October 05, 2020

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. CATALINA DALANGIN
EUROFINS TESTAMERICA EDISON
777 NEW DURHAM ROAD
EDISON, NJ 08817

NY Lab Id No: 11452

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2003) for the category ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved analytes are listed below:

Metals I

Cadmium, Total	EPA 6020B
Calcium, Total	EPA 6010D
	EPA 6020B
Chromium, Total	EPA 6010D
	EPA 6020B
Copper, Total	EPA 6010D
	EPA 6020B
Iron, Total	EPA 6010D
	EPA 6020B
Lead, Total	EPA 6010D
	EPA 6020B
Magnesium, Total	EPA 6010D
	EPA 6020B
Manganese, Total	EPA 6010D
	EPA 6020B
Nickel, Total	EPA 6010D
	EPA 6020B
Potassium, Total	EPA 6010D
	EPA 6020B
Silver, Total	EPA 6010D
	EPA 6020B
Sodium, Total	EPA 6010D
	EPA 6020B
Strontium, Total	EPA 6010D
	EPA 6020B

Metals II

Aluminum, Total	EPA 6010D
	EPA 6020B
Antimony, Total	EPA 6010D
	EPA 6020B
Arsenic, Total	EPA 6010D
	EPA 6020B
Beryllium, Total	EPA 6010D
	EPA 6020B
Chromium VI	EPA 7196A
Mercury, Total	EPA 7471B
Selenium, Total	EPA 6010D
	EPA 6020B
Vanadium, Total	EPA 6010D
	EPA 6020B
Zinc, Total	EPA 6010D
	EPA 6020B

Metals III

Cobalt, Total	EPA 6010D
	EPA 6020B
Molybdenum, Total	EPA 6010D
	EPA 6020B
Thallium, Total	EPA 6010D
	EPA 6020B
Tin, Total	EPA 6010D
	EPA 6020B

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Metals III

Titanium, Total	EPA 6010D
	EPA 6020B

Minerals

Bromide	EPA 9056A
Chloride	EPA 9251
	EPA 9253
	EPA 9056A
Fluoride, Total	EPA 9214
	EPA 9056A
Sulfate (as SO4)	EPA 9038
	EPA 9056A

Miscellaneous

Boron, Total	EPA 6010D
	EPA 6020B
Cyanide, Total	EPA 9012B
Organic Carbon, Total	Lloyd Kahn Method
Phenols	EPA 9065
Specific Conductance	EPA 9050A
Sulfide (as S)	EPA 9034

Nitroaromatics and Isophorone

2,4-Dinitrotoluene	EPA 8270E
2,6-Dinitrotoluene	EPA 8270E
Isophorone	EPA 8270E
Nitrobenzene	EPA 8260D

Nitroaromatics and Isophorone

Pyridine	EPA 8270E

Nitrosoamines

N-Nitrosodimethylamine	EPA 8270E
N-Nitrosodi-n-propylamine	EPA 8270E
N-Nitrosodiphenylamine	EPA 8270E

Nutrients

Nitrate (as N)	EPA 9056A
Nitrite (as N)	EPA 9056A
Orthophosphate (as P)	EPA 9056A

Petroleum Hydrocarbons

Diesel Range Organics	EPA 8015D
Gasoline Range Organics	EPA 8015D

Phthalate Esters

Benzyl butyl phthalate	EPA 8270E
Bis(2-ethylhexyl) phthalate	EPA 8270E
Diethyl phthalate	EPA 8270E
Dimethyl phthalate	EPA 8270E
Di-n-butyl phthalate	EPA 8270E
Di-n-octyl phthalate	EPA 8270E

Polychlorinated Biphenyls

Aroclor 1016 (PCB-1016)	EPA 8082A
Aroclor 1016 (PCB-1016) in Oil	EPA 8082A
Aroclor 1221 (PCB-1221)	EPA 8082A

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Polychlorinated Biphenyls

Aroclor 1221 (PCB-1221) in Oil	EPA 8082A
Aroclor 1232 (PCB-1232)	EPA 8082A
Aroclor 1232 (PCB-1232) in Oil	EPA 8082A
Aroclor 1242 (PCB-1242)	EPA 8082A
Aroclor 1242 (PCB-1242) in Oil	EPA 8082A
Aroclor 1248 (PCB-1248)	EPA 8082A
Aroclor 1248 (PCB-1248) in Oil	EPA 8082A
Aroclor 1254 (PCB-1254)	EPA 8082A
Aroclor 1254 (PCB-1254) in Oil	EPA 8082A
Aroclor 1260 (PCB-1260)	EPA 8082A
Aroclor 1260 (PCB-1260) in Oil	EPA 8082A
Aroclor 1262 (PCB-1262)	EPA 8082A
Aroclor 1262 (PCB-1262) in Oil	EPA 8082A
Aroclor 1268 (PCB-1268)	EPA 8082A
Aroclor 1268 (PCB-1268) in Oil	EPA 8082A

Polynuclear Aromatic Hydrocarbons

Acenaphthene	EPA 8270E
Acenaphthylene	EPA 8270E
Anthracene	EPA 8270E
Benzo(a)anthracene	EPA 8270E
Benzo(a)pyrene	EPA 8270E
Benzo(b)fluoranthene	EPA 8270E
Benzo(g,h,i)perylene	EPA 8270E
Benzo(k)fluoranthene	EPA 8270E
Chrysene	EPA 8270E

Polynuclear Aromatic Hydrocarbons

Dibenzo(a,h)anthracene	EPA 8270E
Fluoranthene	EPA 8270E
Fluorene	EPA 8270E
Indeno(1,2,3-cd)pyrene	EPA 8270E
Naphthalene	EPA 8270E
Phenanthrene	EPA 8270E
Pyrene	EPA 8270E

Priority Pollutant Phenols

2,3,4,6 Tetrachlorophenol	EPA 8270E
2,4,5-Trichlorophenol	EPA 8270E
2,4,6-Trichlorophenol	EPA 8270E
2,4-Dichlorophenol	EPA 8270E
2,4-Dimethylphenol	EPA 8270E
2,4-Dinitrophenol	EPA 8270E
2-Chlorophenol	EPA 8270E
2-Methyl-4,6-dinitrophenol	EPA 8270E
2-Methylphenol	EPA 8270E
2-Nitrophenol	EPA 8270E
3-Methylphenol	EPA 8270E
4-Chloro-3-methylphenol	EPA 8270E
4-Methylphenol	EPA 8270E
4-Nitrophenol	EPA 8270E
Pentachlorophenol	EPA 8270E
Phenol	EPA 8270E

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Semi-Volatile Organics

1,1'-Biphenyl	EPA 8270E
1,2-Dichlorobenzene, Semi-volatile	EPA 8270E
1,3-Dichlorobenzene, Semi-volatile	EPA 8270E
1,4-Dichlorobenzene, Semi-volatile	EPA 8270E
2-Methylnaphthalene	EPA 8270E
Acetophenone	EPA 8270E
Benzaldehyde	EPA 8270E
Benzoic Acid	EPA 8270E
Benzyl alcohol	EPA 8270E
Caprolactam	EPA 8270E
Dibenzofuran	EPA 8270E

Volatile Aromatics

1,2,4-Trichlorobenzene, Volatile	EPA 8260D
1,2,4-Trimethylbenzene	EPA 8260D
1,2-Dichlorobenzene	EPA 8260D
1,3,5-Trimethylbenzene	EPA 8260D
1,3-Dichlorobenzene	EPA 8260D
1,4-Dichlorobenzene	EPA 8260D
2-Chlorotoluene	EPA 8260D
4-Chlorotoluene	EPA 8260D
Benzene	EPA 8260D
Bromobenzene	EPA 8260D
Chlorobenzene	EPA 8260D
Ethyl benzene	EPA 8260D
Isopropylbenzene	EPA 8260D

Volatile Aromatics

m/p-Xylenes	EPA 8260D
Naphthalene, Volatile	EPA 8260D
n-Butylbenzene	EPA 8260D
n-Propylbenzene	EPA 8260D
o-Xylene	EPA 8260D
p-Isopropyltoluene (P-Cymene)	EPA 8260D
sec-Butylbenzene	EPA 8260D
Styrene	EPA 8260D
tert-Butylbenzene	EPA 8260D
Toluene	EPA 8260D
Total Xylenes	EPA 8260D

Volatile Chlorinated Organics

Benzyl chloride	EPA 8260D

Volatile Halocarbons

1,1,1,2-Tetrachloroethane	EPA 8260D
1,1,1-Trichloroethane	EPA 8260D
1,1,2,2-Tetrachloroethane	EPA 8260D
1,1,2-Trichloro-1,2,2-Trifluoroethane	EPA 8260D
1,1,2-Trichloroethane	EPA 8260D
1,1-Dichloroethane	EPA 8260D
1,1-Dichloroethene	EPA 8260D
1,1-Dichloropropene	EPA 8260D
1,2,3-Trichloropropane	EPA 8260D
1,2-Dibromo-3-chloropropane	EPA 8260D
1,2-Dibromoethane	EPA 8260D

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Volatile Halocarbons

1,2-Dichloroethane	EPA 8260D
1,2-Dichloropropane	EPA 8260D
1,3-Dichloropropane	EPA 8260D
2,2-Dichloropropane	EPA 8260D
2-Chloro-1,3-butadiene (Chloroprene)	EPA 8260D
2-Chloroethylvinyl ether	EPA 8260D
3-Chloropropene (Allyl chloride)	EPA 8260D
Bromochloromethane	EPA 8260D
Bromodichloromethane	EPA 8260D
Bromoform	EPA 8260D
Bromomethane	EPA 8260D
Carbon tetrachloride	EPA 8260D
Chloroethane	EPA 8260D
Chloroform	EPA 8260D
Chloromethane	EPA 8260D
cis-1,2-Dichloroethene	EPA 8260D
cis-1,3-Dichloropropene	EPA 8260D
Dibromochloromethane	EPA 8260D
Dibromomethane	EPA 8260D
Dichlorodifluoromethane	EPA 8260D
Hexachlorobutadiene, Volatile	EPA 8260D
Methyl iodide	EPA 8260D
Methylene chloride	EPA 8260D
Tetrachloroethene	EPA 8260D
trans-1,2-Dichloroethene	EPA 8260D
trans-1,3-Dichloropropene	EPA 8260D

Volatile Halocarbons

trans-1,4-Dichloro-2-butene	EPA 8260D
Trichloroethene	EPA 8260D
Trichlorofluoromethane	EPA 8260D
Vinyl chloride	EPA 8260D

Volatile Organics

1,4-Dioxane	EPA 8260D EPA 8270E
2-Butanone (Methylethyl ketone)	EPA 8260D
2-Hexanone	EPA 8260D
2-Nitropropane	EPA 8260D
4-Methyl-2-Pentanone	EPA 8260D
Acetone	EPA 8260D
Acetonitrile	EPA 8260D
Carbon Disulfide	EPA 8260D
Cyclohexane	EPA 8260D
Di-ethyl ether	EPA 8260D
Ethyl Acetate	EPA 8260D
Isobutyl alcohol	EPA 8260D
Isopropanol	EPA 8260D
Methyl acetate	EPA 8260D
Methyl cyclohexane	EPA 8260D
Methyl tert-butyl ether	EPA 8260D
n-Butanol	EPA 8260D
o-Toluidine	EPA 8270E
Propionitrile	EPA 8260D

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Volatile Organics	
Tetrahydrofuran	EPA 8260D
Vinyl acetate	EPA 8260D
Sample Preparation Methods	
	EPA 5035A-L
	EPA 5035A-H
	EPA 3580A
	EPA 9030B
	EPA 3050B
	EPA 3550C
	EPA 3546
	EPA 3060A
	EPA 3541
	EPA 9010C

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Limits for Project: 46034106 - Broadway Triangle; Site C

Analysis Group	Method Description	Method Code	Prep Method	Analyte Description	CAS Number
Solid - PFAS	Fluorinated Alkyl Substances	PFC_IDA	Shake_Bath_14D	Perfluorobutanoic acid (PFBA)	375-22-4
				Perfluoropentanoic acid (PFPeA)	2706-90-3
				Perfluorohexanoic acid (PFHxA)	307-24-4
				Perfluoroheptanoic acid (PFHpA)	375-85-9
				Perfluorooctanoic acid (PFOA)	335-67-1
				Perfluorononanoic acid (PFNA)	375-95-1
				Perfluorodecanoic acid (PFDA)	335-76-2
				Perfluoroundecanoic acid (PFUnA)	2058-94-8
				Perfluorododecanoic acid (PFDoA)	307-55-1
				Perfluorotridecanoic acid (PFTriA)	72629-94-8
				Perfluorotetradecanoic acid (PFTeA)	376-06-7
				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
				Perfluorooctanesulfonamide (PFOSA)	754-91-6
				N-methylperfluorooctanesulfonamidoacetic acid (	2355-31-9
				N-ethylperfluorooctanesulfonamidoacetic acid (N	2991-50-6
				1H,1H,2H,2H-perfluorooctanesulfonic acid (6:2)	27619-97-2
				1H,1H,2H,2H-perfluorodecanesulfonic acid (8:2)	39108-34-4
				18O2 PFHxS	STL00994
				13C4 PFHpA	STL01892
				13C4 PFOA	STL00990
				13C4 PFOS	STL00991
				13C5 PFNA	STL00995
				13C4 PFBA	STL00992
				13C2 PFHxA	STL00993
				13C2 PFDA	STL00996
				13C2 PFUnA	STL00997
				13C2 PFDoA	STL00998
				13C8 FOSA	STL01056
				13C5 PFPeA	STL01893
				13C2 PFTeDA	STL02116
				d3-NMeFOSAA	STL02118
				d5-NEtFOSAA	STL02117
				M2-6:2 FTS	STL02279
				M2-8:2 FTS	STL02280
				13C3 PFBS	STL02337
				13C2 PFOA	STL00623
GW - PFAS (Burl)	Fluorinated Alkyl Substances	PFC_IDA	3535_IVWT	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

Analysis Group	Method Description	Method Code	Prep Method	Analyte Description	CAS Number
				Perfluorodecanoic acid (PFDA)	335-76-2
				Perfluoroundecanoic acid (PFUnA)	2058-94-8
				Perfluorododecanoic acid (PFDoA)	307-55-1
				Perfluorotridecanoic acid (PFTriA)	72629-94-8
				Perfluorotetradecanoic acid (PFTeA)	376-06-7
				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
				Perfluorooctanesulfonamide (PFOSA)	754-91-6
				N-methylperfluorooctanesulfonamidoacetic acid (	2355-31-9
				N-ethylperfluorooctanesulfonamidoacetic acid (N	2991-50-6
				1H,1H,2H,2H-perfluorooctanesulfonic acid (6:2)	27619-97-2
				1H,1H,2H,2H-perfluorodecanesulfonic acid (8:2)	39108-34-4
				18O2 PFHxS	STL00994
				13C4 PFHpA	STL01892
				13C4 PFOA	STL00990
				13C4 PFOS	STL00991
				13C5 PFNA	STL00995
				13C4 PFBA	STL00992
				13C2 PFHxA	STL00993
				13C2 PFDA	STL00996
				13C2 PFUnA	STL00997
				13C2 PFDoA	STL00998
				13C8 FOSA	STL01056
				13C5 PFPeA	STL01893
				13C2 PFTeDA	STL02116
				d3-NMeFOSAA	STL02118
				d5-NEtFOSAA	STL02117
				M2-6:2 FTS	STL02279
				M2-8:2 FTS	STL02280
				13C3 PFBS	STL02337
				13C2 PFOA	STL00623
GW - 1,4-Dioxane	Semivolatile Organic Compounds (GC/MS SIM / Isotope Dilution)	8270E_SIM_MS_ID	3510C_LVI	1,4-Dioxane	123-91-1
				1,4-Dioxane-d8	17647-74-4
Solid - 1,4-Dioxane	Semivolatile Organic Compounds (GC/MS)	8270E	3546	1,4-Dioxane	123-91-1
				2,4,6-Tribromophenol (Surr)	118-79-6
				2-Fluorobiphenyl	321-60-8
				2-Fluorophenol (Surr)	367-12-4
				Nitrobenzene-d5 (Surr)	4165-60-0
				Phenol-d5 (Surr)	4165-62-2
				Terphenyl-d14 (Surr)	1718-51-0

RL	MDL	LOD	Units	LCS - Low	LCS - High	LCS - RPD %	MS - Low	MS - High	MS - RPD %	Surrogate Low	Surrogate High
0.500	0.190		ug/Kg	70	130	20	70	130	20		
0.200	0.0180		ug/Kg	70	130	20	70	130	20		
0.200	0.0240		ug/Kg	70	130	20	70	130	20		
0.200	0.0230		ug/Kg	70	130	20	70	130	20		
0.200	0.0140		ug/Kg	70	130	20	70	130	20		
0.200	0.0200		ug/Kg	70	130	20	70	130	20		
0.200	0.0210		ug/Kg	70	130	20	70	130	20		
0.200	0.0240		ug/Kg	70	130	20	70	130	20		
0.200	0.0150		ug/Kg	70	130	20	70	130	20		
0.200	0.0130		ug/Kg	70	130	20	70	130	20		
0.200	0.0190		ug/Kg	70	130	20	70	130	20		
0.200	0.00880		ug/Kg	70	130	20	70	130	20		
0.200	0.0150		ug/Kg	70	130	20	70	130	20		
0.200	0.0150		ug/Kg	70	130	20	70	130	20		
0.200	0.0670		ug/Kg	70	130	20	70	130	20		
0.200	0.0190		ug/Kg	70	130	20	70	130	20		
0.200	0.00880		ug/Kg	70	130	20	70	130	20		
2.00	0.0340		ug/Kg	70	130	20	70	130	20		
2.00	0.0300		ug/Kg	70	130	20	70	130	20		
2.00	0.0220		ug/Kg	70	130	20	70	130	20		
2.00	0.0290		ug/Kg	70	130	20	70	130	20		
			ug/Kg								
			ug/Kg								
			ug/Kg								
			ug/Kg								
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			ug/Kg								

5.00	1.13	1.20	ng/L	50	150	30	40	160	30		
2.00	1.08	1.20	ng/L	50	150	30	40	160	30		
2.00	0.830	1.20	ng/L	70	130	20	40	160	20		
2.00	0.460	1.20	ng/L	70	130	20	40	160	20		
2.00	0.980	1.20	ng/L	70	130	20	40	160	20		
2.00	0.580	1.20	ng/L	70	130	20	40	160	20		

RL	MDL	LOD	Units	LCS - Low	LCS - High	LCS - RPD %	MS - Low	MS - High	MS - RPD %	Surrogate Low	Surrogate High
2.00	0.460	1.20	ng/L	70	130	20	40	160	20		
2.00	0.730	1.20	ng/L	70	130	20	40	160	20		
2.00	0.460	1.20	ng/L	70	130	20	40	160	20		
2.00	0.430	1.20	ng/L	70	130	20	40	160	20		
2.00	0.590	1.20	ng/L	70	130	20	40	160	20		
2.00	0.630	1.06	ng/L	70	130	20	40	160	20		
2.00	0.670	1.09	ng/L	70	130	20	40	160	20		
2.00	0.390	1.14	ng/L	50	150	30	40	160	30		
2.00	0.870	1.11	ng/L	70	130	20	40	160	20		
2.00	0.480	1.16	ng/L	50	150	30	40	160	30		
2.00	0.570	1.20	ng/L	50	150	30	40	160	30		
5.00	0.790	1.20	ng/L	70	130	20	40	160	20		
5.00	0.930	1.20	ng/L	70	130	20	40	160	20		
5.00	0.720	1.14	ng/L	50	150	30	40	160	30		
2.00	0.660	1.15	ng/L	50	150	30	40	160	30		
			ng/L				25	150			
			ng/L				25	150			
			ng/L				25	150			
			ng/L				25	150			
			ng/L				25	150			
			ng/L				25	150			
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			ng/L				25	150			
			ng/L				25	150			
			ng/L				25	150			
			ng/L				25	150			
			ng/L				25	150			
0.200	0.0160		ug/L	10	200	50	70	130	20		
0.400			ug/L	10	200	50	10	200	20	10	150
0.100	0.0289		mg/Kg	31	81	30	31	81	30		
			mg/Kg			30			30	10	123
			mg/Kg			30			30	14	103
			mg/Kg			30			30	10	105
			mg/Kg			30			30	11	104
			mg/Kg			30			30	15	100
			mg/Kg			30			30	12	126

Limits for Project: 46034106 - Broadway Triangle; Site C

Analysis Group	Method Description	Method Code	Prep Method	Analyte Description	CAS Number	RL	MDL
Soil - Part 375 Metals	Mercury (CVAA)	7471B	7471B_Prep	Mercury	7439-97-6	0.0170	0.00400
Soil - Part 375 Metals	Chromium, Hexavalent	7196A	3060A	Cr (VI)	18540-29-9	2.00	0.349
Soil - Part 375 Metals	Chromium, Trivalent (Colorimetric)	7196A_CR3		Cr (III)	16065-83-1	2.00	0.349
Soil - Part 375 Metals	Cyanide, Total	9012B	9012B_Prep	Cyanide, Total	57-12-5	0.240	0.131
Soil - Part 375 Metals	Metals (ICP/MS)	6020B	3050B	Arsenic	7440-38-2	1.00	0.100
				Barium	7440-39-3	2.00	0.145
				Beryllium	7440-41-7	0.400	0.0570
				Cadmium	7440-43-9	1.00	0.113
				Chromium	7440-47-3	2.00	0.174
				Copper	7440-50-8	2.00	0.220
				Lead	7439-92-1	0.600	0.200
				Manganese	7439-96-5	4.00	0.403
				Nickel	7440-02-0	2.00	0.194
				Selenium	7782-49-2	1.25	0.118
				Silver	7440-22-4	1.00	0.0890
				Zinc	7440-66-6	8.00	2.29
GW - Part 375 Metals	Metals (ICP/MS)	6020B	3010A	Arsenic	7440-38-2	2.00	0.887
				Barium	7440-39-3	4.00	0.913
				Beryllium	7440-41-7	0.800	0.130
				Cadmium	7440-43-9	2.00	0.386
				Chromium	7440-47-3	4.00	2.50
				Copper	7440-50-8	4.00	2.45
				Lead	7439-92-1	1.20	0.844
				Manganese	7439-96-5	8.00	1.47
				Nickel	7440-02-0	4.00	0.905
				Selenium	7782-49-2	2.50	0.589
				Silver	7440-22-4	2.00	0.290
				Zinc	7440-66-6	16.0	6.52
GW - Part 375 Metals	Mercury (CVAA)	7470A	7470A_Prep	Mercury	7439-97-6	0.200	0.0910
GW - Part 375 Metals	Chromium, Hexavalent	7196A		Cr (VI)	18540-29-9	10.0	8.14
GW - Part 375 Metals	Chromium, Trivalent (Colorimetric)	7196A_CR3		Cr (III)	16065-83-1	10.0	8.14
GW - Part 375 Metals	Cyanide, Total	9012B	9012B_Prep	Cyanide, Total	57-12-5	10.0	4.00

LOD	Units	LCS - Low	LCS - High	LCS - RPD %	MS - Low	MS - High	MS - RPD %	Surrogate Low	Surrogate High
	mg/Kg	80	120	20	80	120	20		
	mg/Kg								
	mg/Kg								
	mg/Kg	85	115		11	108	40		
	mg/Kg	80	120	20	75	125	20		
	mg/Kg	80	120	20	75	125	20		
	mg/Kg	80	120	20	75	125	20		
	mg/Kg	80	120	20	75	125	20		
	mg/Kg	80	120	20	75	125	20		
	mg/Kg	80	120	20	75	125	20		
	mg/Kg	80	120	20	75	125	20		
	mg/Kg	80	120	20	75	125	20		
	mg/Kg	80	120	20	75	125	20		
	mg/Kg	80	120	20	75	125	20		
	mg/Kg	80	120	20	75	125	20		
	mg/Kg	80	120	20	75	125	20		
	ug/L	80	120	20	75	125	20		
	ug/L	80	120	20	75	125	20		
	ug/L	80	120	20	75	125	20		
	ug/L	80	120	20	75	125	20		
	ug/L	80	120	20	75	125	20		
	ug/L	80	120	20	75	125	20		
	ug/L	80	120	20	75	125	20		
	ug/L	80	120	20	75	125	20		
	ug/L	80	120	20	75	125	20		
	ug/L	80	120	20	75	125	20		
	ug/L	80	120	20	75	125	20		
	ug/L	80	120	20	75	125	20		
	ug/L	80	120	20	75	125	20		
	ug/L			20	85	115	20		
	ug/L			20	85	115	20		
	ug/L	85	115		90	110	35		

ATTACHMENT 4

Roux Standard Operating Procedures

Date: May 5, 2000

1.0 PURPOSE

The purpose for this standard operating procedure (SOP) is to establish the guidelines for decontamination of all field equipment potentially exposed to contamination during drilling, and soil and water sampling. The objective of decontamination is to ensure that all drilling, and soil-sampling and water-sampling equipment is decontaminated (free of potential contaminants): 1) prior to being brought onsite to avoid the introduction of potential contaminants to the site; 2) between drilling and sampling events/activities onsite to eliminate the potential for cross-contamination between boreholes and/or wells; and 3) prior to the removal of equipment from the site to prevent the transportation of potentially contaminated equipment offsite.

In considering decontamination procedures, state and federal regulatory agency requirements must be considered because of potential variability between state and federal requirements and because of variability in the requirements of individual states. Decontamination procedures must be in compliance with state and/or federal protocols in order that regulatory agency(ies) scrutiny of the procedures and data collected do not result in non-acceptance (invalidation) of the work undertaken and data collected.

2.0 PROCEDURE FOR DRILLING EQUIPMENT

The following is a minimum decontamination procedure for drilling equipment. Drilling equipment decontamination procedures, especially any variation from the method itemized below, will be documented on an appropriate field form or in the field notebook.

2.1 The rig and all associated equipment should be properly decontaminated by the contractor before arriving at the test site.

2.2 The augers, drilling casings, rods, samplers, tools, rig, and any piece of equipment that can come in contact (directly or indirectly) with the soil, will be steam cleaned onsite prior to set up for drilling to ensure proper decontamination.

2.3 The same steam cleaning procedures will be followed between boreholes (at a fixed on-site location[s], if appropriate) and before leaving the site at the end of the study.

2.4 All on-site steam cleaning (decontamination) activities will be monitored and documented by a member(s) of the staff of Roux Associates, Inc.

2.5 If drilling activities are conducted in the presence of thick, sticky oils (e.g., PCBs) which coat drilling equipment, then special decontamination procedures may have to be utilized before steam cleaning (e.g., hexane scrub and wash).

2.6 Containment of decontamination fluids may be necessary (e.g., rinseate from steam cleaning) or will be required (e.g., hexane), and disposal must be in accordance with state and/or federal procedures.

3.0 PROCEDURE FOR SOIL-SAMPLING EQUIPMENT

The following is a minimum decontamination procedure for soil-sampling equipment (e.g., split spoons, stainless-steel spatulas). Soil-sampling equipment decontamination procedures, especially any variation from the method itemized below, will be documented on an appropriate field form or in the field notebook.

3.1 Wear disposable gloves while cleaning equipment to avoid cross-contamination and change gloves as needed.

3.2 Steam clean the sampler or rinse with potable water. If soil-sampling activities are conducted in the presence of thick, sticky oils (e.g., PCBs) which coat sampling equipment, then special decontamination procedures may have to be utilized before steam cleaning and washing in detergent solution (e.g., hexane scrub and wash).

3.3 Prepare a non-phosphate, laboratory-grade detergent solution and distilled or potable water in a clean bucket.

3.4 Disassemble the sampler, as necessary and immerse all parts and other sampling equipment in the solution.

3.5 Scrub all equipment in the bucket with a brush to remove any adhering particles.

3.6 Rinse all equipment with copious amounts of potable water followed by distilled or deionized water.

3.7 Place clean equipment on a clean plastic sheet (e.g., polyethylene)

3.8 Reassemble the cleaned sampler, as necessary.

3.9 Transfer the sampler to the driller (or helper) making sure that this individual is also wearing clean gloves or wrap the equipment with a suitable material (e.g., plastic bag, aluminum foil.

As part of the decontamination procedure for soil-sampling equipment, state and/or federal protocols must be considered. These may require procedures above those specified as minimum for Roux Associates, Inc., such as the use of nitric acid, acetone, etc. Furthermore, the containment and proper disposal of decontamination fluids must be considered with respect to regulatory agency(ies) requirements.

4.0 PROCEDURE FOR WATER-SAMPLING EQUIPMENT

The following is a decontamination procedure for water-sampling equipment (e.g., bailers, pumps). Water-sampling equipment decontamination procedures, especially any variation from the method itemized below, will be documented on an appropriate field form or in the field notebook.

4.1 Decontamination procedures for bailers follow:

a. Wear disposable gloves while cleaning bailer to avoid cross-contamination and change gloves as needed.

b. Prepare a non-phosphate, laboratory-grade detergent solution and potable water in a bucket.

c. Disassemble bailer (if applicable) and discard cord in an appropriate manner and scrub each part of the bailer with a brush and solution.

d. Rinse with potable water and reassemble bailer.

e. Rinse with copious amounts of distilled or deionized water.

f. Air dry.

g. Wrap equipment with a suitable material (e.g., clean plastic bag, aluminum foil).

h. Rinse bailer at least three times with distilled or deionized water before use.

4.2 Decontamination procedures for pumps follow:

a. Wear disposable gloves while cleaning pump to avoid cross-contamination and change gloves as needed.

b. Prepare a non-phosphate, laboratory-grade detergent solution and potable water in a clean bucket, clean garbage can, or clean 55-gallon drum.

c. Flush the pump and discharge hose (if not disposable) with the detergent solution and discard disposable tubing and/or cord in an appropriate manner.

d. Flush the pump and discharge hose (if not disposable) with potable water.

e. Place the pump on clear plastic sheeting.

f. Wipe any pump-related equipment (e.g., electrical lines, cables, discharge hose) that entered the well with a clean cloth and detergent solution, and rinse or wipe with a clean cloth and potable water.

g. Air dry.

h. Wrap equipment with a suitable material (e.g., clean plastic bag).

As part of the decontamination procedure for water-sampling equipment, state and/or federal protocols must be considered. These may require procedures above those specified as minimum for Roux Associates, Inc., such as the use of nitric acid, acetone, etc. Furthermore, the containment and proper disposal of decontamination fluids must be considered with respect to regulatory agency(ies) requirements.

STANDARD OPERATING PROCEDURE 5.1
FOR COLLECTION OF SOIL SAMPLES
FOR LABORATORY ANALYSIS

Date: May 5, 2000

1.0 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to establish guidelines for the collection of soil samples for laboratory analysis. This SOP is applicable to soil samples collected from split-spoon samplers during drilling, hand auger samples, grab samples from stockpiled soils, surface samples, test pit samples, etc.

2.0 CONSIDERATIONS

Soil samples may be collected in either a random or biased manner. Random samples can be based on a grid system or statistical methodology. Biased samples can be collected in areas of visible impact or suspected source areas. Soil samples can be collected at the surface, shallow subsurface, or at depth. When samples are collected at depth the water content should be noted, since generally “soil sampling” is restricted to the unsaturated zone. Equipment selection will be determined by the depth of the sample to be collected. A thorough description of the sampling locations and proposed methods of sample collection should be included in the work plan.

Commonly, surface sampling refers to the collection of samples at a 0 to 6-inch depth interval. Certain regulatory agencies may define the depth interval of a surface sample differently, and this must be defined in the work plan. Collection of surface soil samples is most efficiently accomplished with the use of a stainless-steel trowel or scoop. For samples at greater depths a decontaminated bucket auger or power auger may be needed to advance the hole to the point of sample collection. Another clean bucket auger should then be used to collect the sample. To collect samples at depths of greater than approximately six feet the use of a drill rig and split spoon samples will usually be necessary. In some situations, sample locations are accessed with the use of a backhoe.

3.0 MATERIALS/EQUIPMENT

a. A work plan which outlines soil sampling requirements.

b. Field notebook, field form(s), maps, chain-of-custody forms, and custody seals.

c. Decontamination supplies (including: non-phosphate, laboratory grade detergent, buckets, brushes, potable water, distilled water, regulatory-required reagents, aluminum foil, plastic sheeting, etc.).

d. Sampling device (split-spoon sampler, stainless steel hand auger, stainless steel trowel, etc.).

e. Stainless steel spoons or spatulas.

f. Disposable sampling gloves.

g. Laboratory-supplied sample containers with labels.

h. Cooler with blue or wet ice.

i. Plastic sheeting.

j. Black pen and indelible marker.

k. Zip-lock bags and packing material.

l. Tape measure.

m. Paper towels or clean rags.

n. Masking and packing tape.

o. Overnight (express) mail forms.

4.0 DECONTAMINATION

All reusable sampling equipment will be thoroughly cleaned according to the decontamination SOP. Where possible, thoroughly pre-cleaned and wrapped sampling equipment should be used and dedicated to individual sampling locations. Disposable items such as sampling gloves, aluminum foil, and plastic sheeting will be changed after each use and discarded in an appropriate manner.

5.0 PROCEDURE

5.1 Prior to collecting soil samples, ensure that all sampling equipment has been thoroughly cleaned according to the decontamination SOP. If samples are to be collected at depth, then the boring must be advanced with thoroughly cleaned equipment to the desired sampling horizon and a different thoroughly cleaned sampler must be used to collect the sample.

5.2 Using disposable gloves and a pre-cleaned, stainless steel spatula or spoon, extract the soil sample from the sampler, measure the recovery, and separate the wash from the true sample. Where allowed by regulatory agency(ies), disposable plastic spoons may be used.

5.3 Place the sample in a laboratory-supplied, pre-cleaned sample container. This should be done as quickly as possible and this is especially important when sampling for volatile organic compounds (VOCs). Samples to be analyzed for VOCs must be collected prior to other constituents.

5.4 The sample container will be labeled with appropriate information such as, client name, site location, sample identification (location, depth, etc.), date and time of collection, and sampler's initials.

5.5 Using the remaining portion of soil from the sampler, log the sample in detail and record sediment characteristics (color, odor, moisture, texture, density, consistency, organic content, layering, grain size, etc.).

5.6 If soil samples are to be composited in the field, then equal portions from selected locations will be placed on a clean plastic sheet and homogenized. Alternately, several samples may be submitted to the laboratory for compositing by weight. The method used is dependent upon regulatory requirements. Specific compositing procedures shall be approved by the appropriate regulatory agency and described in the work plan. Samples to be analyzed for VOCs will not be composited unless required by a regulatory agency.

5.7 After the sample has been collected, labeled, and logged in detail, it is placed in a zip-lock bag and stored in a cooler at 4°C.

5.8 A chain-of-custody form is completed for all samples collected. One copy is retained and two are sent with the samples in a zip-lock bag to the laboratory. A custody seal is placed on the cooler prior to shipment.

5.9 Samples collected from Monday to Friday are to be delivered to the laboratory within 24 hours of collection. If Saturday delivery is unavailable, samples collected on Friday must be delivered by Monday morning. Check the work plan to determine if any analytes require a shorter delivery time.

5.10 The field notebook and appropriate forms should include, but not be limited to the following: client name, site location, sample location, sample depth, sample identification, date and time collected, sampler's name, method of sample collection, number and type of containers, geologic description of material, description of decontamination procedures, etc. A site map should be prepared with exact measurements to each sample location in case follow-up sampling is necessary.

5.11 All reusable sampling equipment must be thoroughly cleaned in accordance with the decontamination SOP. Following the final decontamination (after all samples are collected) the sampling equipment is wrapped in aluminum foil. Discard any gloves, foil, plastic, etc. in an appropriate manner that is consistent with site conditions.

END OF PROCEDURE

Date: May 5, 2000

1.0 PURPOSE

The purpose of this standard operating procedure (SOP) is to establish guidelines for sample handling which will allow consistent and accurate results. Valid chemistry data are integral to investigations that characterize media-quality conditions. Thus, this SOP is designed to ensure that once samples are collected, they are preserved, packed and delivered in a manner which will maintain sample integrity to as great an extent as possible. The procedures outlined are applicable to most sampling events and any required modifications must be clearly described in the work plan.

2.0 CONSIDERATIONS

Sample containers, sampling equipment decontamination, quality assurance/quality control (QA/QC), sample preservation, and sample handling are all components of this SOP.

2.1 Sample Containers

Prior to collection of a sample, considerations must be given to the type of container that will be used to store and transport the sample. The type and number of containers selected is usually based on factors such as sample matrix, potential contaminants to be encountered, analytical methods requested, and the laboratory's internal quality assurance requirements. In most cases, the overriding considerations will be the analytical methodology, or the state or federal regulatory requirements because these regulations generally encompass the other factors. The sample container selected is usually based on some combination of the following criteria:

a. Reactivity of Container Material with Sample

Choosing the proper composition of sample containers will help to ensure that the chemical and physical integrity of the sample is maintained. For sampling potentially hazardous material, glass is the recommended container type because it is chemically inert to most substances. Plastic containers are not recommended for most hazardous wastes because the potential exists for contaminants to adsorb to the surface of the plastic or for the plasticizer to leach into the sample.

In some instances, however, the sample characteristics or analytes of interest may dictate that plastic containers be used instead of glass. Because some metals species will adhere to the sides of the glass containers in an aqueous matrix, plastic bottles (e.g., nalgene) must be used for samples collected for metals analysis. A separate, plastic container should accompany glass containers if metals analysis is to be performed along with other analyses. Likewise, other sample characteristics may dictate that glass cannot be used. For example, in the case of a strong alkali waste or hydrofluoric solution, plastic containers may be more suitable because glass containers may be etched by these compounds and create adsorptive sites on the container's surface.

b. Volume of the Container

The volume of sample to be collected will be dictated by the analysis being performed and the sample matrix. The laboratory must supply bottles of sufficient volume to perform the required analysis. In most cases, the methodology dictates the volume of sample material required to complete the analysis. However, individual laboratories may provide larger volume containers for various analytes to ensure sufficient quantities for duplicates or other QC checks.

To facilitate transfer of the sample from the sampler into the container and to minimize spillage and sample disturbance, wide-mouth containers are recommended. Aqueous volatile organic samples must be placed into 40-milliliter (ml) glass vials with polytetrafluoroethylene (PTFE) (e.g., TeflonTM) septums. Non-aqueous volatile organic samples should be collected in the same type of vials or in 4-ounce (oz) wide-mouth jars provided by the laboratory. These jars should have PTFE-lined screw caps.

c. Color of Container

Whenever possible, amber glass containers should be used to prevent photodegradation of the sample, except when samples are being collected for metals analysis. If amber containers are not available, then containers holding samples should be protected from light (i.e., place in cooler with ice immediately after filling).

d. Container Closures

Container closures must screw on and off the containers and form a leak-proof seal. Container caps must not be removed until the container is ready to be filled with the sample, and the container cap must be replaced (securely) immediately after filling it. Closures should be constructed of a material which is inert with respect to the sampled material, such as PTFE (e.g., TeflonTM). Alternately, the closure may be separated from the sample by a closure liner that is inert to the sample material such as PTFE sheeting. If soil or sediment samples are being collected, the threads of the container must be wiped clean with a dedicated paper towel or cloth, so the cap can be threaded properly.

e. Decontamination of Sample Containers

Sample containers must be laboratory cleaned by the laboratory performing the analysis. The cleaning procedure is dictated by the specific analysis to be performed on the sample. Sample containers must be carefully examined to ensure that all containers appear clean. Do not mistake the preservative as unwanted residue. The bottles should not be field cleaned. If there is any question regarding the integrity of the bottle, then the laboratory must be contacted immediately and the bottle(s) replaced.

f. Sample Bottle Storage and Transport

No matter where the sample bottles are, whether at the laboratory waiting to be packed for shipment or in the field waiting to be filled with sample, care must be taken to avoid contamination. Sample shuttles or coolers, and sample bottles must be stored and transported in clean environments. Sample bottles and clean sampling equipment must never be stored near solvents, gasoline, or other equipment that is a potential source of cross-contamination. When under chain of custody, sample bottles must be secured in locked vehicles, and custody sealed in shuttles or in the presence of authorized personnel. Information which documents that proper storage and transport procedures have been followed must be included in the field notebook and on appropriate field forms.

2.2 Decontamination of Sampling Equipment

Proper decontamination of all re-usable sampling equipment is critical for all sampling episodes. The SOP for Decontamination of Field Equipment and SOPs for method-specific or instrument-specific tasks must also be referred to for guidance for decontamination of various types of equipment.

2.3 Quality Assurance/Quality Control Samples

QA/QC samples are intended to provide control over the proper collection and tracking of environmental measurements, and subsequent review, interpretation and validation of generated analytical data. The SOPs for Collection of Quality Control Samples, for Evaluation and Validation of Data, and for Field Record Keeping and Quality Assurance/Quality Control must be referred to for detailed guidance regarding these respective procedures. SOPs for method-specific or instrument-specific tasks must also be referred to for guidance for QA/QC procedures.

2.4 Sample Preservation Requirements

Certain analytical methodologies for specific analytes require chemical additives in order to stabilize and maintain sample integrity. Generally, this is accomplished under the following two scenarios:

a. Sample bottles are preserved at the laboratory prior to shipment into the field.

b. Preservatives are added in the field immediately after the samples are collected.

Many laboratories provide pre-preserved bottles as a matter of convenience and to help ensure that samples will be preserved immediately upon collection. A problem associated with this method arises if not enough sample could be collected, resulting in too much preservative in the sample. More commonly encountered problems with this method include the possibility of insufficient preservative provided to achieve the desired pH level or the need for additional preservation due to chemical reactions caused by the addition of sample liquids to pre-preserved bottles. The use of pre-preserved bottles is acceptable; however, field sampling teams must always be prepared to add additional preservatives to samples if the aforementioned situations occur. Furthermore, care must be exercised not to overfill sample bottles containing preservatives to prevent the sample and preservative from spilling and therefore diluting the preservative (i.e., not having enough preservative for the volume of sample).

When samples are preserved after collection, special care must be taken. The transportation and handling of concentrated acids in the field requires additional preparation and adherence to appropriate preservation procedures. All preservation acids used in the field should be trace-metal or higher-grade.

2.5 Sample Handling

After the proper sample bottles have been received under chain-of-custody, properly decontaminated equipment has been used to collect the sample, and appropriate preservatives have been added to maintain sample integrity, the final step for the field personnel is checking the sample bottles prior to proper packing and delivery of the samples to the laboratory.

All samples should be organized and the labels checked for accuracy. The caps should be checked for tightness and any 40-ml volatile organic compound (VOC) bottles must be checked for bubbles. Each sample bottle must be placed in an individual Ziploc® bag to protect the label, and placed on ice. The bottles must be carefully packed to prevent breakage during transport. When several bottles have been collected for an individual sample, they should not be placed adjacent to each other in the cooler to prevent possible breakage of all bottles for a given sample. If there are any samples which are known or suspected to be highly contaminated, these should be placed in an individual cooler under separate chain-of-custody to prevent possible cross contamination. Sufficient ice (wet or blue packs) should be placed in the cooler to maintain the temperature at 4 degrees Celsius (°C) until delivery at the laboratory. Consult the work plan to determine if a particular ice is specified as the preservation for transportation (e.g., the United States Environmental Protection Agency does not like the use of blue packs because they claim that the samples will not hold at 4°C). If additional coolers are required, then they should be purchased. The chain-of-custody form should be properly completed, placed in a "zip-lock" bag, and placed in the cooler. One copy must be maintained for the project files. The cooler should be sealed with packing tape and a custody seal. The custody seal number should be noted in the field book. Samples collected from Monday through Friday will be delivered to the laboratory within 24 hours of collection. If Saturday delivery is not available, samples collected on Friday must be delivered by Monday morning. Check the work plan to determine if certain analytes require a shorter delivery time. If overnight mail is utilized, then the shipping bill must be maintained for the files and the laboratory must be called the following day to confirm receipt.

3.0 EQUIPMENT AND MATERIALS

3.1 General equipment and materials may include, but not necessarily be limited to, the following:

a. Sample bottles of proper size and type with labels.

b. Cooler with ice (wet or blue pack).

c. Field notebook, appropriate field form(s), chain-of-custody form(s), custody seals.

d. Black pen and indelible marker.

e. Packing tape, "bubble wrap," and "zip-lock" bags.

f. Overnight (express) mail forms and laboratory address.

g. Health and safety plan (HASP).

h. Work plan/scope of work.

i. Pertinent SOPs for specified tasks and their respective equipment and materials.

3.2 Preservatives for specific samples/analytes as specified by the laboratory. Preservatives must be stored in secure, spillproof glass containers with their content, concentration, and date of preparation and expiration clearly labeled.

3.3 Miscellaneous equipment and materials including, but not necessarily limited to, the following:

a. Graduated pipettes.

b. Pipette bulbs.

c. Litmus paper.

d. Glass stirring rods.

e. Protective goggles.

f. Disposable gloves.

g. Lab apron.

h. First aid kit.

i. Portable eye wash station.

j. Water supply for immediate flushing of spillage, if appropriate.

k. Shovel and container for immediate containerization of spillage-impacted soils, if appropriate.

4.0 PROCEDURE

4.1 Examine all bottles and verify that they are clean and of the proper type, number, and volume for the sampling to be conducted.

4.2 Label bottles carefully and clearly with project name and number, site location, sample identification, date, time, and the sampler's initials using an indelible marker.

4.3 Collect samples in the proper manner (refer to specific sampling SOPs).

4.4 Conduct preservation activities as required after each sample has been collected. Field preservation must be done immediately and must not be done later than 30 minutes after sample collection.

4.5 Conduct QC sampling, as required.

4.6 Seal each container carefully and place in an individual "zip lock" bag.

4.7 Organize and carefully pack all samples in the cooler immediately after collection (e.g., bubble wrap). Insulate samples so that breakage will not occur.

4.8 Complete and place the chain-of-custody form in the cooler after all samples have been collected. Maintain one copy for the project file. If the cooler is to be transferred several times prior to shipment or delivery to the laboratory, it may be easier to tape the chain-of-custody to the exterior of the sealed cooler. When exceptionally hazardous samples are known or suspected to be present, this should be identified on the chain-of-custody as a courtesy to the laboratory personnel.

4.9 Add additional ice as necessary to ensure that it will last until receipt by the laboratory.

4.10 Seal the cooler with packing tape and a custody seal. Record the number of the custody seal in the field notebook and on the field form. If there are any exceptionally hazardous samples, then shipping regulations should be examined to ensure the sample containers and coolers are in compliance and properly labeled.

4.11 Samples collected from Monday through Friday will be delivered to the laboratory within 24 hours of collection. If Saturday delivery is not available, samples collected on Friday must be delivered by Monday morning. Check the work plan to determine if certain analytes require a shorter delivery time.

4.12 Maintain the shipping bill for the project files if overnight mail is utilized and call the laboratory the following day to confirm receipt.

END OF PROCEDURE

STANDARD OPERATING PROCEDURE 5.4
FOR SCREENING SOIL SAMPLES FOR VOLATILE ORGANIC VAPORS USING A PORTABLE PHOTOIONIZATION DETECTOR

Date: May 5, 2000

1.0 PURPOSE

The purpose of this standard operating procedure (SOP) is to establish guidelines for screening soil samples for volatile organic vapors using a portable photoionization detector (PID). This SOP is applicable to soil samples collected from split-spoon samplers during drilling, hand auger samples, and grab samples from stockpiled soils.

2.0 CONSIDERATIONS

The primary objective of photoionization screening of soil samples is to obtain a qualitative understanding of the distribution of volatile organic compounds (VOCs) in soil. The proper design of an organic vapor screening program requires an understanding of site hydrogeology, potential source areas, and potential constituents of concern. Sample locations and frequency must be fully defined in the work plan. The work plan should outline the type of lamp to be utilized in the PID based on the ionization potentials and response factors of the constituents of concern. The work plan must also clearly describe the heating or equilibration procedures to be employed if they differ from those described in this SOP. Regardless of the specific equilibration procedure employed, it is imperative that each sample be treated identically to allow the photoionization results from different locations to be compared. Observations such as water, clay, and organic content should be noted to facilitate interpretation of the data. Every effort should be made to collect a representative portion of soil from the sampling device.

3.0 MATERIALS/EQUIPMENT

a. A work plan which outlines photoionization screening requirements.

b. Decontamination supplies (including: non-phosphate, laboratory grade detergent, buckets, brushes, potable water, distilled water, regulatory-required reagents [e.g., acetone, nitric acid, hexane, etc.], aluminum foil, plastic sheeting, etc.).

c. Field notebook, field form(s), maps, chain-of-custody forms.

d. Sampling device (split-spoon sampler, stainless steel hand auger, stainless steel trowel, etc.).

e. Stainless steel spoons or spatulas.

f. Disposable plastic spoons.

g. Plastic sheeting.

h. Aluminum foil.

i. Mason jars or driller's jars.

j. Water bath (hot plate, extension cord, water tray, thermometer).

k. Photoionization detector with charging unit.

l. Calibration gases with regulator.

m. Indelible marker.

n. Masking tape.

o. Disposable sampling gloves.

4.0 DECONTAMINATION

Where possible, thoroughly pre-cleaned and wrapped sampling equipment must be used and dedicated to individual sampling locations. Disposable items such as sampling gloves, aluminum foil, and sample jars will be changed after each use and discarded in an appropriate manner. If only photoionization results are to be obtained, then split-spoon samples and hand augers may be cleaned with a soap and water wash and potable water rinse or steam cleaning, and a final distilled water rinse. However, if samples are to be collected concurrently for laboratory analytical results, then all reusable sampling equipment must be thoroughly decontaminated according to the SOP for decontamination of field equipment.

5.0 CALIBRATION

The PID must be calibrated according to the manufacturer's specifications at a minimum frequency of once per day prior to collecting photoionization readings. In addition, periodic checks (e.g., every 2 hours or every ten samples) with the standard gas will be conducted to confirm that the calibration has not drifted. The time, date, and calibration procedure must be clearly documented in the field notebook and the calibration log. If at any time the photoionization results appear erratic or inconsistent with field observations, then the unit must be recalibrated. If calibration is difficult to achieve, then the unit's lamp should be checked for dirt or moisture and cleaned, as necessary. During humid or wet conditions, the unit should be calibrated on a more frequent basis as determined by field personnel.

6.0 PROCEDURE

6.1 Extract the soil sample from the sampler, quickly measure the recovery, and separate the wash from the true sample by using a dedicated, stainless steel spatula. Where allowed by regulatory agency(ies), disposable plastic spoons may be used.

6.2 Place the sample in a pre-cleaned glass jar (as quickly as possible to avoid loss of VOCs) filling the jar half full. Place an aluminum foil seal between the glass and metal cap and screw tight.

6.3 Label jars with the boring number, depth of sample, date of collection and blow counts. In addition, the field personnel will ensure the following: samples are taken at appropriate depths; unrepresentative portions of the sample are discarded properly; that the sampler is decontaminated properly between use; and the driller uses proper methods during sample collection and does not use oil or grease on tools entering the borehole.

6.4 Log the sample in detail and record sediment characteristics (color, odor, moisture, texture, density, consistency, organic content, and layering).

6.5 After the sample has been collected, heat the sample under controlled conditions in a water bath for a 2 minute period.

6.6 Ensure that the PID has been calibrated and that the calibration information is documented in the field book. Pierce the aluminum foil seal with the probe from the PID and measure the relative concentration of VOCs in the headspace of the soil sample. The initial (peak) reading must be recorded.

6.7 Record the PID reading in the field notebook, on an appropriate field form, and on the base map, if appropriate.

6.8 Place any material not representative of the interval sampled in a pile with the other cuttings from the borehole.

6.9 If only photoionization results are to be obtained, then reusable sampling devices may be cleaned with a soap and water wash and a potable water rinse. The sampler will then be rinsed with distilled water, assembled and placed on plastic sheeting for reuse. A more rigorous decontamination procedure is required when samples are also being collected for laboratory analysis. Refer to the SOP for collection of soil samples for laboratory analysis for additional information.

END OF PROCEDURE

1.0 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to establish guidance to obtain accurate and consistent samples of soil gas.

2.0 MATERIALS/EQUIPMENT

- Teflon or Nylaflow tubing, one-quarter or one-eighth inch diameter sample tubing.
- Swagelok® ¼-inch nut and ferrule sets for connecting the probe tubing to the sampling manifold, as appropriate for the collection method
- Helium leak check equipment, as dictated by Site-specific data quality objectives (DQOs), including the enclosure, helium cylinder (high purity helium), and helium detector (Dialectric MGD is preferred). The enclosure and helium detector may be provided by the driller.
- Air pump for purging and electric supply for the pump (either battery, generator, or power inverter with adapter for car battery). Must be capable of a flow of 200 milliliters per minute (mL/min) and a vacuum of 20” Hg.
- Canister, tedlar bag or syringe, as appropriate for the collection method.

3.0 DECONTAMINATION

All reusable sampling equipment will be thoroughly cleaned according to the decontamination SOP. Where possible, thoroughly pre-cleaned and wrapped sampling equipment should be used and dedicated to individual sampling locations. Disposable items such as sampling gloves and plastic sheeting will be changed after each use and discarded in an appropriate manner.

4.0. SITE-SPECIFIC CONSIDERATIONS

Prior to attempting soil gas sampling there should be an understanding of subsurface conditions at the Site. Soil gas samples should be collected in the vadose zone and generally, soil gas samples should not be collected at a depth less than above 5 feet below ground surface (bgs), unless sub-slab soil gas samples are needed. It may also not be feasible to collect soil gas from tighter grain soils with little pore volume, such as clays, and these layers should be avoided.

Soil gas sampling should not be performed until 24-hours after a significant rain event (>1/2 inch of rainfall).

5.0 PROCEDURE

5.1 System Set-up

1. Acquire all the necessary hardware and sampling equipment. Be sure to use one-quarter or one-eighth inch diameter Teflon or Nylaflow sample tubing.

2. Assemble or obtain the necessary fittings and vacuum gauge to create a soil gas probe and sampling manifold (vacuum gauge and valving). This manifold must be clean, free of oils, and flushed free of VOCs prior to use. If appropriate, be sure to place the helium leak check enclosure over the probe, and push the sample tubing through the hole in the cap before attaching the sampling manifold.

3. Adjust the purge system evacuation pump sampling rate to achieve the desired flow rate of 200 mL/min. This should be performed at the outlet of the vacuum pump prior to purging, either by using a suitable flow meter, or determining the amount of time required to fill a 1-liter Tedlar bag.

5.2 Shut-In Test

Prior to purging or sampling, a shut-in test should be conducted to check for leaks in the above-ground sampling system.

1. Assemble the above-ground valves, lines and fittings downstream from the top of the probe.

2. Evacuate the system to a minimum measured vacuum of about 100 inches of water using the purge pump.

3. Observe the vacuum gauge for 1-2 minutes. If there is any observable loss of vacuum, adjust the above-ground sampling system until the vacuum is maintained.

5.3 System Leak Checking and Purging

Perform a leak check of the sample manifold system by:

1. Make sure the gas probe valve is off and the sample valves are closed.

2. Open the purge valve and start the purge pump. Verify that the flow is set to 200 mL/min until a vacuum of approximately 15” Hg is achieved.

3. Turn off the purge pump and observe the vacuum gauge for 1-2 minutes. If there is any observable loss of vacuum, the leaks must be fixed prior to sampling.

4. Record the leak check date and time on the field notebook.

5.4 Purge Volume Test (Mobile Laboratory Only)

The purpose of the purge volume test is to ensure that stagnant air is removed from the sampling system and to ensure that samples are representative of subsurface conditions. The test well should be located where soil gas concentrations are anticipated to be elevated, if possible.

Perform a purge test of the test well by:

1. Purge the well one purge volume and collect a sample.

2. Have the mobile laboratory analyze the sample for target compounds. Sample procedures are explained in Section 5.6, below.

3. Purge an additional two purge volumes (for a total of 3 purge volumes), collect a sample and submit to the mobile laboratory for analysis.

    a. One purge volume is equal to the sum of the following volumes:

        - The internal volume of tubing;

        - The void space of the sand pack around the probe tip;

        - The void space of the dry bentonite in the annular space.

4. Repeat for a purge of 10 total purge volumes.

5. The site purge volume will be chosen based on the sample with the highest concentration of target compounds from the purge test. All of other sample locations will utilize this purge volume (either one, three, or ten).

5.5 Helium Leak Check (as dictated by DQOs)

The helium leak check procedure is accomplished by:

1. Start the flow of helium under the leak check enclosure. Position the tube so the helium is directed at the interface of the probe and the ground. Let the helium fill the enclosure for a couple of minutes.

2. Turn the helium leak detector on and make sure that the detector is not reading any helium before proceeding.

3. Verify that the helium concentration inside the leak check enclosure is >10% by placing the probe of the helium detector into the hole where the sample tubing comes out or under the enclosure wall. It is not necessary to verify that the helium concentration is 100% as this is bad for the detector.

4. Purging is carried out by pulling soil gas through the system at a rate of 200 mL/min for a time period sufficient to achieve three purge volumes, equal to the sum of the internal volume of the in-ground annular space, sample line, and sampling manifold system.

   Note: When calculating the purge volume, be sure to take into account the inside diameter and length of the sample tubing, as well as the probe outside diameter and retract distance for the annular space for temporary probes. If during the purge (or sampling) the vacuum exceeds 7 "Hg, then reduce the pump flow rate. The system vacuum must stay below this level at all times.

5. To start the soil gas probe purge, open the gas probe valve and close the sample valve at the same time, and start timing. Verify that the flow rate is still 200 mL/min.

6. During the last 5 minutes of the purge (or the entire purge time if less than 5 minutes), attach a Tedlar bag to the purge pump exhaust and open the bag's valve.

7. At the end of the purge time, close the purge valve, close the valve to the Tedlar bag, and turn off the pump.

8. Attach the Tedlar bag to the helium detector and open the valve. If a helium reading of greater than or equal to 5% of the helium concentration inside the leak check enclosure is observed, then the probe leak check has failed and corrective action should be taken.

9. Record the purge date, time, purge rate, leak check result, and purge volume on the field sampling log.

10. Immediately move on to the sampling phase. Little to no delay should occur between purging and sampling.

5.6 Sample Collection

'Clean' sampling protocols must be followed when handling and collecting samples. This requires care in the shipping, storage, and use of sampling equipment. Sharpie markers should not be used for labeling or note-taking during sampling.

1. Attach the canister, tedlar bag or syringe to the sample tubing.

2. Before taking the sample, confirm that the sampling system valves are set as follows: the purge valve is confirmed to be closed, gas probe valve is open, and the sample valve is open.

3. After sampling for the appropriate amount of time, close the sample valve and the canister/tedlar bag valve. Remove the sample container from the sampling manifold.

4. Record the sampling date, time, canister identification (ID), flow controller ID, and any other observation pertinent to the sampling event on the field sampling log. The temperature and barometric pressure should be recorded.
5. Fill out all appropriate documentation (sampling forms, sample labels, chain of custody, sample tags, etc.).
6. Disassemble the sampling system.

END OF PROCEDURE

ATTACHMENT 5

Laboratory Chains of Custody

Eurofins TestAmerica, Edison
777 New Durham Road

Edison, NJ 08817-2859
phone 732.549.3900 fax 732.549.3679

Chain of Custody Record

eurofins | Environment Testing America

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other:

TestAmerica Laboratories, Inc. d/b/a Eurofins TestAmerica

	Project Manager:			COC No:
Client Contact	**Email:**	**Site Contact:**	**Date:**	______ of ______ COCs
Your Company Name here	**Tel/Fax:**	**Lab Contact:**	**Carrier:**	TALS Project #:
Address	**Analysis Turnaround Time**			Sampler:
City/State/Zip	☐ CALENDAR DAYS ☐ WORKING DAYS			**For Lab Use Only:**
(xxx) xxx-xxxx Phone	TAT if different from Below ________			Walk-in Client:
(xxx) xxx-xxxx FAX	☐ 2 weeks			Lab Sampling:
Project Name:	☐ 1 week			
Site:	☐ 2 days			Job / SDG No.:
P O #	☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y / N)	Perform MS / MSD (Y / N)																		Sample Specific Notes:

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other ____________

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.

☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)

☐ Return to Client ☐ Disposal by Lab ☐ Archive for__________ Months

Special Instructions/QC Requirements & Comments:

Custody Seals Intact: ☐ Yes ☐ No

Custody Seal No.:

Cooler Temp. (°C): Obs'd:_________ Corr'd:__________ Therm ID No.:____________

Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received in Laboratory by:	Company:	Date/Time:

Form No. CA-C-WI-002, Rev. 4.35, dated 10/6/2020

Eurofins TestAmerica, Burlington
30 Community Drive
Suite 11

South Burlington, VT 05403-6809
phone 802.660.1990 fax 802.660.1919

Chain of Custody Record

eurofins | Environment Testing America

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other:

TestAmerica Laboratories, Inc. d/b/a Eurofins TestAmerica

	Project Manager:			COC No:
Client Contact	**Email:**	**Site Contact:**	**Date:**	_______ of ______ COCs
Your Company Name here	**Tel/Fax:**	**Lab Contact:**	**Carrier:**	TALS Project #:
Address	**Analysis Turnaround Time**			Sampler:
City/State/Zip	☐ CALENDAR DAYS ☐ WORKING DAYS			**For Lab Use Only:**
(xxx) xxx-xxxx Phone	TAT if different from Below __________			Walk-in Client:
(xxx) xxx-xxxx FAX	☐ 2 weeks			Lab Sampling:
Project Name:	☐ 1 week			
Site:	☐ 2 days			Job / SDG No.:
P O #	☐ 1 day			

Sample Identification	**Sample Date**	**Sample Time**	**Sample Type** (C=Comp, G=Grab)	**Matrix**	**# of Cont.**	**Filtered Sample (Y / N)**	**Perform MS / MSD (Y / N)**																		Sample Specific Notes:
Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other ____________																									

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.

☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)

☐ Return to Client ☐ Disposal by Lab ☐ Archive for__________ Months

Special Instructions/QC Requirements & Comments:

Custody Seals Intact: ☐ Yes ☐ No

Custody Seal No.:

Cooler Temp. (°C): Obs'd:_________ Corr'd:__________ Therm ID No.:____________

Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received in Laboratory by:	Company:	Date/Time:

Form No. CA-C-WI-002, Rev. 4.35, dated 10/6/2020

APPENDIX G

Site Management Forms

Site Inspection Checklist, 458 East 99th Street, Brooklyn, New York

Description	Status		Actions Taken / Comments
	OK	Action Req.	
<u>Sub-Slab Depressurization System Blower</u> **A. Aboveground Piping** 1 Inspect aboveground (interior/exterior) piping for cracks, leaks and support issues.			
2 Inspect condition of valves (at fan and aboveground piping) for proper operation.			
B. Electrical 1 Check that the electrical source for fan is secured.			
<u>Soil Vapor Extraction System Blower</u> **A. Aboveground Piping** 1 Inspect aboveground (interior/exterior) piping for cracks, leaks and support issues.			
2 Inspect condition of valves (at fan and aboveground piping) for proper operation.			
B. Electrical 1 Check that the electrical source for fan is secured.			
C. Blower and Condensate Bypass 1 Inspect condition of fan and condensate bypass.			
<u>Institutional Controls</u> 1 Confirm that the site usage is in compliance with the institutional controls.			
<u>Site Records</u> 1 Inspect site records and confirm that they are up to date (e.g., Site Inspection Checklists and Sub-Slab Depressurization System Operations Logs, sampling logs, etc.)			

SSDS Operations and Maintenance Log, 458 East 99th Street, Brooklyn, New York

SEMIANNUAL REQUIREMENT

Inspection Item Description	**Yes**	**No**	**Comments/ Actions Taken**
Is the system operating normally?			
Are any warning lights on? (Please list those that are on)			
If there is an alarm condition, was it fixed and the system restarted?			
Is the fan enclosure in good condition?			
Are the valves (at fan and aboveground piping) in good condition?			
Are exterior piping free of cracks, leaks, and support issues?			
Are interior piping free of cracks, leaks, and support issues?			
List maintenance activities that were performed or other comments about the system:			

SEMIANNUAL REQUIREMENT

Source of Reading	**Units**	**Values**	**Comments**
SVE-1 Riser Sample Port	Inches of Water		
SP-1 Riser Sample Port	Inches of Water		
SP-2 Riser Sample Port	Inches of Water		
SP-3 Riser Sample Port	Inches of Water		
SV-1	Inches of Water		
SV-2	Inches of Water		
SV-3	Inches of Water		

Form Completed By:

Signature:

Date & Time:

Soil Vapor Sampling Form

Date: ______________ **Time:** ______________

Weather : ____

Temperature: ______________ Humidity: ______________

Wind Magnitude: ______________ Wind Direction: ______________

Barometric Pressure: ______________ Precipitation: ______________

Sampling Team: ____

Sampling Location: ____________________________

Site Condition (i.e. any adjacent questionable facilities, vent pipes, tanks, etc. and what type of basements are present)

____

____

____

Prior to commencing the sampling activity, remove the brass cap from the end of the sample tubing and fit a new brass hose barb fitting onto the sample tubing.

Calibrate the Helium detection meter

Utility Clearance Completed: ______________

Sampling Depth: ______________ feet below land surface (If ambient air sample, elevate can to approx. 3 ft - 5 ft above land surface)

Sealed with bentonite: ______________

Apparent Moisture Content: ______________

Purge Rate: ______________ Must be less than 0.2 L/min (200 mL/min)

Purge Time: ______________

Helium Rate at enclosure: ______________

Helium Rate from sample tubing: ______________ Is this rate <10% of the rate at the enclosure **Yes / No**

If the Helium readings have a greater ratio than 10% the seals should be rechecked and the tracer gas should be reapplied.

Once the tracer gas screening procedures are completed and no short-circuiting is determined to be present at the location the soil vapor sample can be collected in a lab certified clean summa canister at a rate less than 0.2 L/min.

Is the Summa Canister Certified Clean and within the proper holding time ? Yes

Starting Pressure: ______________ in. of Hg

Starting Time: ______________

Ending Time: ______________

Ending Pressure: ______________ in. of Hg

Summa Canister Identification #: ______________

Flow Regulator ID # ______________

Sample ID # ______________

Time ______________

Analysis ______________________________________

Laboratory ______________________________________

APPENDIX H

Request to Import/Reuse Fill Material Form

NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Request to Import/Reuse Fill or Soil

This form is based on the information required by DER-10, Section 5.4(e) and 6NYCRR Part 360.13. Use of this form is not a substitute for reading the applicable regulations and Technical Guidance document.

SECTION 1 – SITE BACKGROUND

The allowable site use is: Commercial or Industrial Use

Have Ecological Resources been identified? no

Is this soil originating from the site? no

How many cubic yards of soil will be imported/reused? 0-50

If greater than 1000 cubic yards will be imported, enter volume to be imported:

SECTION 2 – MATERIAL OTHER THAN SOIL

Is the material to be imported gravel, rock or stone? yes

Does it contain less than 10%, by weight, material that passes a size 100 sieve? yes

Is this virgin material from a permitted mine or quarry? yes

Is this material recycled concrete or brick from a DEC registered processing facility? no

SECTION 3 - SAMPLING

Provide a brief description of the number and type of samples collected in the space below:

One sample was collected from the source for sieve analysis.

Example Text: 5 discrete samples were collected and analyzed for VOCs. 2 composite samples were collected and analyzed for SVOCs, Inorganics & PCBs/Pesticides.

If the material meets requirements of DER-10 section 5.4(e)5 (other material), no chemical testing needed.

SECTION 3 CONT'D - SAMPLING

Provide a brief written summary of the sampling results or attach evaluation tables (compare to DER-10, Appendix 5):

The sieve analysis indicates 5.8% of the NYSDOT Type 2 stone will pass a size 100 sieve. DER-10 exempts fill materials from a permitted mine or quarry with less than 10% passing a size 80 sieve from chemical analysis requirements. Documentation for the source of the material is attached.

Example Text: Arsenic was detected up to 17 ppm in 1 (of 5) samples; the allowable level is 16 ppm.

If Ecological Resources have been identified use the "If Ecological Resources are Present" column in Appendix 5.

SECTION 4 – SOURCE OF FILL

Name of person providing fill and relationship to the source:

Tilcon New York Inc

Location where fill was obtained:

Clinton Point Quarry

Identification of any state or local approvals as a fill source:

NYSDEC Mine ID 30011

If no approvals are available, provide a brief history of the use of the property that is the fill source:

Provide a list of supporting documentation included with this request:

Sieve Analysis - NYSDOT Type 2 Stone

The information provided on this form is accurate and complete.

Signature

5/29/2024

Date

Noelle Clarke

Print Name

Roux Engineering and Geology, D.P.C.

Firm

Tilcon New York Inc.
9 Entin Road
Parsippany, NJ 07054

TILCON
A CRH COMPANY

T 973-366-7741
www.tilconny.com

People • Character • Innovation • Performance

May 29, 2024

Innovative Recycling Technologies
690 N Queens Ave A
Lindenhurst, NY 11757

Attn: Jack Ewen
Re: 99th St Brooklyn

Dear Mr. Ewen;

As it is produced by our Clinton Point operation and sold through our Port Washington terminal, Item4 Type 2 Subbase is manufactured to meet New York State Department of Transportation (NYSDOT) and ASTM Standard Specifications.

Our Clinton Point Quarry, NYSDOT source #8-9R, supplies 100% virgin dolomite limestone (dolomite) that is quarried and processed to finished sizes. Material shipped from our Clinton Point facility is clean and free of contaminants prior to loading. Our Clinton Point source was approved by the NYSDOT under test number 22AR045 and the letter to this effect is attached.

Also attached please find the gradation, and third-party test results confirming source quality characteristics.

If you have any questions or require additional information, please contact me at leslie.dalessandro@tilconny.com

Very truly yours,
TILCON NEW YORK, INC.

Leslie Dalessandro
Quality Control Department

NEW YORK STATE DEPARTMENT OF TRANSPORTATION MATERIALS BUREAU
COARSE AGGREGATE ANALYSIS FOR 703-02 PHYSICAL REQUIREMENTS

Source
8-9R
Tilcon New York, Inc.
Clinton Point, NY

Sample/Test
Sample Date: 08/11/2022
Test No.: 22AR045
LRN: SM22047312
Smpl ID: bpahucki2292114829

**** Privileged and Confidential ****

Test results represent this sample only. They may not be appropriate for designing mixes. When designing mixes, follow procedures in appropriate Materials Method.

Material meets specifications for §703-02, Coarse Aggregate. Consult pavement friction requirements for intended use.

Run	Specific Gravity	
1	Bulk SSD	2.809
1	Bulk	2.788
1	Apparent	2.846
1	Absorption (%)	0.7

Run	10 Cycle MgSO4	
1	Stone Size	1
1	Loss (%)	6.7

Max Loss ≤ 18% on #2 stone.
*Max Loss ≤ 32% on #1 Stone.**

25 Cycle 3% Brine Freeze Thaw	
Loss #2 (%)	
Loss #1 (%)	

Max Loss ≤ 20% on #2 stone.
*Max Loss ≤ 25% on #1 Stone.**

Uncompacted Voids

Acid Insoluble Residue Results

>20% indicates high residue.

Crush Count

*Min 75% crushed for #2 stone, 85% for #1 stone.**

In accordance with Materials Method 29, only aggregate sources with a current and accepted biennial test and Geologic Source Report will appear on the NYSDOT Approved List
*For detailed specifications, see https://www.dot.ny.gov/main/business-center/engineering/specifications

NEW YORK STATE DEPARTMENT OF TRANSPORTATION MATERIALS BUREAU
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8-9R
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Sample/Test
Sample Date: 08/11/2022
Test No.: 22AR045
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Smpl ID: bpahucki2292114829

**** Privileged and Confidential ****

Petrographic Results*	
Stone Size No.	1
Noncarbonate (%)	0
Deleterious Material	None

Rock Type Description	%
Dolomite (light to medium gray)	86.7
Dolomite (dark gray)	4.5
Dolomite (tan)	7.7
Dolomite (weathered)	1.1

Source Confirmation	
Stone Size No.	1
Source Confirmation	Matches Reference

In accordance with Materials Method 29, only aggregate sources with a current and accepted biennial test and Geologic Source Report will appear on the NYSDOT Approved List
*For detailed specifications, see https://www.dot.ny.gov/main/business-center/engineering/specifications

Client: Tilcon New York Inc.
Project: 2024 Quality Control – Clinton Point, NY
Project Code: 231665
Subject: Laboratory Tests of Coarse Aggregate (Clinton Point Quarry)

On November 27, 2023, your representative delivered one sample of crushed stone, (Advance Testing Sample Number 23-1738A), from the Clinton Point Quarry, to our Campbell Hall, New York facility for testing. A Resistance of Coarse Aggregates to Freezing and Thawing in accordance with NYSDOT Method 703-08P, G, a 10 Cycle Magnesium Sulfate Soundness in accordance with NYSDOT 703-07P, G, a Lightweight Particles in Aggregate in accordance with ASTM C123, a Los Angeles Abrasion in accordance with ASTM C131, a Clay Lumps and Friable Particles in accordance with ASTM C142, and a Density, Relative Density and Absorption in accordance with ASTM C127 was performed on this sample per your request. The laboratory test results follow.

25-Cycle Freeze Thaw
NYSDOT 703-08P, G
Tilcon New York- Clinton Point Quarry- ¾" Stone

Advance Sample No.	Sieve Fraction	Initial Weight (g)	Final Weight (g)	Mass Loss (g)	Loss (%)
23-1738A	1/2" – 1/4"	1092.5	1079.7	12.8	1.2
	3/4" – 1/2"	1057.4	1031.3	26.1	4.8
	1" – 3/4"	1864.6	1749.1	115.5	
NYSDOT Specification: < 20%		**Total Sample Loss: Complies with Specification**			

10 Cycle Magnesium Sulfate Soundness
NYSDOT 703-07 P, G
Tilcon New York- Clinton Point Quarry- ¾" Stone

Advance Sample No.	Sieve Fraction	Initial Weight (g)	Final Weight (g)	Percent Weight Loss (%)
23-1738A	1" – 1/2"	2504.6	2440	2.6
	1/2" – 1/4"	1001.1	932.5	6.9
NYSDOT Specification: < 18%		**Loss: Complies with Specification**		

Los Angeles Abrasion
ASTM C131
Tilcon New York- Clinton Point Quarry- ¾" Stone

Advance Sample No.	Nominal Maximum Size (inch)	Grading	Percent Loss (%)	Project Specification (%)
23-1738A	3/4	B	20.1	**≤ 35**

Density, Relative Density, and Absorption of Coarse Aggregates
ASTM C127
Tilcon New York- Clinton Point Quarry- ¾" Stone

Advance Sample No.	Relative Density (OD)	Relative Density (SSD)	Apparent Relative Density	Absorption (%)
23-1738A	2.806	2.818	2.841	0.44

Clay Lumps and Friable Particles in Coarse Aggregate
ASTM C142
Tilcon New York- Clinton Point Quarry- ¾" Stone

Advance Sample No.	Particle Size Range Tested	Average Clay Lumps and Friable Particles (%)	Project Specification (%)
23-1738A	3/4 - #4	0.00	**≤ 0.5**

Lightweight Particles In Aggregate
ASTM C123
Tilcon New York- Clinton Point Quarry- ¾" Stone

Advance Sample No.	Nominal Maximum Size (inch)	Mass of Sample (g)	Heavy Liquid Used	Specific Gravity of Liquid	Lightweight Particles (%)
23-1738A	3/4	3121.8	Zinc Bromide	2.40	0.00

Sincerely,

Emily J. Rodriguez

Emily J. Rodriguez
Laboratory Manager
Advance Testing Company, Inc.

A CRH COMPANY

Quality Test Report

Plant 060_00210-Clinton Point Aggregate
Product NYSDOT Type 2-NYSDOT Type 2 Subbase 304.12
Specification NYSDOT Granular & Structural Fill

1123533435

Sample Information

Sample No 1123533435
Date Sampled 04/01/2024 13:29
Sampled By Matt Kopek
Type Shipping
Method Load-out Face
Location Lower Dock (South)

Split Sample ☐
Resample ☐

Test Note
Barge HG302
Customer Haugland

Gradation Results

Date Completed 04/01/2024 13:29
Tested By Matt Kopek

Unit	Moist Mass	Dry Mass	Wash Mass	Moisture %	Wash Loss %	Procedure
g		14950.00	14243.15		4.7	

Sieve	Mass Retained	Cum Mass Retained	Ind % Retained	% Retained	% Passing	Target	Specification	Comment
2" (50mm)	0.00	0.00	0.0	0.0	100.0			
1 1/2" (37.5mm)	0.00	0.00	0.0	0.0	100.0			
1" (25mm)	530.00	530.00	3.5	3.5	96.5			
3/4" (19mm)	1640.00	2170.00	11.0	14.5	85.5			
1/2" (12.5mm)	3050.00	5220.00	20.4	34.9	65.1			
3/8" (9.5mm)	1090.00	6310.00	7.3	42.2	57.8			
1/4" (6.3mm)	1470.00	7780.00	9.8	52.0	48.0			
#4 (4.75mm)	1200.00	8980.00	8.0	60.1	39.9			
#10 (2mm)	2265.02	11245.02	15.2	75.2	24.8			
#20 (.85mm)	1773.09	13018.11	11.9	87.1	12.9			
#40 (.425mm)	533.72	13551.83	3.6	90.6	9.4		0-70	
#60 (.25mm)	343.87	13895.70	2.3	92.9	7.1			
#100 (.15mm)	181.49	14077.19	1.2	94.2	5.8			
#200 (75µm)	142.09	14219.27	0.95	95.11	4.89		0-15	
Pan	25.07	14244.35	4.89	100.00	0.00			

APPENDIX I

Excavation Work Plan

APPENDIX [I] – EXCAVATION WORK PLAN (EWP)

I-1 NOTIFICATION

At least 15 days prior to the start of any activity that is anticipated to encounter remaining contamination or breach or alter the site's cover system, the site owner or their representative will notify the NYSDEC contacts listed in the table below. Table [1] includes contact information for the above notification. The information on this table will be updated as necessary to provide accurate contact information. A full listing of site-related contact information is provided in Appendix B.

Table [1]: Notifications*

Name	**Contact Information**
Marlen Salazar NYSDEC Project Manager	(718) 482-7129 marlen.salazar@dec.ny.gov
Jane O'Connell NYSDEC Project Supervisor	(718) 483-4599 Jane.oconnell@dec.ny.gov
Aaron Keegan NYSDOH Project Manager	(518) 408-1943 aaron.keegan@health.ny.gov

* Note: Notifications are subject to change and will be updated as necessary.

This notification will include:

- A detailed description of the work to be performed, including the location and areal extent of excavation, plans/drawings for site re-grading, intrusive elements or utilities to be installed below the soil cover, estimated volumes of contaminated soil to be excavated, any modifications of truck routes, and any work that may impact an engineering control;
- A summary of environmental conditions anticipated to be encountered in the work areas, including the nature and concentration levels of contaminants of

concern, potential presence of grossly contaminated media, and plans for any pre-construction sampling;

- A schedule for the work, detailing the start and completion of all intrusive work, and submittals (e.g., reports) to the NYSDEC documenting the completed intrusive work;
- A summary of the applicable components of this EWP;
- A statement that the work will be performed in compliance with this EWP, 29 CFR 1910.120 and 29 CFR 1926 Subpart P;
- A copy of the contractor's health and safety plan (HASP), in electronic format, if it differs from the HASP provided in Appendix D of this SMP;
- Identification of disposal facilities for potential waste streams; and
- Identification of sources of any anticipated backfill, along with the required request to import form and all supporting documentation including, but not limited to, chemical testing results.

The NYSDEC project manager will review the notification and may impose additional requirements for the excavation that are not listed in this EWP. The alteration, restoration and modification of engineering controls must conform with Article 145 Section 7209 of the Education Law regarding the application professional seals and alterations.

I-2 SOIL SCREENING METHODS

Visual, olfactory and instrument-based (e.g. photoionization detector) soil screening will be performed during all excavations into known or potentially contaminated material (remaining contamination) or a breach of the cover system. A qualified environmental professional as defined in 6 NYCRR Part 375, a PE who is licensed and registered in New York State, or a qualified person who directly reports to a PE who is licensed and registered in New York State will perform the screening. Soil screening will be performed when invasive work is done and will include all excavation and invasive work performed during development, such as excavations for foundations and utility work, after issuance of the COC.

Soils will be segregated based on previous environmental data and screening results into material that requires off-site disposal and material that requires testing to determine if the material can be reused on-site as soil beneath a cover or if the material can be used as cover soil. Further discussion of off-site disposal of materials and on-site reuse is provided in Sections I-6 and I-7 of this Appendix.

I-3 SOIL STAGING METHODS

Although no future soil movement is anticipated for the Site, if it is necessary, direct loading of trucks will be the preferred method of disposal. Soil stockpiles, if any, will be continuously encircled with a berm and/or silt fence. Hay bales will be used as needed near catch basins, surface waters and other discharge points.

Stockpiles, if any, will be kept covered at all times with appropriately anchored tarps. Stockpiles will be routinely inspected and damaged tarp covers will be promptly replaced.

Stockpiles, if any, will be inspected at a minimum once each week and after every storm event. Results of inspections will be recorded in a logbook and maintained at the site and available for inspection by the NYSDEC.

I-4 MATERIALS EXCAVATION AND LOAD-OUT

A qualified environmental professional as defined in 6 NYCRR Part 375, a PE who is licensed and registered in New York State, or a qualified person who directly reports to a PE who is licensed and registered in New York State will oversee all invasive work and the excavation and load-out of all excavated material.

The owner of the property and remedial party (if applicable) and its contractors are responsible for safe execution of all invasive and other work performed under this Plan.

The presence of utilities and easements on the site will be investigated by the qualified environmental professional. It will be determined whether a risk or impediment to the planned work under this SMP is posed by utilities or easements on the site. A site utility stakeout will be completed for all utilities prior to any ground intrusive activities at the site.

Loaded vehicles leaving the site will be appropriately lined, tarped, securely covered, manifested, and placarded in accordance with appropriate Federal, State, local, and NYSDOT requirements (and all other applicable transportation requirements). Trucks transporting contaminated soil must have either tight-fitting opaque covers that are secured on the sides and/or back, or opaque covers that are locked on all sides.

A truck wash will be operated on-site, as appropriate. The qualified environmental professional will be responsible for ensuring that all outbound trucks will be washed at the truck wash before leaving the site until the activities performed under this section are complete. Truck wash waters will be collected and disposed of off-site in an appropriate manner.

Locations where vehicles enter or exit the site shall be inspected daily for evidence of off-site soil tracking.

The qualified environmental professional will be responsible for ensuring that all egress points for truck and equipment transport from the site are clean of dirt and other materials derived from the site during intrusive excavation activities. Cleaning of the adjacent streets will be performed as needed to maintain a clean condition with respect to site-derived materials. Material accumulated from the street cleaning and egress cleaning activities will be disposed off-site at a permitted landfill facility in accordance with all applicable local, State, and Federal regulations.

I-5 MATERIALS TRANSPORT OFF-SITE

All transport of materials will be performed by licensed haulers in accordance with appropriate local, State, and Federal regulations, including 6 NYCRR Part 364. Haulers will be appropriately licensed and trucks properly placarded.

Material transported by trucks exiting the site will be secured with either tight-fitting opaque covers that are secured on the sides and/or back, or opaque covers that are locked on all sides. Loose-fitting canvas-type truck covers will be prohibited. If loads contain wet material capable of producing free liquid, truck liners will be used.

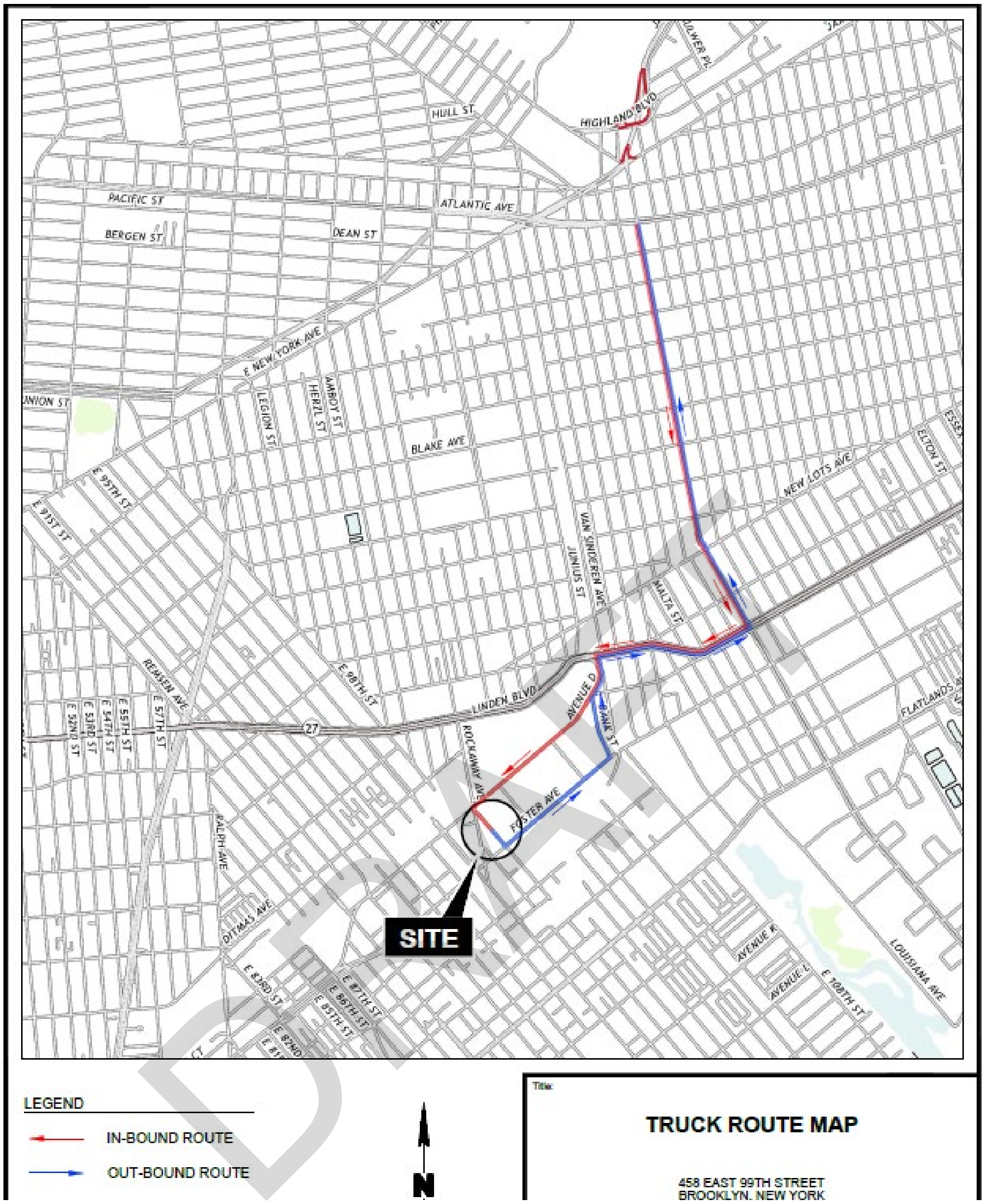
Truck transport routes are as follows:

To Site:

- Via Atlantic Ave turn onto Pennsylvania Ave from the North.
- Turn right onto Linden Blvd.
- Turn left onto Avenue D.
- Turn left onto East 99th Street. Site is located on the right.

From Site

- Head south on East 99th Street and turn left on Foster Ave.
- Turn left on Bank Street.
- Turn right onto Avenue D.
- Turn right onto Linden Blvd
- Turn left onto Pennsylvania Ave
- Turn left onto Atlantic Ave



All trucks loaded with site materials will exit the vicinity of the site using only these approved truck routes. This is the most appropriate route and takes into account: (a) limiting transport through residential areas and past sensitive sites; (b) use of city mapped truck routes; (c) prohibiting off-site queuing of trucks entering the facility; (d) limiting total distance to major highways; (e) promoting safety in access to highways; and (f) overall safety in transport.

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

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

Queuing of trucks will be performed on-site in order to minimize off-site disturbance. Off-site queuing will be prohibited.

I-6 MATERIALS DISPOSAL OFF-SITE

All material excavated and removed from the site will be treated as contaminated and regulated material and will be transported and disposed off-site in a permitted facility in accordance with all local, State and Federal regulations. If disposal of material from this site is proposed for unregulated off-site disposal (i.e. clean soil removed for development purposes), a formal request with an associated plan will be made to the NYSDEC project manager. Unregulated off-site management of materials from this site will not occur without formal NYSDEC project manager approval.

Off-site disposal locations for excavated soils will be identified in the pre-excavation notification. This will include estimated quantities and a breakdown by class of disposal facility if appropriate, (e.g. hazardous waste disposal facility, solid waste landfill, petroleum treatment facility, C&D debris recovery facility). Actual disposal quantities and associated documentation will be reported to the NYSDEC in the Periodic Review Report. This documentation will include, but will not be limited to: waste profiles, test results, facility acceptance letters, manifests, bills of lading and facility receipts.

Non-hazardous historic fill and contaminated soils taken off-site will be handled consistent with 6 NYCRR Parts 360, 361, 362, 363, 364 and 365. Material that does not meet Unrestricted SCOs is prohibited from being taken to a New York State C&D debris recovery facility (6 NYCRR Subpart 360-15 registered or permitted facility).

I-7 MATERIALS REUSE ON-SITE

On-Site reuse is not planned for the Site. However, if it is necessary, the qualified environmental professional, as defined in 6 NYCRR Part 375, will ensure that procedures defined for materials reuse in this SMP are followed and that unacceptable material (i.e. contaminated) does not remain on-site. Contaminated on-site material, including historic fill and contaminated soil, that is acceptable for reuse on-site will be placed below the demarcation layer or impervious surface, and will not be reused within the cover system or within landscaping berms. Contaminated on-site material may only be used beneath the site cover as backfill for subsurface utility lines with prior approval from the DEC project manager.

Proposed materials for reuse on-site must be sampled for full suite analytical parameters including per- and polyfluoroalkyl substances (PFAS) and 1,4-dioxane. The sampling frequency will be in accordance with DER-10 Table 5.4(e)10 unless prior approval is obtained from the NYSDEC project manager for modification of the sampling frequency. The analytical results of soil/fill material testing must meet the site use criteria presented in NYSDEC DER-10 Appendix 5 – Allowable Constituent Levels for Imported Fill or Soil for all constituents listed, and the NYSDEC Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances April 2023 guidance values. Approvals for modifications to the analytical parameters must be obtained from the NYSDEC project manager prior to the sampling event.

Soil/fill material for reuse on-site will be segregated and staged as described in Sections I-2 and I-3 of this EWP. The anticipated size and location of stockpiles will be provided in the 15-day notification to the NYSDEC project manager. Stockpile locations will be based on the location of site excavation activities and proximity to nearby site features. Material reuse on-site will comply with requirements of NYSDEC DER-10 Section 5.4(e)4. Any modifications to the requirements of DER-10 Section 5.4(e)4 must be approved by the NYSDEC project manager.

Any demolition material proposed for reuse on-site will be sampled for asbestos and the results will be reported to the NYSDEC for acceptance. Concrete crushing or processing on-site will not be performed without prior NYSDEC approval. Organic matter (wood, roots, stumps, etc.) or other solid waste derived from clearing and grubbing of the site will not be reused on-site.

I-8 FLUIDS MANAGEMENT

Wastewater is not anticipated to be generated at the Site. However, if it is necessary, all liquids to be removed from the site, including but not limited to, excavation dewatering, decontamination waters and groundwater monitoring well purge and development waters, will be handled, transported and disposed off-site at a permitted facility in accordance with applicable local, State, and Federal regulations. Dewatering, purge and development fluids, if any, will not be recharged back to the land surface or subsurface of the site, and will be managed off-site, unless prior approval is obtained from NYSDEC.

Discharge of water generated during large-scale construction activities to surface waters (i.e. a local pond, stream or river) will be performed under a SPDES permit.

I-9 BACKFILL FROM OFF-SITE SOURCES

All materials proposed for import onto the site will be approved by the qualified environmental professional, as defined in 6 NYCRR Part 375, and will be in compliance with provisions in this SMP prior to receipt at the site. A Request to Import/Reuse Fill or Soil form, which can be found at http://www.dec.ny.gov/regulations/67386.html, will be prepared and submitted to the NYSDEC project manager allowing a minimum of 5 business days for review. A copy of the form is presented in Appendix H.

Material from industrial sites, spill sites, other environmental remediation sites, or potentially contaminated sites will not be imported to the site.

All imported soils will meet the backfill and cover soil quality standards established in 6 NYCRR 375-6.7(d) and DER-10 Appendix 5 for commercial use. Based on an evaluation of the land use, protection of groundwater and protection of ecological resources criteria, the resulting soil quality standards are listed in Table 14. Soils that meet ‘general’ fill requirements under 6 NYCRR Part 360.13, but do not meet backfill or cover soil objectives for this site, will not be imported onto the site without prior approval by NYSDEC project manager. Soil material will be sampled for the full suite of analytical parameters, including PFAS and 1, 4-dioxane. Solid waste will not be imported onto the site.

Trucks entering the site with imported soils will be securely covered with tight fitting covers. Imported soils will be stockpiled separately from excavated materials and covered to prevent dust releases.

I-10 STORMWATER POLLUTION PREVENTION

Barriers and hay bale checks will be installed and inspected once a week and after every storm event. Results of inspections will be recorded in a logbook and maintained at the site and available for inspection by the NYSDEC. All necessary repairs shall be made immediately.

Accumulated sediments will be removed as required to keep the barrier and hay bale check functional.

All undercutting or erosion of the silt fence toe anchor shall be repaired immediately with appropriate backfill materials.

Manufacturer's recommendations will be followed for replacing silt fencing damaged due to weathering.

Erosion and sediment control measures identified in the SMP shall be observed to ensure that they are operating correctly. Where discharge locations or points are accessible, they shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters.

Silt fencing or hay bales will be installed around the entire perimeter of the construction area.

I-11 EXCAVATION CONTINGENCY PLAN

If underground tanks or other previously unidentified contaminant sources are found during post-remedial subsurface excavations or development related construction, excavation activities will be suspended until sufficient equipment is mobilized to address the condition. The NYSDEC project manager will be promptly notified of the discovery.

Sampling will be performed on product, sediment and surrounding soils, etc. as necessary to determine the nature of the material and proper disposal method. Chemical analysis will be performed for a full list of analytes [TAL metals, TCL volatiles and semi-volatiles (including 1,4-dioxane), TCL pesticides and PCBs, and PFAS], unless the site history and previous sampling results provide sufficient justification to limit the list of analytes. In this case, a reduced list of analytes will be proposed to the NYSDEC project manager for approval prior to sampling. Any tanks will be closed as per NYSDEC regulations and guidance.

Identification of unknown or unexpected contaminated media identified by screening during invasive site work will be promptly communicated by phone within two hours to NYSDEC's Project Manager. Reportable quantities of petroleum product will also be reported to the NYSDEC spills hotline. These findings will be also included in the Periodic Review Report.

I-12 COMMUNITY AIR MONITORING PLAN

The Community Air Monitoring Plan (CAMP) is included in Appendix D of the SMP.

Exceedances of action levels listed in the CAMP will be reported to NYSDEC and NYSDOH Project Managers.

I-13 ODOR CONTROL PLAN

This odor control plan is capable of controlling emissions of nuisance odors off-site and on-site. Specific odor control methods to be used on a routine basis will include limiting open excavation areas and covering excavated soil (i.e., with polyethylene sheeting or in covered roll off containers).. If nuisance odors are identified at the site boundary, or if odor complaints are received, work will be halted and the source of odors will be identified and corrected. Work will not resume until all nuisance odors have been abated. NYSDEC and NYSDOH will be notified of all odor events and of any other complaints about the project. Implementation of all odor controls, including the halt of work, is the responsibility of the remedial party's Remediation Engineer, and any measures that are implemented will be discussed in the Periodic Review Report.

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

If nuisance odors develop during intrusive work that cannot be corrected, or where the control of nuisance odors cannot otherwise be achieved due to on-site conditions or close proximity to sensitive receptors, odor control will be achieved by sheltering the excavation and handling areas in a temporary containment structure equipped with appropriate air venting/filtering systems.

I-14 DUST CONTROL PLAN

Particulate monitoring must be conducted according to the Community Air Monitoring Plan (CAMP) provided in Section I-12. If particulate levels at the site exceed the thresholds listed in the CAMP or if airborne dust is observed on the site or leaving the site, the dust suppression techniques listed below will be employed. The remedial party will also take measures listed below to prevent dust production on the site.

A dust suppression plan that addresses dust management during invasive on-site work (although none is being anticipated at this time), will include, at a minimum, the items listed below:

- Dust suppression will be achieved using a dedicated on-site water truck or on-site water sources for road wetting. The equipment will be equipped with a water cannon or nozzle capable of spraying water directly onto off-road areas including excavations and stockpiles.
- Clearing and grubbing of larger sites will be done in stages to limit the area of exposed, unvegetated soils vulnerable to dust production.
- Gravel will be used on roadways to provide a clean and dust-free road surface.
- On-site roads will be limited in total area to minimize the area required for water truck sprinkling.
- Covering excavated areas and material after excavation activity ceases.
- Reducing the excavation size and/or number of excavations

I-15 OTHER NUISANCES

A plan for rodent control will be developed and utilized by the contractor prior to and during site clearing and site grubbing, and during all remedial work.

A plan will be developed and utilized by the contractor for all remedial work to ensure compliance with local noise control ordinances.

APPENDIX J

Remedial System Optimization Table of Contents

APPENDIX J

REMEDIAL SYSTEM OPTIMIZATION TABLE OF CONTENTS

REMEDIAL SYSTEM OPTIMIZATION FOR 458 EAST 99th STREET

TABLE OF CONTENTS